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The lexical category of adjective in English academic written discourse.
A cross-disciplinary study

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To my Parents and Piotr

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Introduction

Communication in its spoken and written forms is an inseparable part of academia all over the world. The importance of communication is expressed as “life blood of academia” (Becher and Trowler, 2001). A notion which carries broader meaning than communication is academic discourse explained as “ways of thinking” and “using language” in academic environment (Hyland, 2009:1). Academic discourse is seen as diverse and this diversity derives from different disciplines and genres that are used in academia (Hyland, 2004). Disciplines and genres, in turn, have an influence on authors of academic texts since there are formats and traditions which authors need to respect while writing texts (Flottum, et al., 2006).

Research on academic written discourse has much attracted scholarly attention concentrating on different genres, e.g., research article, research article abstract, PhD thesis, and review. The directions of studies focus on, e.g., rhetorical strategies, metadiscourse, macrostructure of academic texts or different parts of speech. The analyses also compare the afore-mentioned issues across different disciplinary fields. A number of studies on adjectives either have examined their selected types, e.g., evaluative adjectives in journal papers, or discussed adjectives in other corpora than research articles, e.g., spoken corpora and websites. Analyses on adjectives in research articles and their lexico-grammatical structures, especially from cross-disciplinary perspective have not been popular in academic arena. To fill the gap and test the validity of the claim by Bartholomae (1986) and Swales (1990) that disciplines have their own norms and nomenclature this study verifies if adjectives in research articles are common across selected disciplines or there are discipline-specific adjectives.

The ultimate goal of this thesis is to present a detailed analysis of the most frequent adjectives found in the English Language Corpus (the ELC, compiled for this dissertation) and the lexico-grammatical constructions that the adjectives enter.

The thesis is divided into a theoretical part devoted to academic discourse and adjectives and a practical part which examines the adjectives and their lexico-grammatical patterns in research articles in the entire corpus and its seven sub-corpora. The thesis consists of six chapters.

The first chapter, *Academic discourse*, discusses what academic discourse is and introduces fundamental notions which refer to it, such as: academic community, register, genre. It also concentrates on features of specialised discourse. In its further part, it elaborates on selected written genres, the first of which is research article. The section provides a historical

overview of research article, and discusses the structure of its particular segments, that is, Introduction, Methods, Results, Discussion and Conclusion. These segments may vary across disciplines. The structure of journal papers collected for the ELC is briefly discussed as well. To fully present the model of research article, the next section of Chapter one focuses on research article abstract. Chapter one closes with a brief outline of spoken academic discourse.

Chapter Two reports on the studies of research article. The first part describes the analyses devoted to the macrostructure of research article and its segments. The second part looks at rhetorical strategies in research articles and introduces the notion of metadiscourse and its model, as proposed by Hyland (2005). The third section provides an analysis of lexis in journal papers, and centres on the category of adjective by reviewing studies into evaluative adjectives, negative polarity of adjectives, litotic constructions which include adjectives, or investigate the distribution of adjectives.

Chapter Three, *Adjective*, begins with a presentation of parts of speech categorisations, including those that lack the category of adjective. In its further part, the chapter presents the main features of adjectives (Quirk, et al., 1985) and the criteria according to which adjectives can be differed from other parts of speech, namely, nouns, adverbs and participles (Quirk, et al., 1985, Huddleston and Pullum, 2002, Radford, 1989). The second section of Chapter Three focuses on semantic classifications of adjectives.

Chapter Four presents the methodology adopted in this thesis. It introduces the corpus, (the English Language Corpus) compiled for this dissertation. The corpus is a collection of 693 research articles and runs nearly 3.3 million words. This chapter describes methods and criteria used in the analysis of data.

Chapter Five is an analysis of the top-frequency adjectives in the corpus. It presents the distribution of the adjectives in the entire corpus and across the seven sub-corpora representing the disciplinary fields: biotechnology, ecology, linguistics, material science, medicine, mathematics and political science. The study also presents the most frequent lexico-grammatical patterns of the top-frequency adjectives and provides instances of use from the corpus. The analysis of each adjective closes with its most common collocates and the most frequent lexical bundles which contain the adjectives.

Chapter Six discusses the findings obtained in Chapter Five. The present dissertation is closed with final conclusions and a summary in the English and Polish languages.

Chapter 1 - Academic discourse

The aim of the chapter is to introduce and clarify the notion of academic discourse as well as other notions which are connected with it, such as: discourse community, speech community, and genre. In its further part, the chapter is going to concentrate on the features of specialized discourse. Then, the discussion is devoted to the written genres of academic discourse, especially, research article (henceforth RA) and its macrostructure. Attention will also be drawn to the problem of RA structure within the English Language Corpus (henceforth the ELC), which was compiled for the purposes of this dissertation. The last section of the chapter provides a brief analysis of the spoken genres.

1.1. Defining academic discourse

A discussion on academic discourse needs to open with a definition of what it is, which will draw our attention to its broad scope. As Warchał indicates (2015:11), academic discourse refers to: “academic settings”, “research settings”, “academic contexts” and “academic environment” (Swales, 1990, Paltridge, 1997, Hyland and Hamp-Lyons, 2002, Gravett and Petersen, 2007). Paltridge (1997) understands research settings as the process of writing and publishing research results, but this perspective is limited to written forms of academic discourse. According to the definition proposed by Duszak (1998:313-314), academic discourse is the entire process of communication with its diverse ways to spread scientific knowledge as well as discuss scientific issues, which conflate an inherent element of social life. In the aforementioned definition Warchał (2015:11) highlights the following aspects: the intellectual approach in the communication process, the aim to produce and spread knowledge, which occurs by means of communication rather than reporting it only, and the need to exchange information. A broader definition is presented by Hyland (2009:1), who claims that academic discourse “refers to the ways of thinking and using language which exists in the academy” (Hyland, 2009:1). The significance of academic discourse is connected with the fact that a great many activities within academia like teaching students, exchanging ideas, and spreading knowledge require using language. As Elbow (1991:139-140) observes, academic discourse pertains to two areas of research, and the first of which is pedagogically oriented focusing on students’ needs, and the process of students’ skills development, which is an inherent aspect of English for Specific Purposes (ESP) that is taught at universities and in academic environment.

The second area of research concentrates on communication of experts who belong to the community of academic discourse. Needless to say, these two strands are inevitably connected with each other. Holland (1988:72-73) points out that each research strand complements each other, since a scholar teaches what he knows, and inquires what he does not know by means of dialectic. This means that academic discourse is both dialectic and didactic.

Academic discourse cannot be understood only as a tool to exchange scientific knowledge, facts and research where language takes rather depersonalized account, meaning that a writer and a scholar are absent from the text. It is advisable to go beyond the general concept that academic discourse allows universities to continue the process of teaching and conducting research. Hyland (2009:1) draws our attention to the fact that academic discourse deals with social roles and relationships, which influence academics and students which, in turn, create and support knowledge, disciplines, and finally universities. As Gee (1996:VIII) puts it straightforwardly “discourses include much more than language” and explains that:

“they are ways of behaving, interacting, valuing, thinking, speaking, and often reading and writing that are accepted as instantiations of particular roles... by specific groups of people... Discourses are ‘ways of being in the world’; they are ‘forms of life’”.

It is clear that academia cannot exist without discourses. Hyland (2009:2) claims that academic discourse has spread to the entire world and became seen even in everyday life. The traces of it are found not only in popular science journals, but in TV documentaries, advertisements of everyday products, e.g., language of the pharmaceutical bottle, or dentist’s leaflet. As Halliday and Martin (1993:11) conclude: “the language of science has become the language of literacy”. Although academic discourse may be understood as printed texts, it entails specialist language competence to comprehend and produce written texts to be spoken, such as conference, lectures, seminars, dissertation defence (Hyland, 2009:3). The research on academic discourse is connected with discourse community and particular genres, the notions which are going to be discussed in the following sections.

1.1.1. Discourse community

A notion which pertains to academic discourse is *discourse community*. It was developed by Swales (1990) and is explained as “a body of persons of common interests within a larger society” (Swales, 1990). A membership within such group is possible by means of

language and discursive practices. Swales's definition of discourse community is viewed from the angle of sociorhetorics, since in sociorhetorical communities it is linguistic behaviour that precedes the process of socialization and solidarity. To make things clear, linguistic behaviour develops through communicative needs which are the goals of the group (Łyda, 2007:29). The goals of the community are clearly marked in a definition of academic discourse by Holland (1988:72):

A search for truth through questions and answers designed to rectify, using logic, the evidence of observed data with the assertions of theory. Academic discourse is, then, both Aristotelian and Platonic: Aristotelian in its empiricism and its appeal to logical relationships claimed between particular instances and general truths; Platonic in its commitment to an intersubjective search for truth through dialectic.

The above-mentioned definition discloses that the aims of the discourse are similar to those of scientific research, which aims at posing questions, acquiring knowledge, as well as describing and explaining various phenomena (Łyda, 2013:23). However, this definition, as pointed out by Łyda (2013:23-24), can be seen as an instance of "isolationism", since the role of academic discourse, i.e., the distribution of research findings, is omitted. Relevant to the present discussion is the view of Flower et al. (1990) in which academic discourse should be understood by virtue of academic research as a collaborative effort rooted in a wide range of practices of disciplines. This idea is also shared by Elbow (1991) who clarifies that academic discourse is the discourse used by academics, who publish for other academics, but it is highlighted that its main aim is to explain experience and not only to present it.

Swales (1990:24-27) proposes six conditions that a discourse community needs to fulfil:

- a broadly agreed set of common public goals – a set of goals is the fundamental factor for identification of the community; public goals may be formally written in the documents, or may be more tacit.
- mechanisms of intercommunication among its members – the community members need to communicate, in speech and writing, with each other, and it is natural that the mechanisms differ according to the community, e.g., meetings, telecommunications, correspondence, conversations, etc.
- uses its participatory mechanisms primarily to provide information and feedback – members of the community need to activate the process of information exchange, and

without this it cannot be said that they belong to the particular community, although their formal membership.

- utilizes and hence possesses one or more genres in the communicative furtherance of its aims – the community develops its discursal expectations. These may entail, e.g., appropriate topics, the form and function. As explained by Swales (1990:26) “these discursal expectations are created by the *genres* that articulate the operations of the discourse community”. By means of these genres members can communicate, which as Warchał (2015:15) notes lead to the development of of the goals of the group.
- has acquired some specific lexis – this aspect involves acquiring and using specialized lexis, which Szajewski (2014:10) describes as “a set of distinguishing lexical resources”. Specialized lexis is known to the wider speech communities, e.g., technical lexis in information technology discourse communities or highly technical lexis in medical communities.
- has a threshold level of members with a suitable degree of relevant content and discursal expertise – members in the community change, on the one side, new members attend, which guarantees the development in the community, but on the other side the process is associated with “a threshold level”, which controls the membership of those who aspire to join the community (Szajewski, 2014:10).

It may be of interest to see a comparison between speech community and discourse community (Swales, 1990:23-24). As far as speech community is concerned, it refers to people “who share functional rules that determine the appropriacy of utterances” (Fishman, 1971). For Hymes (1974:51), the sharing pertains to knowledge of one speech form at least and knowledge of its patterns. Another aspect that distinguishes speech community from discourse community is medium or literary activity. The members of discourse community tend to communicate in writing since they are physically detached, whereas speech community involves physical proximity (Szajewski, 2014:8). In the speech community, sociolinguistic factors such as socialization or group solidarity tend to dominate over its development of discursal characteristics. As was previously stated, in the case of discourse community, it is a sociorhetorical grouping.

Crucial to the understanding of academic discourse is the fact that it is not homogenous in its nature. Discourse community, as observed by Swales (1990:24), is centrifugal, which means that people are grouped into occupational and speciality-interest sections. In the case of speech community, they are centripetal, which means that people are absorbed into the “general

fabric”. It is worth adding that the membership in discourse community is possible voluntarily; it is not inherited. Members are recruited through persuasion, training or other relevant qualification. A member decides the type of community he joins in, and decides the extent to which he is involved (Johns, 1997:53). As Hyland (2005:140) concludes, discourse communities are not monolithic or unitary, but are described as hybrid, with various values and discourses, and are characterized by individuals with different experiences.

Apart from speech and discourse community, there is also a notion of community of practice (CoP). As Johns (1997:500) claims, community of practice understood as “complex collections of individuals who share genres, language, values, concepts, and “ways of being” (Geertz, 1983). Johns points out that in discourse community members concentrate on texts and language, and the genres and lexis which enable them achieve their aims and communicate. As far as community of practice is concerned, it pertains to lexis and genres, but it also focuses on practices and values of particular community. Lave and Wenger (1991) explain this dependence on the basis of a group of students who begin to function in a new academic discipline. They start to understand common issues as well as those particular ones, how they involve using “language, practice, culture and a conceptual universe, not just mountains of facts”.

1.1.2. Genre

As was stated in the previous section, genre is a crucial part in the research on academic discourse. Swales (1990:33) provides an exemplification which refers to a class of communicative events, written or spoken, whose members share a set of communicative goals seen as valid by a particular discourse community. This dimension of understanding corresponds to Biber’s observations (1988:68) in which genre types depend upon external criteria, which pertain to the speaker’s topic and purpose. In his further considerations, Swales (1990:45-58) describes characteristic features and values of genres:

- “genre is a class of communicative events” – as assumed by Swales (1990:45), language or paralinguistic plays a principal role in a communicative event. We should bear in mind that on the one hand, there are activities which are entirely based on talk, e.g., a phone call or a lecture, but on the other side, in activities such as doing gymnastics or household chores, talk can be incidental. The latter are not considered communicative events, not to mention such activities as listening to music or looking at photos.
- The principal criterial feature that turns a collection of communicative events into a genre is some shared set of communicative events – genres are communicative tools,

or as named by Swales, vehicles used to achieve particular goals. In some cases identifying a purpose may be an easy task, and in others not. Recipes, for example, are instructional texts which are designed to ensure that if particular activities are followed, a cookery success will be achieved. One more instance would be news broadcasts, whose main purpose is to keep people up to date with the events all over the world, however they also mould public opinion, or present leaders or paymasters in more favourable light. As pointed out by Miller (1984), purposive elements can get into conflict with each other, and for this reason “the effectiveness of the genre as a sociorhetorical action becomes questionable” (Swales, 1990:47).

- Exemplars or instances of genres vary in their prototypicality – as has been discussed genre membership is grounded on communicative purpose and on two additional features: the definitional approach and family resemblance approach. As far as the definitional approach is concerned, a particular set of features can identify members of a given category, e.g., a bird belongs to a particular category, because it has wings and lays eggs. Things get complicated if we turn to, e.g., lectures, staff meetings, research papers or consultations. A membership can also be stated not only by analysing a set of features, but also inter-relationships or similarities that overlap and criss-cross. This means that some lectures may be similar to others and thus belong to a particular category. One more way in categorizing objects is prototype approach (Rosch, 1975), which can be illustrated with the following example: eagles, swallows and ostriches are all birds, but we can observe that not all of them have the same status, since ostriches are unable to fly. As observed by Rosch (1975), “a category has its own internal structure, which will assign features or properties a certain probability for being included in category membership”. Swales concludes that communicative purpose is the privileged property of a genre. This means that form, structure, or audience expectations identify the extent to which an exemplar can be a prototype in a particular genre.
- The rationale behind a genre establishes constraints on allowable contributions in terms of their content, positioning and form – a set of purposes of a genre are recognized by members of a discourse community – these purposes may be partly recognized by apprentice members, and even completely not recognized by non-members. The ability to recognize purposes gives the rationale, and this entails constraints. This can be illustrated with a medical consultation, which stresses differences in perception of the rationale between established and non-established discourse communities’ members.

As observed by Jones (1982), doctors in Britain tend to use a SOAP system, which is a structure of their consultations and consists of four steps: *Subjective* – the symptoms which the patient perceives, and they can be wrong; *Objective* – results of tests, and symptoms that the doctor observes; *Analysis* – the symptoms are analysed to diagnose the patient; and, finally, *Prescription* – prescribing pharmaceuticals and giving advice to the patient).

- However, patients can very often be unaware of the fact that their doctor organizes a consultation using the above-mentioned system. The reason for this may be that some other things go on, e.g., greetings or reassuring patients, or some things do not occur, e.g., discussing the tests results or prescribing treatment.
- A discourse community's nomenclature for genres is an important source of insight – active community members provide names to different communicative events, and these names are spread to broader communities (Swales, 1990:55). Genre nomenclatures are of particular importance here, since they are created by those who are most familiar with and professionally involved in particular genres.

In the case of academic genres, many of them use a pre-modifying nominal of purpose, e.g., *introductory lecture*, *qualifying exam*, etc. Other genres incorporate a purposive head-noun, e.g., *grant application*, *course description*. There are also genres which highlight the occasion, e.g., *final exam*, *plenary lecture*, *festschrift*. The process of naming of communicative events in post-secondary education functions as institutional labels, rather than descriptive ones. It should be noted that one member of staff's "lecture" is another member of staff's "tutorial". This means that a label does not stay on a par with the communicative event it will be. One more aspect to note is that the meaning of names tend to change as time flows, e.g., in the past, lectures were only a monologic recitations, but now involve also students into discussions. New genre categories are inherited and spread from one generation to another.

1.1.3. Genre vs. register

As observed by Biber (2006:10), many studies adopt one of the terms "genre" or "register" and disregard the other. Both terms are central while analysing academic language, and both refer to communicative purposes. It is worth to note that studies such as Swales (1990, 2004), Bhatia (2002), and Samraj (2002a) use the notion "genre", while others, e.g., Biber et al. (1999, 2006), Conrad (2001) operate with the term "register". Biber (2006:11) draws our attention to the distinction between the two notions, *genre* and *register*, which can be compared

in terms of object of study and the characteristics of language and culture. As far as *register* is concerned, it focuses on language of specific domain, e.g., *scientific register* or *legal register*. If we turn to *genre*, its object of analysis is message type and its structure, e.g., ecology research article, a business memo, etc. It is important to bear in mind that it is difficult to indicate clear differences in the object of study of genre and register. With regard to the perception of language characteristics, *register* concentrates on lexical and grammatical features, explaining how particular words and grammar are used. *Genre*, in contrast, usually concentrates on socio-cultural aspects and ideology.

1.2. Features of Specialized Discourse

Crucial to the understanding of specialized discourse are its lexical features, which this section concentrates on. Gotti (2011:25-47) elaborates on the ten features of specialized discourse, which are as follows:

- monoreferentiality – a pivotal feature of specialized lexis is its monoreferentiality, which denotes that “in a given context only one meaning is allowed” (Gotti, 2011:25). Every term in an utterance pertains to a particular concept and its role is to condense the semantic value. Monoreferentiality is limited to a peculiar discipline, in which a given notion is employed, this, in turn, may be complicated by the fact that dictionaries provide several definitions of one term. Each discipline has its own epistemology in theoretical considerations, and this entails specific languages that contain lexis needed in particular disciplines.
- lack of emotion – as Gotti stresses (2011:27), the nature of specialized discourse is neutral, and its illocutionary force is rooted in logic, consequential order of ideas and evidence that can support them, instead of using emphatic language. The purpose of specialized language is informative and prevails over emotive or aesthetic aspects, characteristic of language for general purposes (LGP), giving specialized communication cold and artificial tone.
- precision – referential precision is another feature of specialized lexis, which means that a particular term must indicate its own concept. There is no place for indirect reference system using, e.g., euphemisms in specialized communication.
- transparency – the possibility to indicate a term’s meaning on the basis of its form or structure. A good example here is a naming system for chemical compounds, developed by a French chemist Lavoisier, which allows us to identify the nature of a particular

compound. This system expresses both conceptual and terminological aspects. This means that nomenclature needs to reflect facts and ideas in a precise way. As Gotti (2011:30) highlights, particular lexical components of a specialized terms can carry decoded meaning of the whole term. For instance, in a word *gastroenterology*, we can find three components: *gastro*, *entro*, and *logy*, which mean *stomach*, *intestine*, and *study*, respectively. If we join the elements together, we gain the meaning of the whole term *gastroenterology* which is “a study of the stomach and intestine”. Apart from lexical components, there is one more tool in specialized lexis which pertains to conventional affixes. In chemistry and mineralogy for instance, we recognize the suffix *-ite*, which denotes derivatives of other components thanks to which the meaning is clearly-defined, e.g., *magnetite*, *fluorite*. The aforementioned system expresses simplification, however, there are also suffixes that present more than one meaning (polysemy), which can be the result of constantly developing scientific knowledge and processes.

- conciseness – means that concepts must be expressed as short as possible. Conciseness results in “reduction of textual surface”, for instance in zero derivation, in which affixes are omitted. Another process to note is linking two lexemes into one (blending), e.g., *telematica* in Italian emerged from *telecomunicazione* and *informatica*. In other cases, the term can be reduced itself (clipping), e.g., *urinalysis* has its origin in *urinoanalysis*. Conciseness is concerned with using abbreviations and acronyms, for instance oral texts in medicine, “He entered in a bad DKA” (diabetic ketoacidosis).
- conservatism – in some fields of knowledge, e.g., law, old words and expressions are preferred than words which have already occurred, because of their accepted universality and highly-codified interpretation. An example of this process is a word *whereas*, used in many English legal texts which has a close link with ancient tradition of using special formulae for oaths or appointments. A good example for conservatism can be found in business language where old expressions are widely used because of their crystal meaning in the discourse community, e.g., *a bill of lading* has an old form of a modern word *loading*, but *lading* has survived up to present times in this kind of paper only. Other terms that can still be encountered are, e.g., *wherefore*, *forthwith*, *whosoever*.
- redundancy in specialized discourse – in some specialized languages we can identify the process of redundancy, which occurs due to the use of pleonasm. This, in turn, remains in contrast to transparency, as one of the features of specialized lexis discussed

above. Legal discourse is an example of using far too many lexemes than necessary, e.g., employing words in one utterance that can be used interchangeably, e.g., *new and novel*, *terms and conditions*, or *false and untrue*. Each of the expressions mentioned consists of a Latin term with an Anglo-Saxon equivalent. Such a lexical pattern ensured comprehension when England had two spoken languages: English and Norman French.

- the relationship with general language – this process is regarded with the meanings of words in general language which become specialized. As observed by Williams (1976), words such as *experiment* or *experience* tended to be used interchangeably up to the 1700s, and then acquired specialized meanings, which differ from each other: now it is obvious that an *experiment* is a scientific test and *experience* refers to knowledge acquired through job or activity. Hughes (1988), who focused on the development of English lexis, highlights the process of borrowings from Latin into English. Borrowings spread into specialized discourse, e.g., *carnivorous*, *premium*, *appendix*, *otorhinolaryngology*. Many prefixes and suffixes, which have their origin in classical languages, are used in specialized fields, e.g., *multi-*, *kilo-*, *micro-*, *mega-*. There are also “combing forms” such as: *graphoscope*, *electrophile*. One more aspect to note is concerned with the names of body parts which are Anglo-Saxon nouns, but their adjectival equivalents have their origin in classical languages, e.g., *heart* – *cardiac*, *lung* – *pulmonary*, *skin* – *dermal*. This reflects the development of English lexis from superficial description of appearance characteristic of Old-English to more scientific approach, which developed in later centuries by introducing Latin and Greek expressions in English lexis.
- metaphor in specialized discourse – the process of metaphorization is not only common in language for general purposes (LGP), but also in specialized fields, which concerns the use of existing words in a new sense, and thanks to this it fulfils the gap in vocabulary, which Black (1962:33) calls catachresis. The advantages of this process are terminological transparency and conciseness, since transfer of information occurs without new and complex terminological definitions. One more phenomenon related to metaphors is ‘shortened similes’, which refer to two terms in a metaphor which are similar semantically, e.g., *the brain is a computer*, or *information stored in the memory*. These examples are linked semantically, since they present a similarity between human and computer functions. Metaphorised components present the occurrence of new functions and play a vital role in the development of disciplines.

- lexical productivity – it should not come as a surprise that words drawn from general language are employed in specialized discourse. But words which are characteristic of specialized language spread to everyday language. It is true that specialized discourse has higher lexical concentration, more prefixes and suffixes, as well as borrowings and calques, but we should bear in mind that these elements are accumulated in general language. This means that the production of specialized lexis is inseparably related to the rapid emergence and development of disciplinary fields and the process of redefinition of existing lexis and concepts.

To sum up the discussion so far, academic discourse has its lexical features that distinguishes it from other discourses. Lexis in specialized discourse is employed in accordance with particular regularities, which emphasize precision in meaning e.g., *conservatism* to avoid ambiguous meaning, and *monoreferentiality*, which means that only one meaning is correct in a given context. It uses lexical processes such as blending and clipping to coin new terms as well as acronyms and abbreviations. It is worth noting that some disciplines use transparency, which makes it easier to guess the meaning of a word, while other use redundancy, instead of transparency. Another process used in specialized discourse is metaphor to create notions that have their origin in general language. The opposite process is also common in specialized discourse, namely, specialized terms spread into everyday lexis. Some of the processes mentioned are dependable on the discipline they occur in.

1.3. Written and spoken genres in academic discourse

The following section aims to analyse the most significant written and spoken academic genres. The names of particular segments of RA are written in capital letters to present the content of the chapter in a comprehensive way.

1.3.1. Research article

The research article (henceforth RA) dates back to the 17th century has its origin in the periodical named *The Philosophical Transactions of the Royal Society* (henceforth *the PT*), which appeared in 1665 (Hyland, 2009:67; Łyda, 2013:35). As Swales assesses, it was an embryonic stage of the genre. Its function was to “propagate new information regarding specialized facts or events among the wide and varied readership of this journal” (Gotti, 2011). The linguist compared the PT to a *newsletter*, which served as source for dissemination of

knowledge between the Royal Society and other scientific circles. Gotti (2011:145) emphasizes that the role of the PT was to attract attention of new minds in specialized topics, which was named “a proselytizing function”. The PT gained popularity not only in Britain, but all over the world. The universality in readership is another aspect highlighted by Gotti. About 20 per cent of all contribution in the PT were written in Latin, which was a lingua franca in learned circles at that time. The letters were also translated into English and even into French, which confirms the importance of the Journal in that country.

The early articles in *Philosophical Transactions* were devoted to a particular scientific event or phenomenon. The articles were also purely descriptive and concentrated on natural phenomena (Biber and Conrad, 2009:157-158). Other early examples of articles were devoted to scientific experiments characterizing natural phenomena. The contributions published by the PT can be classified as: calculations, essays, experiments, observations, proposals, remarks, and other types. Gotti points out that they were not arranged in accordance with any strict rules of how to structure the text (2011:148). As mentioned above, the first scientific journal was published in the 17th century, and this means that for more than two centuries, academic articles were compiled without any widely accepted and well-thought structure. The structure was gradually developed in this period of time. As Day (1989) indicated, IMRAD structure of RA was invented by Louis Pasteur and published in *Etudes sur la Biere*, in 1876. Although, Pasteur did not include the headings *INTRODUCTION*, *METHODS*, *RESULTS* or *DISCUSSION*, his work was organized under this rigour. Section headings became the standard after 1950 (Swales, 1990:115). By the late 1970s, IMRAD was used in the majority of academic papers of leading journals. As shown by Sollaci and Pereira (2004), academic papers concentrating on medical studies adopted IMRAD structure in 1950s, which then gained in popularity in the 1960s, and became the norm in the 1980s. Interesting observations come from Bazerman (1984), who investigated RAs in physics, published in the years 1893 to 1980. In the 1950s, the RAs headings started to be popular. But before 1930 if sections were used at all, *RESULTS* were the last one without any discussion at the end. Since that period, *DISCUSSION* and *CONCLUSION* were more and more popular and much longer. According to Meadows (1998), Sollaci and Pereira (2004), and Day and Gastel (2006), IMRAD structure of RA contributes significantly to clear framework of RA, thanks to which various concepts and components can be addressed in particular order. An aspect of additional importance is that information of particular interest can be looked at without detailed reading of the entire paper. There is also a benefit for the reviewers regarding manuscript evaluation, which is easier within a well-organized article’s structure.

1.3.1.1. Introduction

A more detailed description of the RA structure is provided by Swales in his publication *Genre Analysis* (1990). As Swales (1990:137) observes, *INTRODUCTION* seems to be troublesome, which is confirmed by the majority of researchers who claim that they find it more difficult to begin to write than to continue or finish it. He points out that paragraphs which are at the beginning of a written piece can cause some troubles concerning the knowledge to include in the RA or whether to use an authoritative or sincere stance (Arrington and Rose, 1987) or how to draw readers' attention.

Introductory section can be seen as a shortened problem – solution text, which consists of five steps (Zappen, 1983): *goal* – addressing the goal of the study, *current capacity* – addressing current capacities, *problem* – signalling the research problem, *solution* – what can be done with the problem, and *criteria of evaluation* – assessment of the results and solution.

Zappen (1983) and Toulmin (1972) point out that researchers need to refer the context to the discipline in which they are located. This means, as Zappen (1983:130) explains, that the author uses the aforementioned steps and operates within particular discipline.

Swales (1990:140-142) offers a model for RA *INTRODUCTION* – *Create-a-Research-Space (CARS)*, according to which academic writers emphasize their own work on the research by means of outlining the topic of the study, then describing the most significant points of the previous studies and finally marking a gap or development of that study which can build the foundations for the researcher's assumptions (Dudley-Evans, 2000). CARS model accumulates three moves and several steps for each move (Swales, 1990:140-142):

- Move 1 – Establishing a territory: which consists of three steps: claiming centrality; making topic generalizations and reviewing items of previous research.

The above-mentioned steps mean that writers emphasize and explain the importance of the research study conducted to the discourse community. The research can also be confronted with the previous studies.

- Move 2 – Establishing a niche: which includes four steps: counter-claiming, indicating a gap, question-raising and continuing a tradition. Move 2 concentrates on how contemporary research refer to the significance of our research study.
- Move 3 – Occupying the niche containing: outlining purposes or announcing present research, announcing present findings and indicating RA structure. Move 3 focuses on describing how the niche in the wider aspect can be occupied and defended (Swales, 1990:142).

Swales, in his monograph *Research Genres* (2004), presented a revised version of the CARS model. He explains (2004:228) that in the first version, a move was understood as a “term of art”. But now it refers to “a discoursal or rhetorical unit that performs a coherent communicative function in a written or spoken discourse”. A move can also be described as a flexible unit by means of a sentence or several sentences (Swales, 2004:229). It must be emphasized that this unit is a functional, not a formal one. Swales stresses that grammatical features can describe the nature of a move. These grammatical features include the use of, e.g., present continuous tenses (Lewin et al. 2001), some negative elements while indicating a gap or personal pronouns, e.g., “In this paper, we propose a new model...” (Swales, 2004:229). Furthermore, Swales enumerates instances of lexical signals of a move, which are the following: “The results are shown in Table 1” or “The main methods used were”. The indications of a move can be more subtle as well, e.g., “in summary” or “in Conclusion”.

A variety of criteria can indicate and set boundaries of particular moves and, as a result, produce decision criteria, as proposed by Nwogu (1990:126-135) and Bhatia (2001). Identification of moves is a system process, but it can also be influenced by intuition concerning the structure of different types of texts and genres (Swales, 2004:229). Samraj (2002b), who investigated RAs focusing on wildlife behaviour, provides an example of descriptive statements, which express site and species which occurred in her study:

“*Pieris occidentalis* Realist is common throughout western North America at altitudes of 1400-4300m”.

Samraj emphasizes that the move could be used at the beginning of Move 1, but was used at the beginning of Move 3 after presenting the aims of the study.

A new picture of Moves that emerges from Swale’s observations focuses on “Topic generalizations of increasing specificity” in Move 1. As far as Move 2 is concerned, Swales (2004:229-230) proposed condensing it into two steps instead of the previous four. The first thing to note is nomenclature aspect of the step “continuing a tradition”, which Swales find rather odd choice. He poses a question “continuing a tradition of what?” (Swales, 2004:230). Swales stresses that studies which focus on *INTRODUCTIONS* show that “indicating a gap” is most frequently chosen. “Counterclaiming” and “question-raising” do not differ to a great extent from “indicating a gap”. From the above reasons, it would be reasonable to focus on the two steps: “Indicating a gap” and “adding to what is known”. If we turn to Move 3, “Occupying the niche”, we can see that it is more sophisticated than it was in the previous version. It shows

that separating Step 1A (Outlining purposes) and 1B (announcing present research) from Steps 2 (Announcing principal findings) and 3 (Indicating RA structure) may be challenging. Move 3 has a multi-faceted character, since it can focus on detailed discussions of definitions of key notions, explaining research questions and hypotheses, as well as signalling principal findings. One more step which is a common one in Move 3, is the function of a “roadmap” of the entire RA.

As Swales (2004:226) explains, the three-part structure for RAs *INTRODUCTIONS* enables both writers and reviewers to see what the article in general is about and understand the direction of further specificity. Moreover, this model is now prototypical for *INTRODUCTIONS* written in English. This was confirmed in RAs in medicine by Nwogu (1990), in EFL by Chu (1996), in computer sciences (Anthony, 1999), social sciences (Lewin et al., 2001), physical sciences (Gross et al., 2002) and biology (Samraj, 2002b). Lewin et al. (2001) provides us with a terminological modification of CARS (see Table 1). As Swales emphasizes, the difference between the two models is in Move 3. Lewin et al.’s Move 3 focuses mainly on presenting the research purposes.

| | Swales (2004) | Lewin, Fine, & Young (2001) |
|--------|--------------------------|--|
| Move 1 | Establishing a territory | Claiming relevance of field |
| Move 2 | Establishing a niche | Establishing the gap present research is meant to fill |
| Move 3 | Occupying a niche | Previewing authors’ new accomplishments |

Table 1. Moves in *INTRODUCTIONS*; Lewin et al. (2001) and Swales compared (Swales, 2004:227)

CARS model for RA *INTRODUCTIONS* serves well as a step-by-step guideline of how to write *INTRODUCTIONS* and what information to include. The model can be applied not only in linguistics, but in other disciplines as well.

1.3.1.2. Methods

The main differences in RA structure occur in *METHODS* and *DISCUSSION* sections. They are found across many disciplinary sectors (Swales, 1990:175-176). It may be interesting to note that *METHODS* sections tend to be at first sight more indeterminate, or even incoherent in their structure, but this inevitably refers to the discipline of the RA. Swales argues (1990:169-170) that *METHODS* in physical and life sciences are enigmatic and swift, and often lack in the sentences regarding the rationale for the study and choices made. Also the study by Weissberg

(1984), who analysed *METHODS* sections in various disciplines, showed that “inferential bridging” was needed for coherence of the text. This need was much more visible in *METHODS* than in *INTRODUCTIONS* and *DISCUSSIONS*. Weissberg adds that *METHODS* texts evince “coherence, but little cohesion”. He compares sentences to “islands in a string”, which can be easily understood only for experts with specialized knowledge. A good example is Swales’s (1990:166-167) analysis of an extract from a biochemistry *METHOD* section, in which he points out that methodological procedures are mentioned, but not explained, and may be difficult to understand for non-experts:

... by the method of Wong
... by a modification of the procedure of Madden
... according to the method of Gale.

Dubois (1982) observes that *METHODS* sections can abound in extended NPs (Gilbert and Mulkey, 1984:51):

heavy beef heart mitochondria
well coupled mitochondrial particles
inhibition-protein-deleted particles

At this point, we can see that *mitochondria* are mysteriously particulated in the examples, and the particles have been changed from *well coupled* into *inhibition-protein-deleted*. This shows that both language and syntax become specialized.

One more crucial observation on *METHODS* sections is undertaken by Huckin (1987) who states that they receive an “increasingly de-emphasized” status. This part of RA can physically be relocated to the end of RAs, e.g., in biochemistry. They can also be presented even in smaller print than other parts of the RA.

In contrast to hard sciences tradition of *METHOD* sections’ structure, Swales (1990:169) presents a part of *METHOD* section from *TESOL Quarterly*. It discloses a clear and step-by-step ordered picture of *METHOD* structure, which is achieved by means of anaphoric reference and lexical repetition. This can be illustrated by the extracts from the text marked by the words in bold:

15 research articles in the biological sciences were randomly selected ...

Each of the selected **articles** ...

... appeared twice in **the corpus**

The corpus contained 39,578 words ...

One should bear in mind that articles in humanities with essayist tradition may have no methodology section (Swales, 2004:219). Swales indicates that in the 2001 issue of *Applied Linguistics* which contained eighteen articles in sum, only eight of them have clearly marked *METHODOLOGY* sections, but the nomenclature can vary, e.g., *The Study, Method, Data and Methodology, Methodology, or Setting and Methodology*. Among them we may find five texts which have named subsections, and they can be subdivided into five or four subsection models, e.g., participants/materials/tasks/procedure/data analysis, or speakers/stimuli/listeners/procedure. This, in turn, is related to the idea of “clipped texts” vs. “elaborated texts” in methodological descriptions, as proposed by Swales (2004). Table 2 lists characteristic features of both types of texts showing the most crucial differences between the two types of texts:

| <i>Clipped texts</i> | <i>Elaborated texts</i> |
|--|---|
| <ul style="list-style-type: none"> • assume background knowledge of the general methodology | <ul style="list-style-type: none"> • recognise a need to provide background knowledge |
| <ul style="list-style-type: none"> • avoid named subsections | <ul style="list-style-type: none"> • frequently contain subsections |
| <ul style="list-style-type: none"> • use acronyms and citations as shorthand for procedural descriptions | <ul style="list-style-type: none"> • use descriptions rather than citations to indicate the various aspects of the methodology adopted |
| <ul style="list-style-type: none"> • avoid definitions of terms and examples | <ul style="list-style-type: none"> • provide definitions, examples, and illustrations as necessary |
| <ul style="list-style-type: none"> • provide few justifications for methodological choices | <ul style="list-style-type: none"> • includes justifications and rationales for details of the procedures adopted, sometimes placed in the marked presubject position via a purpose clause |
| <ul style="list-style-type: none"> • use very few “volitional” verbs, i.e., “we analysed” rather than “we decided to analyse” | <ul style="list-style-type: none"> • contain one or more of “volitional” verbs, such as “we decided to focus on” |
| <ul style="list-style-type: none"> • offer few reiterations of the subjects/objects of the research, but focus on the techniques used | <ul style="list-style-type: none"> • tend to have a wide range of linking phrases (logical, temporal, spatial) at the beginning of sentences |

Table 2. A shortened version of “Variations in methods sections” (Swales, 2004:220)

The following instance illustrates the features of *clipped text* (Swales, 2004:221-222):

Methods - Methods of collection were essentially those of Sinclair. Items were tagged with a modification of Biber, data-based, and then subjected to a KWIC concordance. Collocational outcomes were derived by adapting procedures from Stubbs, Partington, and Aston. Statistical procedures utilized the Wordsmith package (...).

As can be seen, the presented example lacks in background knowledge as well as justifications. It concentrates on procedures used, while almost nothing is said on the objects or subjects of the research conducted. There is also one unclarified acronym. Swales (1990) concludes that the style of jumping subject themes is similar to RA abstracts style of writing.

The second fragment serves as an example of *elaborated text* (American Journal of Botany, 1998, quoted in Swales, 2004:221):

Morphology – We selected 92 of the specimens available to us as a representative subset to measure for univariate and multivariate statistical analyses. We chose mature, complete, and ample specimens that exhibited the full range of morphological variation of the *C. willdenowii* complex and that originated from throughout the geographic range of the complex. We measured 12 continuous and two discrete characters (Table 1) on each of these specimens. Each specimen we measured is denoted by a superscript asterisk in the lists of representative specimens below.

This extract is an example of a well-thought, step-by-step outline of procedures. It is important to note that a word *specimen* is mentioned throughout the text, which makes understanding easier.

To conclude, *METHOD* sections in hard sciences can differ to a great extent from those in soft sciences, e.g., linguistics. The essence of the differences may be caused by sociological phenomena, nature of the discourse community, or the level of agreement to use appropriate methodology. Swales (1990:170) points out that *METHODS* section pertain strongly to disciplinary conventions, which means that academic papers in physics, chemistry, biology, and medicine would be clipped, whereas, these in education and psychology are elaborated

ones. Elaboration can also occur when the methods used seem controversial or when reviewers question them (Blakeslee, 2001).

1.3.1.3. Results, Discussions, and Conclusions

The structure of RAs with regard to *RESULTS*, *DISCUSSIONS* and *CONCLUSIONS* can have three forms: *RESULTS* and *DISCUSSION* are two separate segments of a RA, *RESULTS AND DISCUSSIONS* are coalesced into one segment of a RA, and there are also RAs which end with a labelled section *CONCLUSIONS*, sometimes entitled *Applications* or *Implications* (Swales, 1990:170). As Yang (1999:63) points out, the essence of RA is included in *RESULTS* section, since other sections play a subordinate role, meaning that they either prepare the reader for the results of the study, or enhance the findings.

Swales (1990:170-171) compares *RESULTS* paragraphs derived from an issue of *Research in the Teaching of English*, in which the RAs vary in terms of their structure. The first RA, for instance, runs 20 pages, while the second is curtailed to 30 lines of text and three tables. In the third RA, *RESULTS* section concentrates on the presentation of the study findings with reference to the literature. This is enriched with some observational remarks of the author.

As far as *DISCUSSION* section is considered, Belanger (1982:1, quoted in Swales, 1990:171-172) states that its structure is connected with the number and kind of research questions posed in the *INTRODUCTION*. He indicates that each research question passes a cycle of the three following steps:

- the results are summarised and conclusions are stated which pertain to the previous studies;
- what the study suggests with regard to previous studies and/or current work;
- forthcoming questions with possible clarification and references.

It is worth indicating that not always all the three steps can be found in each research question.

The studies by McKinlay 1984, Hopkins, 1985, Peng, 1987, Hopkins and Dudley-Evans, 1988 have focused on the cyclic form of *DISCUSSION* sections, in which Move-Steps are improved. Peng (1987) and Hopkins and Dudley-Evans (1988) highlight the following most frequently used 8-Move-patterns, which differ from each other in secondary issues only:

- Background information – the aim of this is to indicate or remind of theoretical information in order to strengthen the *DISCUSSION*. Swales adds, that this point is a free-standing one, and can be found “at any point of the cycle” (Swales, 1990:172);

- Statement of results – has a status of quasi-obligatory step and is a point of departure in the cycle. It may be expected that the strongest findings would be dealt with first, and then followed by weaker ones;
- (Un)expected outcome – the author states if a result is expected or not;
- Reference to previous research – the reference has two directions: comparison to present research and support for present research.
- Explanation – this move is important when the author presents reasons for unexpected findings;
- Exemplification – instances are used very often to illustrate and support explanation (Hopkins and Dudley-Evans, 1988).
- Deduction and Hypothesis – this step is used for the purpose of generalizability of a part or all results.
- Recommendation – it aims at directions for further research.

The steps presented above clearly indicate that *DISCUSSION* sections' structure stays in contrast to *INTRODUCTIONS*, since they begin with stating the study's findings, which is followed by implementing them within the literature of the subject, and assessing their general significance (Swales, 1990:173). A similar perspective is adopted by Berkenkotter and Huckin (1995), which Swales (2004:235) calls "a mirror-image reversal" of *DISCUSSIONS*' moves as compared to *INTRODUCTIONS*. The first step is *occupying the niche*, which is followed by *(re)establishing the niche*, and finally *establishing additional territory*.

Swales (2004:235) indicates a problem concerning the sub-sections in *DISCUSSIONS*. Interestingly, it is possible to find *DISCUSSIONS* unnamed, *DISCUSSIONS* and *CONCLUSIONS*, or even *CONCLUSIONS* only.

To conclude, the structure of *RESULTS*, *DISCUSSIONS* and *CONCLUSIONS* can differ from one another. *DISCUSSION* segment has the 8-Move pattern which may serve as a framework for authors, but *RESULTS* and *CONCLUSIONS* lack such a pattern. The titles of particular segments of RA remain a sophisticated issue across various disciplines.

1.3.1.4. The structure of RAs in the English Language Corpus

With reference to the discussion in sections 1.3.1.1-1.3.1.3. on the structure of RAs, it may be interesting to see what the structure of journal papers looks like in the English Language Corpus (ELC), which was compiled for this dissertation. The aim of this section is to see and compare the structure of RAs across the seven disciplinary contexts: biotechnology, ecology,

linguistics, material science, medicine, mathematics, and political science. Further, the present discussion looks at the nomenclature of the headings of particular sections within the articles. The study serves as an outline of the issues discussed in the section 1.3.1.

As far as the field of biotechnology is concerned, the journal entitled *Biotechnology and Bioengineering* is an example of RAs in which sections are divided in accordance with IMRD pattern. Interestingly, *RESULTS AND DISCUSSIONS* tend to be incorporated into one section, however, there are also instances in which they occur as separate parts. The last section is a brief *CONCLUSION*, which occurs optionally. This pattern is shared by another journal, *Engineering in Life Sciences*, the only difference being that the last section is entitled *CONCLUSION* or *CONCLUDING REMARKS*.

In the field of ecology, RAs have a tendency to follow IMRD pattern in general, with slight differences in nomenclature. In *Acta Ecologica Sinica*, *RESULTS AND DISCUSSION* can also function under the name *RESULTS AND ANALYSIS*. *Ecology of Freshwater Fish* proves the rule of IMRD pattern, in which *RESULTS AND DISCUSSION* parts are separated. Both material science and medicine disciplines belong to a group of well-structured RAs in accordance with IMRD pattern, in which *RESULTS AND DISCUSSION* can be presented either together or separately. In the above-mentioned disciplines, there can be found RAs whose sections' titles present a proliferation of options. *METHODS* sections can have various names, e.g., *Experimentation*, *Experimental setup and measurement system*, *Standard design parameters*, and even a more detailed one, e.g., *Push-out test*. *RESULTS AND DISCUSSION*, in turn, can be, e.g., *Experimental results and Discussion*.

As far as linguistics is concerned, the first journal which draws our attention is *Language and Communication*, and it does not follow the IMRD pattern. It is worth indicating that its guidelines for authors do not advise to use IMRD pattern. Instead, authors are advised on how to write abstract, keywords, abbreviations and acknowledgements. The second journal to analyse is *Journal of English for Academic Purposes*, in which RAs are structured as at least two models. The first model follows the IMRD pattern and finishes with *CONCLUSION* section. The second model is similar to the first one, yet has one more section and uses different nomenclature: *INTRODUCTION*, *DESIGN AND METHODOLOGY*, *METHOD*, *ANALYSIS*, *SUMMARY OF FINDINGS*, and *DISCUSSION* and *CONCLUSION*. Interestingly, these differences occur within one Journal.

Each discipline, excluding biotechnology, comprises some RAs in which subdividing into sections was a troublesome challenge. From this reason, the most feasible solution was to use a tripartite structure: *INTRODUCTION*, *MAIN BODY*, *CONCLUSION*.

The difficulty to identify the structure of RAs aggravates in political science. Here, nearly half of the RAs are subdivided in three sections only. The sections within *MAIN BODY* (henceforth MB) are entitled with regard to the topic of the discussion, e.g., *Australia, British Decolonisation, and South Africa, or Fixing the Economy*.

The last discipline which remains to discuss is mathematics. None of the RAs in the corpus follow the IMRD pattern. Instead, they use a tripartite sub-division, in which the text in MB intermingles with equations, formulae, theorems, and lemmas. The names of sub-sections within MBs reveal the discussed subjects, characteristic of the discipline, e.g., *Monoidal Gröbner bases, Symmetric type II compound Laplace distribution: review*. There are also ten RAs which do not follow any pattern, and, therefore, are left without any sub-division. One RA in mathematics stays in stark contrast to others, since it begins with a section *Main result*, which is followed by *Proof of Proposition 1.1*, and the RA closes with *Non-smooth perturbations*.

As can be seen on the basis of the analysis conducted, the issue of RAs structure and nomenclature of their headings sections could be regarded as sophisticated in the ELC. The corpus comprises RAs which are well-ordered examples in terms of their structure and nomenclature as well as those whose structure is rather loose. The problem with RA segments is vast, since it occurs throughout the entire corpus, in all the seven disciplines. The two observations in the present section are: the IMRD pattern is applied in some disciplines, e.g., biotechnology and medicine, but in other it is not used, e.g., mathematics or political science. The nomenclature of headings of particular sections can be either conservative, e.g., *INTRODUCTION* or *METHODS*, or specific, which includes words typical of particular discipline, e.g., *Monoidal Gröbner bases*.

1.3.2. Research article abstract

The text which is undoubtedly concerned with RA is the abstract. However, the two genres are independent ones (Łyda, 2013:39). The importance of research article abstract has been growing in the recent years with developing amount of published texts and databases in electronic form (Warchał, 2015:29, Darabad, 2016:127).

The pivotal function of abstract is representation of another text, whose most crucial points are presented in a shorter form (Bazerman, 1984). Abstract functions as a short summary or a representation of a RA published in a journal, which reveals if the whole text is worth reading (Kaplan et al., 1994:405). Hyland (2000:64) compares abstract to a “persuasive device used to induce the reader to read the whole text”. The crucial observation, then, is that an

abstract carries a “news value” and its readers can be divided into two groups: some of the readers who have read the title will follow to read the abstract, and some who have read the abstract, will also continue reading the entire RA (Huckin, 1987). Abstract can also be a summary of a paper presented at a conference (Gotti, 2011:88). This genre enables conference participants to choose a presentation they want to attend, since presentations often occur at parallel sessions. It also acts as a “visiting card” in the process of article submission to a particular journal (Warchał, 2015:29). For Swales and Feak (1994:384), abstract is regarded as a text which provides information of the study and indicates its results. As presented by Wu (2011:1348), the adjectives which best describe abstracts are *concise*, *complete* and *clear*, and they emphasize that abstracts are “a short, but complete story”.

Swales claims that abstracts are easy to recognize thanks to their distilled quality. As far as language is considered, Graetz (1985:125) provides a clear characteristics of abstracts language, in which it is pointed out that abstracts tend to be written in a past tense, third person, and passive form. The second aspect concerns what abstracts tend to avoid: negatives, subordinate clauses, abbreviations, jargon, symbols, repetitions, descriptive details, redundancy, examples, or footnotes. Graetz points out that also adjectives are not commonly used in abstracts. Some of Graetz’s observations may be supportable, but Swales argues that there are a great many of abstracts that do not fit this picture. The first thing to note is that abbreviations can be common, e.g., *Anglo-Australian (N=48) and Greek-Australian (N=48) M and F high school students...*. The second issue is the use of passive participle at the beginning of a sentence, e.g., *Discussed are rituals and vocabulary associated with...* Swales points out that the present tense is more popular than the past tense. The present tense expresses that the research and its results are still alive.

As far as the structure of abstract is concerned, its outline should provide answer to the following cases: what the author has done, the ways of achieving this action, the study findings, and the conclusions.

Structurally, abstracts tend to follow the pattern *PROBLEM – METHOD – RESULTS – CONCLUSIONS*, as Graetz claims. However, as pointed out by Swales (1990:181), the introductory lines of abstracts in Graetz’s study revealed that in 44 % of the abstracts, Move 1 ‘establishing a territory’ was found. 24 more texts began with Move 3, ‘occupying the niche’. As Swales concludes, there is little evidence that findings of the study are presented in the topic sentence, as was advised by Cremmins (1982).

As far as Swales’s CARS model of research article’s *INTRODUCTIONS* is concerned, it served as a guideline in studies analysing the *INTRODUCTION* parts as well as abstracts.

Bhatia (1994) proposed his own model for research article abstracts, which contains four moves:

- Move 1 – Introducing the purpose
- Move 2 – Describing the methodology
- Move 3 – Summarizing the results
- Move 4 – Presenting the conclusions (Helder, 2011:89).

One more model to analyse belongs to Hyland (2000). This one includes five moves:

- *INTRODUCTION* – Establishes context of the paper and motivates the research
- *PURPOSE* – Indicates purpose, outlines the aim behind the paper
- *METHOD* – provides information on design, procedures, data analysis, etc.
- *PRODUCT* – Indicates results and the argument
- *CONCLUSION* – Point to applications or wider implications and interpretation scope of paper.

Liddy (1988) proposes a more detailed structure of empirical abstracts, which begins with *HYPOTHESES*, that is followed, similar to Hyland (2000), by *PURPOSE*, and other parts are *SUBJECTS*, *METHODOLOGY*, *RESULTS*, *CONCLUSIONS*. The structure ends with the part of references, which is a component omitted in other models of abstracts' structure. Dahl (2000) provides a clear structure, which consists of the following components: *BACKGROUND*, *PURPOSE*, *METHODOLOGY*, *RESULTS*, *COMMENTS* and *RESULTS*.

The models presented are gathered by Stotesbury (2006:129), on the basis of which his own model of abstract structure is presented:

- *BACKGROUND* – (possibly) gap
- *CRITICISM OF PREVIOUS RESEARCH* – inadequacies or limitations in research or evidence; counterclaim (gap)
- *PURPOSE* – including an innovation, a new model/method, etc. to improve the one criticized above
- *METHOD* – including an innovation, a new model/method, etc. to improve the one criticized above
- *RESULTS* – evidence of improvements
- *CONCLUSIONS* – (possibly) including a comparison between the present approach and the one criticized above; (possibly) repetition of criticism expressed earlier in the abstract.

To sum up, abstract is an important genre in academic career. There are structure models of abstracts. which aid authors write this type of text. Abstracts have their own linguistic rules which need to be followed while writing this genre.

1.4. Spoken genres in academic discourse

Discussion in Section 1.3 on written academic genres has lead us to a couple of academic genres which are bridges between written and spoken genres. As observed by Gimenez (2000), it is a common phenomenon that oral genres are based on written documents which are read by the audience, e.g., academic lectures. Swales (1990:62) adds that written dependent genres are understood as prepared genres, which include conference presentations or poster presentations.

Spoken academic genres are approached to be classified using different parameters. As far as Gimenez’s (2000) classification is concerned, the author uses the relationship between the speaker and the author to present a couple of kinds of genres:

- expository genres – lecture, paper presentation, poster presentation, etc.
- interactive genres – the interview, the speech, the workshop, the academic meeting, etc.
- teaching genres – the tutorial, the seminar, and the academic lecture.

In the opinion of Fortanet (2005), this classification mixes up the relation between the speaker and the audience. This means that the teaching genres, i.e., the tutorial and the seminar, can be implemented into the interactive genres. Fortanet adds that the academic lecture could be included in expository genres. This, in turn, leads us to Fortanet’s classification (Fig. 1) in which she proposes the parameter of purpose.

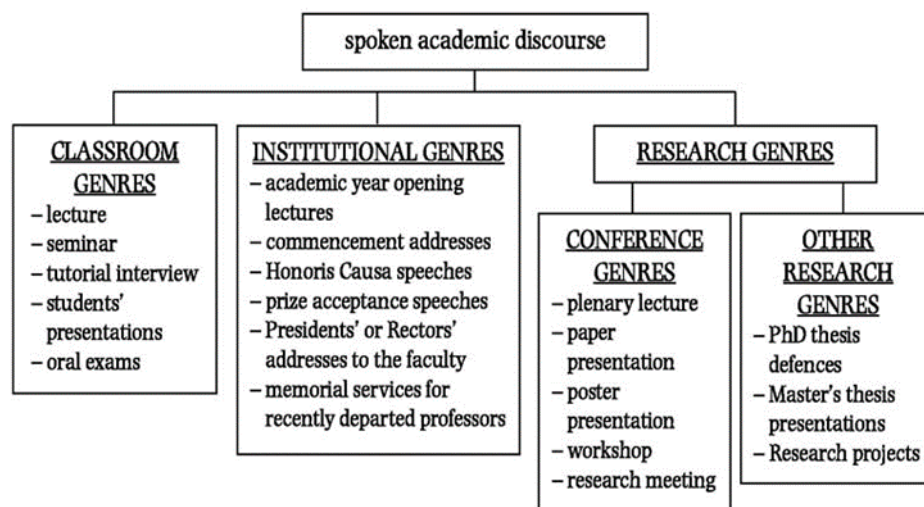


Figure 1. Classification of academic genres according to their purpose (Fortanet, 2005:32)

The first group refers to classroom genres, important both for students and teachers, include lecture, seminar, tutorial interview, students' presentations and oral exams. The second group, genres which focus on research, can be divided into those that relate to conferences, e.g., plenary lectures, paper presentations, poster presentations workshops and research meetings, and those are present in different university settings, e.g., PhD thesis defences Master's thesis presentations and other research projects. The third group in Fortanet's classification, institutional genres, which are not limited to the classroom or a group of particular experts. The examples are: academic year opening lectures, commencement addresses, and memorial services for recently departed professors (see Fig. 1).

Interesting observations come from Łyda (2013:52-53), who draws our attention to *interactionality* parameter, which was used by the MICASE (Michigan Corpus of Academic Spoken English) compilers. In the MICASE, the four basic discourse modes are differentiated from each other using the monologue vs. dialogue/polylogue degree and their distribution in time which in practice means "the degree to which a single speaker holds the floor" (Łyda, 2013:52). This concept is correlated with the events that take place in the classroom or beyond. The primary modes are the following:

- monologic – during which one speaker is speaking, e.g., lectures and colloquia;
- panel – refers to a sequence of monologues that precede interactions between several speakers, e.g., student presentations;
- interactive – in includes dialogue and polylogue, which focuses on direct interaction between the participants of particular event, and the possibility to reverse the roles of the speaker and the hearer;
- mixed – without any predominant mode, which means that ratio between monologic and interactional sequences tends to be equal. It correlates with dissertation events and labs.

A classification of spoken academic genres seems to be a sophisticated task with regard to the proliferation of parameters. As Łyda (2013:53) concludes, one of criteria to classify spoken genres is similarity to other genres which belong to the same class. In the words of Gillet (2013), the reasonable criteria to assess features of spoken academic discourse are formality, being explicit and not different from academic writing.

1.5. Concluding remarks

Discussion in this chapter has concentrated on academic discourse and has introduced the notions which are connected with it: discourse community, speech community and community of practice as well as genre and register. It also aimed at describing the features of specialized discourse. In its further part, the chapter elaborated on written genres: research article and research article abstract. The attention was drawn to particular segments of research article as well. The chapter ends with a brief presentation of spoken genres.

The next chapter offers a presentation of the studies on research article. First, it describes the studies on the macrostructure of RA. Then, the research on rhetorical strategies is going to be presented. It will also discuss studies on lexis in research article.

Chapter 2 - Studies on Research Article

The scope of research on academic genres has been extensive and conducted in many directions. Of the written genres, the research article is probably the most frequently studied genre, because of its importance in the academic career of scholars as well as in the dynamics of the development of disciplines. In this chapter, studies on RA concentrate on three main aspects. The first section is devoted to the macrostructure of RA, in which particular parts of IMRD are compared with each other within one discipline or as a cross-disciplinary study. The second area of research focuses on rhetorical strategies such as, e.g., passive and active patterns, clauses of condition, and metadiscourse devices. The third direction of research discussed here highlights the importance of selected parts of speech in RAs, e.g., nouns, verbs or adjectives, their collocates and lexical bundles.

2.1. The macrostructure of the Research Article

The present section is the first step in the multi-aspect discussion on the direction of research on RA. It is devoted to the presentation of the research studies on the macro-structure of RA and serves as an introduction to the discussion of adjective in journal papers.

One of the first complex studies on experimental research articles was a study undertaken by Bazerman (1984) on the ninety-year evolution of this genre in the field of physics. Bazerman analysed structural and organisational aspects of the texts: article length, references, sentence length and its syntax, devices to display data as well as argument and epistemology. As regards lexis, the author draws our attention to multiword noun phrases, e.g., *aluminum-iron alum*, *mean particle-electric-field strength*, *thermally excited longitudinal plasma waves*.

A multi-aspect study on RA structure was published by Swales (1990), in which the author concentrated on the four parts of RA – *INTRODUCTION*, *METHODS*, *RESULTS* and *DISCUSSION* (IMRD). It presented a step-by-step model of *INTRODUCTION* writing, called *Create a Research Space* (henceforth *CARS*). Swales analysed also various *METHODS* sections of research papers in different disciplines. *METHODS* sections were compared between soft and hard sciences. The last part was devoted to *RESULTS*, *DISCUSSIONS* and *CONCLUSIONS*, in which differences in structure of RA were pointed out. Namely, there were RAs, in which *RESULTS* and *DISCUSSIONS* were separate parts, while in other studies they

could be coalesced, and in some RAs, *CONCLUSION* section occurred as an additional part, even though other papers omitted it at all. The study finished with an analysis on eight moves which created *DISCUSSIONS* framework. The work on RA analysis was continued in *Research Genres. Explorations and Applications* (Swales, 2004), in which Swales presented a refreshed overview of RAs. In the case of *METHODS* sections, it is stated that it may not occur at all, if the RA has an essayist tradition in the humanities. If a RA has a *METHODS* part, it can have a twofold nature: here a clipped and elaborated texts need to be distinguished from each other. As pointed out by Harati and Mobashshernia (2019:48), Swales's (1990) study served as a springboard for further analyses and development for research on RA organisational structure in disciplinary and cross-disciplinary perspectives.

Swales and Najjar (1987) concentrated on RA *INTRODUCTIONS* in two fields: physical and educational psychology, in which they investigated whether *INTRODUCTIONS* contained statements that announce principal findings (APFs). The study revealed the imbalance between the rhetorical feature with the ratio of 45% (in physics) to 7% (in educational psychology).

As far as a study by Anthony (1999) is concerned, he investigated 12 RAs in software engineering aiming at comparing the *INTRODUCTIONS* to the Swales's *CARS* model (1990). Anthony reported that the model was an adequate one in *INTRODUCTIONS* framework. Yet it omitted important features, e.g., an outline of previous studies, explanations of notions with examples and concepts as well as evaluation of the research part, which is a crucial step in writing *INTRODUCTION* segment.

Moghaddasi and Graves (2017) presented a slightly modified model of Swales's *CARS* for *INTRODUCTIONS* in mathematics. Move 1, *Establishing a territory*, remains unchanged, Move 2 is called *Establishing presumptions*, in which authors tend to present their assumptions, introduce notations, provide definitions of objects and make reference to previous studies. This is followed by Move 3, *Presenting the present work*, in which scholars describe their present research, state research questions and hypotheses, introduce study findings and make an outline of the entire paper. Move 4, then, *Establish a niche*, is an optional one, and refers to a problem that is retrieved, indicates that the previous research is insufficient, and the last step is counter-claiming. This shows that Move 2, *Establishing a niche*, in both Swales's *CARS* models (1990, 2004), is the last move to occur in the field of discrete mathematics. Moghaddasi and Graves (2017:70) point to the status of Move 2, which is obligatory with the ratio of 70% - 100 % as confirmed by results from the studies in the following disciplines: engineering 72% - 86%, (Kanoksilapatham, 2015), computer science – 94 % (Shehzad, 2008), agricultural science –

100%, (Del Saz-Rubio, 2011), management – 100% (Lim, 2012) and chemistry – 100 % (Stoller and Robinson, 2013). A similar observation has been made by Łyda and Warchał (2014) who found *Establishing a niche* a crucial component in academic argument whose prevalence varied across disciplines.

Studies of Swales's *CARS* (2004) model are numerous. In the study by Adika (2014), RAs in the field of humanities were analysed. The study revealed that Step 3 in Move 1, *Reviewing items of previous research*, may not be used in order to strengthen the research niche in Move 2. Lu et al. (2021) examined *INTRODUCTION* segments in RAs across five disciplines: anthropology, applied linguistics, political science, psychology, and sociology. The study revealed disciplinary variations of rhetorical moves across the five disciplines. For instance, Move 2, Step 1, *Establishing a niche*, occurred in 90% of texts in sociology, while it dropped to 60 % in anthropology. Move 3, Step 6, *Stating the value of present research*, appeared in more than half of RAs in political science, while only 16 % in applied linguistics. The paper by Muangsamai (2018) investigated rhetorical patterns of *INTRODUCTIONS* in health and medical news reports published in *New Scientist*. It revealed seven obligatory and two optional moves. Lakić (2015) proposed a slightly modified model of Swales's *CARS* in the corpus of 80 *INTRODUCTIONS* of academic texts in economics. The model consisted of 4 Moves, in which Move 2, *Summarising previous research*, was added. Its function was to present previous studies and introduce other perspectives as well as open a suitable way towards other Moves, 3 and 4. In the research undertaken by Sćepanović (2015), *INTRODUCTIONS* in the field of civil engineering were investigated using Swales's *CARS* (1990) model, and, additionally, Hoey's (1983) problem-solution model, which can be graphically presented as follows:

situation > problem > response > evaluation

The third model used in the analysis is Lakić's (1999, 1997) four-move concept: Move 1 - *Establishing the Territory*, Move 2 - *Summarising Previous Research*, Move 3 - *Establishing a Niche*, and, Move 4 - *Occupying the Niche*. Sćepanović's (2015) analysis included elements of Swales's, Lakić's and Hoey's models. The following model was established for Sćepanović's analysis:

| | |
|--------|-------------------------------|
| Move 1 | Establishing a territory |
| Move 2 | Elaboration |
| Move 3 | Establishing a niche |
| Move 4 | Solution |
| Move 5 | Summarising previous research |
| Move 6 | Occupying the niche |

Table 3. Scepanović's model of *INTRODUCTIONS* (Scepanović, 2015:69-70)

Basturkmen (2012) explored *DISCUSSION* sections in the field of dentistry as compared to a schematic framework of *DISCUSSIONS* in applied linguistics (Basturkmen, 2009). The study revealed that the rhetorical organisation of *DISCUSSIONS* in the two disciplines was similar in terms of moves and steps.

Donesch-Ježo (2014) explored *INTRODUCTION* and *DISCUSSION* segments of medicine RAs written in English by native speakers of English and Polish researchers. The two corpora have shown some discrepancies in their rhetorical structure. 100% of papers written by English native speakers followed the number of moves as proposed by Swales (2004) and Nwogu (1997). In the other corpus not all papers contained the aforementioned moves.

The analysis by Kanoksilapatham (2005) concentrated on the structure of the whole RA. In his study, 60 RAs in the field of biochemistry were analysed in terms of moves and steps in the form of a two-level rhetorical structure, which consisted of 15 different moves, several in each RA segment, i.e., three moves in the *INTRODUCTIONS*, four in *METHODS*, four in *RESULTS* and four in *DISCUSSIONS*. The analysis provided a complete and coherent pattern of moves for rhetorical organisation of texts in biochemistry. The structure of *INTRODUCTIONS* is congruent with Swales's model concerning the sequence of moves. However, there were several RAs in Kanoksilapatham's (2005) study that omitted Move 2: *Preparing for the present study*. Move 6 and 7 in *METHODS* segments, *Detailing equipment* and *Describing statistical procedures* occurred only in 10 % and 13% of texts, respectively. This means that *METHODS* do not present a clear outline of the section, which is similar to the findings by Nwogu in medicine (1997), and Wood in chemistry (1982). Kanoksilapatham (2005:287) claims that variations across disciplines can occur both in *INTRODUCTIONS* and *RESULTS*, which confirms Swales's view (1990:170). Thanks to Move 9 *Justifying procedures or methodology*, and Move 11, *Stating comments on results*, *RESULTS* sections in biochemistry can be differentiated from other disciplines. Among the moves in *DISCUSSION* sections, Move 12, *Contextualizing the study*, and Move 13, *Consolidating results*, need to be highlighted, since

they make it easier to scrutinize particular studies with regard to scientists' contributions. The study by Kanoksilapatham can serve a template of RA in the biochemistry discipline.

Tessuto (2015) draws our attention to the macrostructure and rhetorical sections (moves) in law RAs. The study allowed identification of a structure model with the following sections: *INTRODUCTION*, *BACKGROUND REVIEW*, *METHODS*, *RESULTS*, *DISCUSSION* and *CONCLUSION* (I-BR-M-R-D-C). The corpus presented a tendency with clearly distinguishable segments, although additional headings and subheadings were also needed. The core segments which appeared in 100% of RAs were: *INTRODUCTION*, *METHOD*, *RESULTS* and *DISCUSSION*. Background reviews were identified in 88% of RAs, while *CONCLUSIONS* in 83%. The structural framework of RA in the field of law tend to corroborate with IMRD models presented by Ruiying and Allison (2004) and Lin and Evans (2012) in various academic disciplines.

Graves et al. (2013) examined the structure of empirical RAs in pure and applied mathematics. Interestingly, mathematics RAs did not follow Swales's IMRD model, but instead completely omitted *METHODS* and *DISCUSSION* segments. The two factors may contribute to this fact: the importance of formalism and logic in studies in mathematics as well as the sophisticated nature of concepts in this discipline (Graves et al., 2013:423). The absence of *METHODS* indicates that this discourse community agrees on the way how to solve mathematical problems. This claim is supported in Brett's (1994) considerations on *METHODS* in sociology, which are extended segments which imply less agreement among discourse members on methodological practice in this discipline. As Graves et al. emphasize (2013:425), the prevalence of *INTRODUCTIONS* in the corpus denotes the awareness of creating a rhetorical space for their study. This means that all *INTRODUCTIONS* consisted of clauses that introduced mathematical concepts and designate a variety of symbols. Morgan (2005) and Jamison (2000) claim that definitions are crucial elements in writing papers in mathematics. The process of defining serves as a common communicative purpose in *INTRODUCTIONS* meaning that from preceding definitions new *CONCLUSIONS* can be drawn, which leads us to Swales's (1990) *CARS* model, Move 3, Step 2. Definitions have a communicative purpose in creating a research space, and this is compared to scaffolding thanks to which new claims and findings are created (Graves et al., 2013:426). Nearly 40% of RAs in Graves et al.'s (2013) study included *INTRODUCTIONS*, which were followed by additional sections such as: *definitions*, or more extended headings: *Known results and more definitions*, *The gale-Shapley Algorithm*. The function of those sections is to explain specialized terminology, introduce particular problems and describe previous studies. Another instance of the section is *Known*

results on total domination, which expresses its purpose: describing results of previous studies. As regards the section's structure, it included seven theorems and citations enriched with authors' comments on the results presented. This leads the reader to considerations on current results on *total domination*, which refers to Move 1, Step 3, as presented in *CARS* model (Swales, 1990). Interestingly, if a review of literature was presented, it was located as a separate section. As far as *RESULTS* are concerned, they comprised more than 60 per cent of the entire RA in the corpus. 75% of RAs had two or three *RESULTS* sections, which helped mathematicians organise their contribution and aided readers understand the text. Only two *RESULTS* sections in the corpus were entitled *MAIN RESULT* which indicated that the most common type of heading was content heading. The sub-headings used in *RESULTS* highlight an autonomous result, e.g., *3. Lower bounds*, *4. Upper bounds*, % (Graves et al., 2013:431). The *DISCUSSION* segment, in turn, did not occur separately, but it served as a comment on the results. Graves et al. (2013:429) referred to them as "discussion-like activities", which are argumentative moves in *RESULTS* such as: "accounting for, commenting on, extending or delimiting, evaluating or exemplifying findings". These activities were common in *DISCUSSIONS* in other disciplines. However in mathematics, they were rather brief. As Foss et al. (2002) concludes, people tend to accept claims which are based on logic. In the case of *RESULTS* in mathematics, they are persuasive, because they are based on logical reasoning. Because of this, they do not need interpretation or discussion, since they are persuasive and demonstrative by themselves. With regard to *CONCLUSION* segment, as many as eight RAs in the corpus included it. Graves et al. (2013:432) lists rhetorical purposes of *CONCLUSIONS*: summarizing the findings, highlighting the significance of the study and its application, results interpretation, and suggesting the direction for further research. Apart from *CONCLUSION*, the section used the following variations of generic headings, e.g., *Concluding remarks*, *Summary and Conclusion*, *Other remarks and further work*, *Conclusions and future work*, *Comments and Open Problem*.

Ruiying and Allison (2004) focused on the IMRD framework of RAs in applied linguistics. The study revealed that RAs both drew upon and differed in IMRD structure. The macro-structure of the half of the corpus, showed that they shared the following three segments: *INTRODUCTION*, *METHODS* and *RESULTS* (including segments entitled *RESULTS AND DISCUSSION*), and they finished with *DISCUSSION*, *CONCLUSION* or *PEDAGOGIC IMPLICATION*. Thirteen of the twenty journals had at least one of the three sections, which occurred between *INTRODUCTION* and *METHODS*: *THEORETICAL BASIS*, *LITERATURE REVIEW* and *RESEARCH QUESTIONS FOCUS*. With reference to the *METHODS* section, it

occurred in each of the 20 RAs in this corpus. Considering the *RESULTS AND DISCUSSION* sections, they occurred as one segment of RA in as many as twelve RAs. Eight RAs had the *DISCUSSION* section which was presented separately from *RESULTS*. As far as the second half of the corpus is concerned, with another 20 RAs, they can be subdivided into three main segments: *INTRODUCTION*, *ARGUMENTATION* and *CONCLUSION*. Two of twenty RAs contained *THEORETICAL BASIS* between *INTRODUCTION* and *ARGUMENTATION*. As Ruiying and Allison (2004:273) point out, section demarcation was not an easy task. Regarding *ARGUMENTATION*, is served as an umbrella term which comprised several sub-sections as the whole argument. This can be followed by *PEDAGOGIC IMPLICATION/APPLICATION* in as many as 2 RAs. All the RAs in the corpus closed with *CONCLUSION*. The study by Ruiying and Huckin (2004:269) draws our attention to the fact that every RA has its own organisational framework. This means that the structure of RA is not clear and transparent as may be thought. Similar observations come from Khani and Tazik (2017) who analysed papers in applied linguistics. The outcome was congruent with patterns such as IMRDC or IMRD. However, 54% of papers did not follow any specific framework.

One more research on RA macro-structure examined the corpus of 780 RAs in a wide disciplinary spectrum, i.e., 24 academic disciplines, taught at The Hong Kong Polytechnic University (Lin and Evans, 2012). The analysis revealed that the most frequently used pattern was *INTRODUCTION*, *LITERATURE*, *METHODS*, *RESULTS AND DISCUSSION*, and *CONCLUSION* (henceforth ILM[RD]C) in 21% of records, in which [RD] in brackets signifies merged segments. This pattern was followed by a framework which omitted *LITERATURE* section, and was represented by 15,7 of RAs in the corpus. The framework IMRDC, in which *RESULTS* and *DISCUSSION* were separate segments, had almost a similar percentage as the latter one, at the level of 12,2 %. Lin and Evans (2012) emphasize that the conventional IMRD framework occurred in as many as 12% of the empirical RAs. This indicates that IMRD pattern is a default pattern in organizing empirical RAs. Cargill and O'Connor (2009) demonstrated the patterns with *LITERATURE REVIEW* and *CONCLUSIONS* segments, which were treated as peripheral in the traditional IMRD pattern, now appeared to be more prevalent. This shows that *CONCLUSION* and *LITERATURE* sections are independent and significant elements in empirical RA organisation. The findings tally to some extent with those of Yang and Allison (2004), in which the traditional IMRD structure is inapplicable to a large portion of the linguistic RAs in their corpus.

Harati and Mobashshernia (2019) investigated RA macro-structure in the field of management. The study revealed 9 patterns of RA structure, and, interestingly, the IMRD

pattern was not included. The top two structural patterns were: ILMRDC and ILMRD, which were followed by I(LH)MRDC and I(LH)M, in the latter two acronyms H denotes *HYPOTHESES* section. In their study, nearly 30% of RAs in the corpus included *HYPOTHESES* (H) either separate or merged with *LITERATURE* segment (L) between *INTRODUCTION* and *METHODS* sections. With regard to *CONCLUSION* (C) section, it is prevalent in as many as 68% of RAs in the corpus. *RESULTS* and *DISCUSSION* segments were presented separately in nearly 130 RAs. Stoller and Robinson (2013:51) examined 60 empirical RAs in chemistry and presented three patterns of *RESULTS* and *DISCUSSION*:

- blocked R&D – a block of *RESULTS* is followed by a block of *DISCUSSION*. The structure is the same as with the separate R&D sections, but the two sections are merged into *RESULTS AND DISCUSSION* heading; The pattern is: *RESULTS 1, RESULTS 2, DISCUSSION 1, DISCUSSION 2*, etc.
- interactive R&D – in this schema, *RESULTS* alternate with presentation of *DISCUSSION*, and it is as follows: *RESULTS 1, DISCUSSION 1, RESULTS 2, DISCUSSION, 2*, etc.
- integrated R&D – there is no clear delineation between *RESULTS* and *DISCUSSION* segments. This means that they are presented in one paragraph, or even one sentence.

Harati and Mobashshernia (2019) also discussed the issue of headings and sub-headings of sections. If a section labelling lacks, it may denote a particular writing style of a journal. A good example is the sixth edition of the APA publication manual (2010:27), in which it is advised that “the introduction is clearly identified by its position in the manuscript, it does not carry a heading labeling in the introduction”. The authors have found that 3 out of 22 journals in their corpus omitted *INTRODUCTION* heading.

An interesting study was that of Ye (2019) which analysed a set of 74 RAs in the field of energy engineering. The study has shown that 86 % of RAs in the corpus followed the IM[RD]C macrostructure. 63% of texts used *EXPERIMENT* section instead of *METHODS*. As can be seen the sections used a variety of labelling, e.g., *Methods and materials, Materials and methods, Data acquisition methods, Experimental, Experimental section, Experimental materials, Theoretical modeling, Mathematical modeling*. At the beginning, they were all analysed under the umbrella term *METHODS*, but later the sections containing a word *METHOD* were distinguished from those containing *EXPERIMENT* (henceforth E). Under the same condition, the headings containing the words *THEORY OR PROCEDURE* were coded as T, e.g., *THEORETICAL MODELING, THE THEORY OF ..., THE PRINCIPLE OF... .*

Continuing the discussion on macrostructure, we can find that *CONCLUSION* was a necessary addition after the merged RD section in order to synthesize main findings and *DISCUSSION* points (Lin and Evans, 2012). If E, T and M were overlooked independently, the pattern IE[RD]C occurred most frequently, at the level of 62% of texts. Then, IM[RD]C structure occurred in 16 % of RAs. This was followed by IT[RD]C (8%). The traditional IMRD pattern was found in none of the RAs. With reference to rhetorical moves and steps, nine out of twelve were obligatory across the texts in the corpus and occurred in 100 % of them. The moves are:

- *INTRODUCTIONS* – Establishing a territory, Establishing a niche and Presenting the present work (all obligatory);
- *METHODS* – Developing a theoretical model (quasi-obligatory, 51%), Describing experiments (quasi-obligatory, 84%), and Describing data analysis procedure;
- *RESULTS* and *DISCUSSION* – Reporting results, Commenting on the results and evaluating the results (all obligatory);
- *CONCLUSION* – Reviewing the present study, Evaluating the present study, and Promoting future research (optional, 14%).

The macrostructure of the entire RA was also investigated from a cross-cultural perspective (Donesch-Ježo, 2013). Papers written by native speakers of English included all Swales's (2004) moves in *INTRODUCTIONS* and Nwogu's (1997) moves for other RA's segments.

On the basis of the studies reported in this section we can conclude that the macrostructure of journal papers as well as the titles of RAs' segments vary to a great extent. Differences are observed not only across different disciplines, but also within one disciplinary field.

2.2. Rhetorical strategies in Research Articles

This section is the second step in our review of the studies of journal papers. Studies on RA have also concentrated on a wide variety of rhetorical strategies.

As noted by Warchał (2015:33), in terms of rhetorical strategies authors use different language resources to aid the readers comprehend and interpret the text, and confirm authors' claims in order to convince the audience and be socially acceptable. Rhetorical strategies are also a tool to control information provided in the discourse. In line with this remains an important cross-disciplinary study on imperatives in RAs (Swales et al. 1998). In the

introduction to the study, Swales et al. (1998) emphasize that “academic discourse is a social construct”, and its success relies on the combination of rhetorical and interactive components. In the practice of academic writing, writers play two roles: the first one focuses on “the humble servants of the discipline” (Myers, 1989:4), and the second refers to “the irrelevant pioneers breaking new grounds and arguing for originality of claims and rightness of his findings” (Jacoby, 1987:34). All this leads to the point that writers need both to clearly present their concepts and demonstrate their claims concerning social context in the particular community. The most common imperatives identified in Swales et al.’s (1998) study are: *see, consider, note, suppose, let A + verb B*, and *let us*. Imperatives are used most frequently in RAs in statistics and linguistics, followed by experimental geology and philosophy. Results presented that imperatives occurred in the sections of main argumentation, but their distribution was uneven across fields. Interviews with the authors of the RAs revealed that the imperatives were used for different strategic purposes, e.g., in order to achieve reader engagement, text economy as well as manifest writer’s individual style.

The study undertaken by Tarone et al. (1998) has concentrated on rhetorical strategies and frequency of use of the passive and active patterns. Passive and active constructions were compared in RAs in the field of astrophysics. Tarone et al. (1998) examined four rhetorical types of *we* in the logical argument papers. The study revealed that active *we* verbs outnumbered passive ones, with the ratio of 23 % to 11.5 %. In their discussion, Tarone et al. (1998) enumerated four rhetorical functions of *we plus active verb* as compared to the passive, in which the first one denoted a unique choice that has been made by the author. As far as the passive form is concerned, it emphasizes that the authors followed “established or standard procedure”, such as using generally accepted equations (Tarone et al., 1998:127). The second function of the active *we* form was to describe authors’ previous research, and the passive expressed others work. The passive was also used when authors considered their future work. Finally, the use of active voice was conditioned by function of discursal features, in which the author decided to postpone or to front particular components of a sentence for emphasis. What followed from this, was that lengthy equations were embedded within the sentence, but could not interfere with grammar. These are equations that tend to be placed at the end of the sentence, and the use of active or passive form is conditioned by them. It may be of interest to note that the macrostructure of RAs in astrophysics in Tarone et al.’s (1998) analysis does not fit the Swales’s (1990) hourglass pattern, since, most obviously, we cannot experiment on stars or galaxy. And, for this reason RAs in this discipline are logical arguments instead of experiments. The structure of RA can be compared to an inverted pyramid which develops with gradual steps

beginning from the argument based on general physics, through explanations of phenomena, then discussion of equations and boundary conditions needed.

The extended version of Tarone et al.'s (1998) research is the study by Walkova (2019), who proposed three dimensions of self-mention: rhetorical functions, grammatical forms, and hedging and boosting. In her discussion, Walkova enumerated three patterns of linguistics RAs written by authors with different language backgrounds: L1 English, L1 Slovak, and L2 English written by Slovak authors. The analysis revealed that authors in L1 English corpus tended to position themselves using rhetorical functions of self-mention personal pronouns as “humble servants of the discipline” (Myers, 1989:4). They compensated humbleness for using hedging and boosting devices (73%), similar to their colleagues with L1 Slovak (76%). Slovak researchers with L2 English, in turn, did not tend to use obtrusive self-mention forms, which were limited quantitatively, since they used possessive forms. Interestingly, they used more visible rhetorical functions, those of boosters. The outcome of the study suggests also that discourse practices of self-mention may transfer from L1 to L2 English.

Another line of study of rhetorical strategies focuses on conditional clauses. Carter-Thomas and Rowley-Jolivet (2008) investigated clauses of condition in three genres: research articles, conference presentations and editorials. *If-clauses* occurred most frequently in conference presentations, which were followed by editorials and research texts. Of these, let us draw our attention to their occurrence in the research article genre. The preference for factual conditionals (68 %) in research papers referred to a need to express facticity in medical academic texts and to describe the conditions of research precisely. Refocusing function can be found in 32 %, and its main aim was to expand the argumentative space. The preference for factual conditionals was also visible within the macrostructure of RAs, since there were almost twice as many of them in *METHODS* than in *DISCUSSIONS*, with the ratio of 56% to 27%. The findings tally with previous research on medical RAs, which show that *METHODS* and *RESULTS* segments are informative and descriptive, while the functions of *INTRODUCTIONS* and *DISCUSSIONS* are argumentative and polemical (Nwogu, 1997, Salager-Meyer, 1994).

Conditional clauses were the object of a study in linguistics (Warchał, 2010). The predominant function of conditionals was content-oriented (57% of all occurrences in the corpus), which reflected a subject-matter relationship of condition, which aimed at the relation between different sections in the text and to make readers be aware of it, as indicated by Mann and Thompson (1988). The remaining 43% of clauses of condition had an interpersonal role with particular aims: guidance of reader's interpretation, reader's engagement in questions left

open for discussion to outline problem areas. Among these, 23% accounted for epistemic conditionals.

To fully exploit rhetorical strategies in research papers, it would be advisable to introduce the notion of metadiscourse. In the words of Crismore and Fransworth (1989:86), “metadiscourse can be conceptualized as a rhetorical strategy used by speakers and authors to talk about their own talk”. As Hyland notes (2005), metadiscourse relates to self-reflective expressions in order to negotiate interactional meaning, aid the writer express the point of view as well as engage the readers who are members of particular community. Hyland claims that "metadiscourse embodies the idea that communication is more than just the exchange of information, goods or services, but also involves personalities, attitudes and assumptions of those who are communicating" (Hyland, 2005:3). It is described as "discourse about discourse" and is strongly related to the writer's or speaker's linguistic action in the text so as to interact with the audience (Vande Kopple, 1985). The meaning of the text can be understood at two levels: propositional and metadiscoursal (Vande Kopple, 1985, Crismore et al., 1993). On the propositional level, information of the subject of the text is provided. On the metadiscoursal level, propositional content is not added, but aids readers organise, interpret and classify material in the text. Amiryousefi and Rasekh (2010) present three factors that affect the use and distribution of metadiscourse markers.

- metadiscourse and genre, as the first factor, concentrates on writing which is understood as social engagement, in which writers interact with readers aiming not only to provide information, but also to aid the audience understand it. Texts can be identified as a particular genre with essential linguistic and rhetorical features, and metadiscourse is one of the features.
- metadiscourse and community – in the words of Barton (1994:57), discourse community is compared to “the people the text is aimed at”, and continues as a tribe with its own standards, categorizations and conditions (Becher, 1989). As far as metadiscourse is concerned, it refers to knowledge and the social clarification of concepts, and what writers need to do is to consider readers standards, perception and answers which are deeply rooted in the community they belong to, which aims at persuasive writing.
- metadiscourse and culture – cultural factors have an influence on shaping understanding of various phenomena, and may affect writing. Cultural values influence language, learning and the use of metadiscourse (Hyland, 2005:113-115). Interestingly, the

devices which make the text well-organised and coherent can be different in different cultures (Hyland, 2005:113-115).

Hyland's taxonomy of metadiscourse is subdivided into two categories: interactive and interactional, each of which comprises five types (Table 4).

| Category | Function | Examples |
|----------------------|--|--|
| Interactive | Help to guide the reader through the text | Resources |
| Transitions | express relations between main clauses | in addition; but; thus; and |
| Frame markers | refer to discourse acts, sequences or stages | finally; to conclude; my purpose is |
| Endophoric markers | refer to information in other parts of the text | noted above; see figure; in section 2; |
| Evidentials | refer to information from other texts | according to X; Z states |
| Code glosses | elaborate on propositional meaning | namely; e.g., such as; in other words |
| Interactional | Involve the reader in the text | Resources |
| Hedges | withhold commitment and open dialogue | might; perhaps; possible; about |
| Boosters | emphasize certainty and close dialogue | in fact; definitely; it is clear that |
| Attitude markers | express writers' attitude to proposition | unfortunately; I agree; surprisingly |
| Self-mentions | explicit reference to author(s) | I; we; my; me; our |
| Engagement markers | explicitly build relationship with reader | consider; note; you can see that |

Table 4. An interpersonal model of metadiscourse (Hyland, 2005:49)

Having clarified the concept of metadiscourse and its categories, the present section is mainly going to present metadiscourse and genre from the perspective of rhetorical strategies.

A multi-faceted study on both interactive and interactional features of metadiscourse was conducted by Abdi (2011) in a corpus of RAs in natural and social sciences. Evidentials,

as the feature of interactive metadiscourse, were used most frequently in the *INTRODUCTION* segments in both fields. Transitions and frame markers were highly visible in R&D in social sciences. Regarding natural science, endophoric markers were highly employed in R&D, while code glosses were frequent in *METHODS*. As far as interactional strategies are concerned, these were boosters which were the most frequently employed in R&D sections by NS researchers. Hedging and self-mentions occurred frequently in R&D in the social field. As Abdi sums up, nearly a half of metadiscourse markers occur in R&D segments.

An analysis undertaken by Bruce (2009), compared *RESULTS* sections in sociology and chemistry in terms of metadiscoursal devices. In the corpus of sociology RAs, the entire sample used endophoric markers, ten used first person, and twelve evidentials. All papers in chemistry, in turn, used endophoric references, thirteen presented self-mention markers, and evidentials occurred in as many as eight papers.

Donesch-Ježo's (2014) analysis, introduced in section 2.1., concentrated on interactive and interactional strategies as well. *INTRODUCTIONS* in the two corpora used a similar share of metadiscoursal strategies, the most frequent of which were transition markers, hedges and boosters. The same types of strategies were top-frequency ones in *DISCUSSIONS*.

Donesch-Ježo (2013) has also focused on metadiscoursal strategies in the entire RA, also in the field of medicine. In all three corpora, the most frequent were transition markers and hedges, which connote the findings of Donesch-Ježo (2014). Interestingly, attitude markers found in the corpora included adjectives such as *particular*, *essential* and *important*. Their function is to express the author's "claims and attitude towards presented data" (*translation mine BG*, Donesch-Ježo, 2013:147).

The interactional side of metadiscourse, i.e., hedges, boosters, attitude markers, self-mentions and engagement markers, was investigated by Hu and Cao (2015). The analysis has indicated the preference for using boosters in applied linguistics and education academic texts. Psychology RAs tended to use more self-mention expressions than linguistic articles. A higher proportion of the type of engagement markers, reader references, was used in applied linguistics than in psychology.

The research on particular components of interactional metadiscourse has been fruitful in academic arena. Hyland (1996) concentrated on hedging practice in cell and molecular biology research articles. The accumulation of hedges was observable in *DISCUSSION* segments in the corpus with the following parts of speech: modal and lexical verbs as well as adverbs and adjectives. Varttala (1999) focused on hedging strategies in the corpus of medicine RAs. In relation to IMRD sections, hedging devices tended to be accumulated in

DISCUSSIONS and *INTRODUCTIONS*, while other sections contained fewer hedges, which stays in line with Salager-Meyer's (1994) research. As Myers (1989) and Salager-Meyer (1994) observe, hedges were the typical device of peer communication. Koutsantoni (2006) compared the use of hedges in RAs and research theses on electronic and chemical engineering. The study presented that theses' authors hedged more than research articles' authors. Liviyska (2019) investigated content- and reader-oriented hedges, and the results indicated that the former type outnumbered the latter and fulfilled the main pragmatic role of hedges in RAs in the field of applied linguistics. Hedging devices in Liviyska's corpus were represented by prevailing number of lexical verbs. Vuković (2015), in turn, investigated hedges as weak epistemic modality markers, and provided us with the following definition of epistemicity "the modification of an utterance to express confidence or lack thereof, truthfulness and probability". Weak epistemic modality was represented more frequently in world leading journals than in papers published in Montenegro. Weak epistemic verbs and adjectives played a crucial role in both sub-corpora. The top-frequency examples of verbs were: *may*, *would*, *suggest*, and of adjectives *possible*, *potential*, *likely*, *hypothetical*, *apparent*. In the study by Demir (2018), scientific articles written by native speakers of English were compared with articles written by Turkish speakers of English. The most frequently used category of hedges were epistemic verbs, while the least frequent were nouns in both groups. Vold (2006) examined the use of hedges in linguistics and medical RAs in the three languages: English, French and Norwegian. As observed in the study, Norwegian and English authors used higher proportion of hedges. There was also variation in distribution of hedges in the disciplines.

As Warchał (2015:38) observes, the research on boosters recognized also as certainty markers or emphatics, has been more scarce as compared to hedges research practice. A cross-disciplinary study on boosters in RAs was undertaken by Hyland (1998), who sees their function as adding force to assertions and introducing solidarity with readers. Philosophy and marketing prevailed over other disciplines in the number of boosters. The lowest proportion of boosters was seen in electrical engineering. An interdisciplinary comparison of boosting was also presented by Peacock (2008), who focused on the following academic areas: business, language and linguistics, public and social administration, law, physics, and environmental science. Language and linguistics represented the highest number of boosters, which were followed by environmental science. The top-frequency boosters in the entire corpus were: *show*, *will/ will not*, *clear(ly)*, *establish*, and *must*. An analysis of boosters, in particular of their verbal forms, was undertaken by Skorczynska and Carrió-Pastor (2021). The distribution of boosters in the three disciplines (engineering, medicine and linguistics) has been found to be similar and

the top-frequency representatives overlapped, e.g., *show, determine, demonstrate*, which proved that boosters perform their role regardless of the discipline (Skorczyńska and Carrió-Pastor, 2021).

Interesting observations come from Koutsantoni (2004), who examined certainty, attitude and common knowledge markers in electronic and electrical engineering fields. Among certainty markers, the most frequent were: adverbs (30%) and adjectives (20%) represented by the examples: *clearly, obviously, obvious, apparent*. With reference to attitude markers, evaluative adjectives accounted for 60%, e.g., *significant, interesting, important*, followed by adverbs (15%), e.g., *significantly, considerably, unfortunately*. As far as common knowledge markers are concerned, their role is to “stress common knowledge of authors with readers” (Koutsantoni, 2004:175), and this group, to a large extent, was represented by evaluative adjectives (71%), e.g., *well-established, well-known, common*, which was followed by expressions of generalized attribution (29%) represented by lexical bundles, e.g., *it is known, it is widely accepted*. Attitude markers were also analysed from a cross-cultural perspective (Mur Duenas, 2010, Blagojević, 2009). In the study by Mur Duenas (2010), journal papers in business management written in English and Spanish were compared. The analysis did not reveal a significant difference in the frequency of use of attitude markers in both languages. As highlighted by Mur Duenas (2010:55), explicit attitudinal adjectives were the top-frequency used attitudinal markers, which stays in line with previous studies (Swales and Burke, 2003, Stotesbury, 2003, Koutsantoni, 2004). The instances of the adjectives in English in Mur Duenas’ (2010) research were: *important, inconsistent, critical, interesting*. The analysis by Blagojević (2009) focused on expressions which English and Serbian authors use to present their attitude to the content of texts. The study has revealed that similar expressions were used in both languages. The distribution of attitude markers in texts written by Serbian authors in Serbian and English and English authors fluctuated between 30% to 40%. The top-frequency attitudinal expressions were adverbs, followed by verbs and adjectives.

Sahragard and Yazdanpanahi (2017) analysed engagement markers in RAs in eight disciplines, i.e., psychology, sociology, economic, law, mathematics, geology, physics and biology. The analysis presented that engagement devices were used more frequently in humanities than in science RAs. Among types of engagement markers, there were directives that were the top-frequency device used in both fields of study. Mangyu and Rahim (2019) confirm that directives are most frequently occurring devices in terms of engagement markers.

As far as self-mention expressions are concerned, the research on this subject has developed in cross-disciplinary and cross-cultural directions. McGrath (2016) investigated

journal papers in history and anthropology and discussed the differences regarding the frequency and the roles adopted by authors. Texts in the latter discipline used more self-mentions than the former one. Anthropologists tended to use ‘narrative I’, which can be caused by the fact that researchers in this field have personal observations, experience and interactions in the fieldwork. This finding stays in contrast with the research by Sheldon (2009), as observed by McGrath (2016:92), who found more instances of ‘reflexive I’ in anthropology. And, equally, the study by Coffin (2002), who found fewer instances of ‘reflexive I’ in history. In the study mentioned above, Sheldon (2009) analysed RAs written in English and Spanish. Spanish writers tended to use slightly more self-mentions than English. *I as navigator* was most frequently used function in both corpora, e.g., *we also include...*, *we highlight...*. *I as conveyor of general knowledge* occurs in Spanish texts only. Molino (2010) discussed self-mention devices in English and Italian corpus in the discipline of linguistics. English academic texts used almost twice as many self-mentions as Italian ones. Previous studies also presented that English RAs contained more self-mention expressions as academic texts in other languages (Vassileva, 2000, Mur Duenas, 2007, Yakhontova, 2006), as Molino (2010:90) observes. Vassileva (1998), for instance, compared the use of *I* and *we* in English, German, French, Russian and Bulgarian academic texts. Vassileva (1998:165) indicates that the author’s presence is mostly observed in the English language sub-corpus.

Hyland (2008a:1) draws our attention to one more crucial issue concerning the research on metadiscourse. He indicates that “texts are persuasive only when they employ rhetorical conventions that colleagues find convincing”. Hyland explains that readers can be guided by authors in particular interpretation, but readers always have the possibility to refute writers’ interpretation. Using academic persuasion, writers are able to anticipate forthcoming negative claims, but, to do this researchers need to be fluent with persuasive practices in their disciplines, encoding concepts, projecting arguments to be perceived convincing. In terms of credibility, authors need to be seen as “a professionally acceptable persona” with a suitable attitude to their audience and arguments. This means that the practice of persuasion in RAs, similar to other areas, entails using language in order to make a relationship between our thoughts and experience. Hyland points out that interaction in academic discourse takes place in the process of choices which comes from the interpersonal system of stance and engagement. *Stance* has a writer-oriented function and can be compared to “the writer’s textual voice”, thanks to which a writer is able to express his concepts, judgements and opinions. *Engagement*, in turn, is the reverse side of the coin, which contributes to the way writers rhetorically are aware of the presence of the audience and how they guide them through an argument and interpretations and

include them as participants of discourse. Stance and engagement devices aid writers and readers interact through texts in their disciplinary cultures. In his study, Hyland (2008a) analysed grammatical devices of stance and engagement which can be illustrated with the following instances:

- hedges – *possible, may, could*
- boosters – *surely, obviously, highly*
- attitude markers – *remarkable, proficient, unexpected, self-evaluative*
- self-mention – *our, we*
- reader mention – *we*
- directives – *refer to Table 2, open the valve, note, concede*
- questions – *Why did protests center in some shantytowns, but not others?*
- knowledge reference – *well-known, obviously*
- asides - And – *as I believe many YESOL professionals will readily acknowledge – critical thinking ...*

As Hyland (2008a) points out, it is obvious that authors present themselves, their study and audience in different ways, especially in different disciplines. These findings showed that higher proportion of stance devices was included in philosophy and marketing than in engineering.

Vazquez Orta (2010) continued the tradition on stance research, and analysed particular stance markers in the corpus of English and Spanish research texts in the field of business management. The study emphasizes the role of stance devices in two segments of RAs, *INTRODUCTIONS* and *DISCUSSIONS*, where they were most frequently used. Hedging was the strategy mostly visible in *DISCUSSION* sections of English texts, while in Spanish RAs these were *INTRODUCTIONS* that presented the highest proportion of this strategy.

Stance and engagement were also investigated in mathematics RAs (McGrath and Kuteeva, 2012). In terms of stance, the analysis revealed that boosters were the most frequently used devices. Compared to hedges, they were less prevalent devices in the corpus. Attitude markers and self-mentions occurred rarely in the analysis. Engagement markers expressed as a reader pronoun *we* were the top-frequency devices in this category.

2.3. Studies on lexis in Research Articles

Having presented the studies on macrostructure (section 2.1) and rhetorical strategies in RAs (section 2.2), this section focuses on lexical categories in RAs, the last part of which will

be devoted to the studies on adjectives in research papers. The research on particular parts of speech as well as lexical bundles in RAs can be viewed from various perspectives, since they are discussed with regard to IMRD segments or in the entire RA, in terms of one discipline or as a comparative cross-disciplinary study.

With regard to the lexical bundles, research into them has been undertaken by Esfandiari and Moein (2016), who investigated 1,421 RAs across the disciplines of food science and technology. The study categorized bundles into text-oriented (help to organize the text) and research-oriented (aid authors structure and prioritize experiences of the real world) in accordance with Hyland's taxonomy (2008b). Among text-oriented expressions, the most frequently used were: *on the other hand, in the present study*. Lexical bundles were examined in science papers by Allen (2009), in which research-oriented phrases dominated over text- and participant-oriented, which stays in contrast with Esfandiari and Moein's (2016) findings of the study. Lexical bundles as an interdisciplinary mark, across the disciplines of finance, accounting, biology and applied linguistics, were the subject of research in the work by Yin and Li (2021). It revealed that papers in finance and accounting contained more lexical bundles than the two other disciplines. Finance RAs tended to contain NP-based lexical bundles, while accounting papers contained VP-based lexical bundles. Golparvar and Barabadi (2020) analysed four- and five-word frames in the *DISCUSSION* sections in the discipline of Higher Education. Four- and five-word frames which did not contain verbs dominated in the corpus. The instances were: *about the * of, the * of higher education*.

The research on nouns, the largest group of words, has been popular in the literature. Mousavi and Moini (2014) focused on a specific type of abstract nouns, shell nouns, defined as cohesive devices in texts. Other names can be found in literature, e.g., general nouns (Halliday and Hassan, 1976) or signaling nouns (Flowerdrew, 2003). Schmid (2000:4) defines shell nouns as "open-ended functionally-defined class of abstract nouns that have, to varying degrees, the potential of being used as a conceptual shell for complex, preposition-like pieces of information". According to Flowerdrew (2003), the meaning of signaling nouns can only be conceptualised in the context. Mousavi and Moini (2014) investigated RAs in the field of education. The findings indicated that nouns *change, process* and *form* occurred more frequently than other. These nouns collocated with prepositional phrases most frequently, e.g., *the + N + of (the type of questions)*. Its function was to describe and specify a piece of information.

The study on noun modification and connection between IMRD segments in applied linguistics and language teaching papers was presented by Hutter (2015). It focused on the

difference in the use of attributive adjectives, premodifying nouns and prepositional phrases in particular IMRD sections. A good example is *METHODS* section which often has premodifying nouns, e.g., *corpus analysis, conversation analysis, speech sample*. Premodifying *noun + noun* was a top-frequency pattern used in this RA segment. As far as *RESULTS* are concerned, its prevailing structures were: *premodifying noun / attributive adjective + prepositional phrase postmodifier*. Leon and Divasson (2008) discussed the rhetorical distribution of noun phrases (henceforth NPs) and their premodification structures in 20 biomedical RAs. These were *INTRODUCTIONS* and *DISCUSSION* sections which outnumbered other IMRD segments in the frequency of NPs.

As far as the research on verbs is concerned, Reimerink (2006) investigated a classification of verbs in particular IMRD sections in the field of medicine. The results point out that the distribution of lexical domains was different among the sections of RA, e.g., in *INTRODUCTIONS* verbs denoting existence prevailed, for *METHODS* verbs expressing action outnumbered other classes, while *RESULTS* and *DISCUSSION* shared verbs of existence. Vicic and Petek (2016) analysed modal verbs in RAs in the field of logistics, which revealed that modals (*can, could, may, might, must*) outnumbered the use of semi-modals (*able to, bound to, have to*). Among modals, the most frequently used was *can*, followed by *should*. Pique-Angrodans et al. (2001) compared the distribution of epistemic and deontic modality across two fields: health science and literary criticism. In health sciences, epistemic modality heavily outnumbered deontic modality, in which the total use of the former is 97% and the latter 2.97%. In journalism papers, the distribution was similar, with the ratio of 91% for epistemic markers and 9% for deontic.

Ngula (2017) described epistemic modal verbs in research papers in three fields: sociology, economics and law. As the results indicate, international writers in law papers revealed a greater tendency to use modal verbs as compared to sociology and economics.

The use of verbs from interdisciplinary perspective was presented by Hiltunen (2006) which concentrated on coming-to-know lexical verbs, which expressed epistemic achievements in academic articles (Meyer, 1997), e.g., *find, see, observe*. Those verbs presented “acquisition of knowledge through scholar’s intentional action” (Meyer, 1997:119). The corpus comprised RAs in three academic disciplines: literary criticism, law and medicine. Coming-to-know verbs were almost equally distributed in law and literary criticism articles, but the proportion was higher in medical texts.

Reporting verbs, have also been investigated in the academic arena. Thompson and Yiyun (1991) examined reporting verbs in terms of citations, used in the corpus of

INTRODUCTIONS of RAs. They present a categorization of reporting verbs and subdivide them into denotation and evaluation. Barghamadi (2021) analysed verbs as a part of citation practice in 60 RAs across two disciplines, applied linguistics and nursing and midwifery. The analysis was a cross-cultural study, since it focused on both Iranian and international journals. The findings indicated that Iranian papers used more reporting verbs than international ones. The verbs shared across the corpus were: *find*, *show* and *report*. This study stays on a par with observations of Jafarigohar and Mohammadkhani (2015), who analysed reporting verbs in applied linguistics written by native and non-native English authors. It revealed that native writers used more direct quotations with verbs than non-native authors.

Reporting verbs and citation practice have also been studied by Yilmaz and Marti (2015), who claim that the verbs can play various roles in academic discourse, since authors can position themselves at various stages as neutrally reporting previous studies or expressing an evaluative stance towards the work they cite (Swales, 1990, Thompson and Yiyun, 1991). Their study compared 30 RAs written by native speakers of English and 30 RAs of Turkish authors writing in English, and presented differences at both qualitative and quantitative levels. The findings are similar to previous studies (Thompson and Yiyun, 1991). Thomas and Hawes (1994) analysed 11 medical RAs in terms of reporting verbs and compiled semantic categories which comprised: experimental/real-world activities, discourse activities and cognition activities. They found that the correlation between the rhetorical function and the choice of verbs: certainty verbs correlated with reporting findings and results of the study, discourse verbs with generalized conclusions, and cognition verbs with reports of consensus views.

Yeganeh and Boghayeri (2014) analysed reporting verbs in the Second Language Acquisition field (SLA), in 60 RAs, 30 of which written by native speakers of English, and 30 by Iranian authors. The study concentrated on two segments: *INTRODUCTIONS* and *LITERATURE REVIEWS*. It revealed that both group of writers revealed a tendency to use *argue* verb group, which was followed by *find* verbs for English writers, and *think* verbs for Iranian authors.

Un-udom and Un-udom (2020) discussed reporting verbs in literature review segment of applied linguistic RAs. In the study reporting verbs were classified using Hyland's (2002) framework. The category of research acts verbs which denote findings was most frequently used. Uba (2020) studied reporting verbs across accounting, applied linguistics, engineering and medicine in the corpus of 120 research papers. Their study presented that there were more reporting verbs in accounting and applied linguistics than in engineering and medicine. A

variety of verbs across disciplines differs, which denoted that papers in linguistics and accounting used a wide spectrum of reporting verbs as compared to engineering and medicine.

The presentation of the studies on nouns, verbs and lexical bundles has finally led us to the issue of adjective in research papers. Evaluative expressions, and among them adjectives, have been the subject of study in research papers. Giannoni (2010b) discussed evaluative metaphors across RAs in the disciplines of economics, law, medicine and linguistics. The most essential finding was the prevalence of adjective *significant* in medicine. Giannoni (2010b) indicated that *significant*, understood as *a mathematical quality*, was found in medicine only, and this meaning omits other interpretations of this adjective. In contrast to legal studies, in the 98% of cases, *significant* was used in a subjective, non-statistical understanding.

Giannoni (2011) discussed also value markers in research papers across a wide spectrum of disciplines: biology, physics, engineering, medicine, anthropology, history, economics, sociology, mathematics and computer science. If we focus on scientific domains, the findings suggest that the following values dominated: relevance in engineering and medicine, in which the instances of adjectives were: *significant, relevant, important*, size in biology and physics, e.g., *small, large*, goodness in economy and sociology, e.g., *positive, right, negative*, and novelty in anthropology and history., e.g., *new, recent*. Lei (2016) discussed two parts of speech, namely adjectives and adverbs, in different genres of written discourse. The distribution of adjectives was higher in natural and applied sciences than in humanities and social sciences. This study is in contrast with the one by Okulicz-Kozaryn (2013), who found that scientific papers in natural sciences used fewer adjectives than social sciences. Matesić and Memisević (2016) investigated evaluative adjectives in two languages, Croatian and English, in the disciplines of medicine and linguistics. English papers dominated in the frequency of adjectives over Croatian texts. Interestingly, Croatian papers had more evaluative expressions in *INTRODUCTIONS* and *CONCLUSIONS*, while English in abstracts and *DISCUSSIONS*. Kartal (2017) explored adjectives in the Corpus of Contemporary American English (COCA), and concentrated on academic sub-corpus. The linguist observed that 40 % of the top-frequency adjectives occurred in academic papers rather than spoken language, fiction, magazines and newspapers. As many as 35 evaluative adjectives were found, e.g., *significant, difficult*. The proportion of adjectives was found to be higher in social sciences than in technology and medicine.

Laso and John (2013) explored how selected abstract nouns, e.g., *conclusion, agreement, comparison and decision* collocated with adjectives in the *Health Science Corpus*. It was found that a variety of adjectives occurred more frequently in the attributive position.

The adjectives that collocated with the nouns in Laso and John's (2013) study were subdivided into two semantic groups: descriptors and classifiers. *Comparison* and *decision* collocated with relational and topical adjectives (the class of classifiers), e.g., *direct comparison* (relational), and *clinical decision* (topical), which stays on a par with Biber et al.'s (1999) observations. *Agreement* and *conclusion* presented collocations with evaluative descriptors, e.g., *controversial conclusion*, *general agreement*.

It may be interesting to note, a study on negative polarity of adjectives (Laso, Comelles and Verdaguer, 2013). *Likey* and *unlikely* were present as formulaic patterns, e.g., *it is/seems (un)likely that/to -inf*. 81% of mentioned patterns can be found in *RESULTS* and *DISCUSSION* segments. Another adjective to discuss was *clear* and its negative equivalents, *unclear* and *not clear*. In this case, negative polarity occurred in 54 % of the instances, mainly in *DISCUSSION* segments. With regard to *able*, *unable* and *not able* their distribution in *RESULTS* and *DISCUSSION* sections was comparable in frequency in both segments. The study emphasizes the influence of negative bundles on clauses of cause, e.g., *we were unable to detect...*, and consequence, e.g., *Thus, it seems unlikely that ...*

Adjectives have also been investigated in litotes and litotic constructions, which are defined as "the denial of the opposite" (Łyda and Warchał, 2011:193). The study focused on research papers in two languages, Polish and English, and in two disciplinary contexts, linguistics and biological sciences. The analysis of the first corpus, *The Polish linguistics corpus* (PLRA) revealed that the pattern *nie V nie-ADJ* was the second most frequent one in this corpus, of which the examples were: *nie jest niemiłe*, *nie jest to metoda niezawodna*. In the second corpus, *The English linguistics corpus* (ELRA), litotic constructions with adjectives, namely, *not NEG-ADJ*, were the most frequent pattern, e.g., *is not an uncommon finding*, *is not an unreasonable assumption*, *are not inflexible structures*. In the third corpus, *The English biology corpus* (EBRA), the most common structure was *(BE) not NEG-ADJ*, e.g., *is not uncommon*, *is not impossible*, *not non-existent*. The paper also concentrated on the position of litotic constructions across the IMRD model of RA. In the EBRA corpus, litotic patterns were identified in *DISCUSSION* part. Whereas in the ELRA, litotic constructions were used not only in *DISCUSSION* segments, but also in *INTRODUCTIONS*.

Soler (2002) explored the frequency and semantic implications of adjectives in the corpus of biochemistry RAs. In 80% of RAs, the proportion of adjectives was the highest in *DISCUSSION* sections. Attributive adjectives were much more common than the predicative type. Predicative adjectives occurred most frequently in *DISCUSSIONS*. Soler (2002:164)

points out that adjectives are crucial in expressing objectivity (certainty) as well as subjectivity (interpretation).

Kuźniak (2015), who discussed language tools in Translation Studies narrative, indicated the instances of adjectives that can be applied in academic discourse, e.g. *like, analogous, comparable*. The examples of original translation excerpts from Kuźniak's (2015) analysis were proposed to be modified, e.g., with the use of adjectives and comparative expressions containing adjectives, e.g., *The translation should give a complete transcript of the ideas of the original work* modified into *The translation should give **as close** a transcript of the ideas of the original work **as possible**; replacing one word class with another without changing the meaning of the message* has been modified into *replacing one word class with another without a **great** change in the meaning of the message*.

Adjectives were investigated in abstracts of RAs across biology and linguistics (Grymska, 2017). The study demonstrated that the two disciplines shared the same adjectives, e.g., *high, different*, but also contained discipline specific adjectives, e.g., *discursive, rhetorical*, in linguistics, and *osteogenic, extracellular*, in biology. Research has also been carried out on adjectives in other written genres than research papers and abstracts, e.g., doctoral dissertations (Agcam and Ozkan, 2015), written lectures in economics (Samson, 2006), promotional texts and websites in tourism (Duran-Munoz, 2019, Pavlickova and Razusova, 2013).

To summarise the research presented in this section, there are only few studies on adjectives in RAs, which can be subdivided into three groups. The studies has focused on journal papers, undertaking various subjects of study, e.g., macrostructure, rhetorical strategies, parts of speech, and only some of them are devoted to adjectives. The research has also been conducted on selected types of adjectives in RAs, e.g., evaluative adjectives, emotive lexis, etc. There are also papers which have concentrated on adjectives, but in other corpora than journal papers, e.g., RA abstracts, websites, etc. With reference to the aforementioned issues, there is a lack of the research devoted to the distribution of adjectives and systematization of their lexio-grammatical patterns, especially, in the corpus of research papers. The present study embraces the corpus of 693 RAs and spans a broad scope of academic disciplines.

2.4. Concluding remarks

The aim of this chapter has been to describe the research studies which focus on the genre of RA. The discussion begins with the macrostructure of RA. In its second part, the chapter analyses the studies on rhetorical strategies in this genre. The third part, is devoted to

research on lexical categories in journal papers, which leads our discussion to the notion of adjective in research papers. The chapter highlights the importance of RA, which is the main material in the research part of this thesis.

The next chapter is going to present a historical overview of parts of speech, in which the attention is drawn to adjective. It also analyses the main features of adjective. In its further part, the chapter elaborates on the differentiation between the adjective and other parts of speech, i.e., adverbs, nouns and participles. The second part of Chapter 3 is devoted to the semantic classifications of adjectives.

Chapter 3 - Adjective

The following chapter takes up the issue of adjective in English academic written discourse. The chapter opens with a historical overview of categorizations of parts of speech. In its further part, it seeks to explain what adjective is and provides its characteristic features. It also elaborates on types of adjectives and semantic functions that adjectives can fulfil in a sentence. The chapter also focuses on differentiation between adjectives and other parts of speech, i.e.: nouns, verbs, adverbs and participles. The first section of the chapter closes with an analysis of 60 adjectives from *the English Language Corpus* and describes what features they have, on which basis it can be judged whether they are adjectives or not. The second part of the chapter performs a deep analysis of semantic classes of adjectives in English.

3.1. Adjective – general overview

Understanding language and being able to communicate involves not only the myriad of linguistic knowledge and skills but also implies the awareness that a single word carries meaning. Whatever the type of communication, e.g., business, school, or everyday, written or spoken, these are words which are an omnipresent and inherent tool thanks to which people can express their thoughts.

The earliest attempts to categorize parts of speech were undertaken in India, and are dated back as far as 5th or 6th century BC, by the Sanskrit grammarian Yaska (Matilal, 1990). The following four categories were highlighted: *noma* – nouns, *akhyata* – verbs, *upasarga* – pre-verbs or prefixes, and *nipata* – particles. The first two – nouns and verbs were classified as inflectable, whereas the last two as uninflectable. The process of categorization of parts of speech was also cultivated in the ancient Greece and is tremendously different from how we categorize them now. As pointed out by Robins (1966:8), parts of speech were identified on the basis of rhetoric and logic, and as a result the first concepts of speech categorization can be found in philosophical treaties (Hejl, 2014). Plato's model of parts of speech distinguished between two fundamental parts nouns and verbs. According to Plato, nouns were regarded as parts of sentences which functioned as subjects of predication. As far as verbs are concerned, they expressed action or quality (Lyons, 1968:10-11). One more crucial observation is that verbs and adjectives were conflated into one speech category. Later on, the classification founded by Plato was abandoned by other Greek grammarians, who, instead of replacing it with

a tripartite system, regarding nouns, verbs and adjectives as separate elements, exchanged it with another bipartite classification, in which nouns and adjectives are in one class.

As far as Aristotle's model is concerned, the philosopher added another part *syndesmos*, which included conjunctions, articles, and pronouns (Robins, 1966:10). The concepts developed by Plato and Aristotle are merely the very first possible division of a sentence.

Studies on speech categorization were continued by Dionysios Thrax, who developed the categorization into eight parts. It should be noted that this work referred to Classical Greek (Robins, 1990:39). The parts of speech were as follow:

- *onoma* – *noun* - a part of speech inflected for case, signifying a concrete or abstract entity
- *rhema* – *verb* – a part of speech without case inflection, but inflected for tense, person, number, signifying an activity or process performed or undergone
- *metoche* – *participle* – a part of speech sharing the features of the verb and the noun
- *arthron* – *article* – a part of speech inflected for case, proposed to nouns
- *antonymia* – *pronoun* – a part of speech substitutable for a noun and marked for person
- *prothesis* – *preposition* – a part of speech placed before other words in composition and in syntax
- *epirrhema* – *adverb* – a part of speech without inflection, in modification or in addition to a verb
- *syndesmos* – *conjunction* – a part of speech binding together the discourse and filling gaps in its interpretation.

This Greek classification can be compared to the list of Latin *partes orationis*, the one presented by Apollonius Dyscolos (a Greek grammarian) and Priscian (a Roman grammarian, Robins, 1990:66). *Partes orationis* presents eight parts as well, but there are no articles, which Latin omits, and interjections are added (Anward, 2000:10). This classification is as follows:

- *nomen* – *noun* – indicates a substance and a quality;
- *verbum* – *verb* – indicates action;
- *participium* – *participle* – participles derivationally refer to verbs, and have tenses and cases
- *pronomina* – *pronoun* – pronouns substitute proper nouns
- *adverbium* – *adverb* – it is used in the structure with verbs

- *praepositio* – preposition – it is used as a separate word before words that inflect for case
- *interiectio* – *interjection* – interjections are independent from verbs from syntactic perspective, they express feelings or state of mind
- *coniunctio* – conjunction – the main role of conjunctions is to join two or more different parts of speech, with a need to indicate a relationship between them.

Apart from the two features, namely, *article* (Thrax’s list) and *interjection* (Dyscolos and Priscian’s list) the two lists remain similar to a great extent. As pointed out by Anward, (2000:13), both Dionysios’ and Priscian’s categorization are based on “a syntactic function, an inflectional pattern and a semantic category”.

One more classification to note is Varro’s classification (Robins, 1990:58-59), in which a quadripartite system of parts of speech of Latin words:

- words that inflect for case, but not for tense - nouns and adjectives,
- words inflected for tense, but not for case – verbs,
- words which inflect both for case and tense – participles,
- and words that inflect neither for case, nor tense – adverbs.

Varro’s two distinguishing factors were tense and case, which means that the leading factor in classifying words was morphology, in contrast to the previous categorizations by Thrax, Dyscolos and Priscian. As pointed out by Robins (1990:70), Priscian’s work serves as a bridge between the antique times and the Medieval. *Institutiones grammaticae* laid the foundations for the medieval Latin grammar and philosophy.

In the Middle Ages Latin gained the status of the universal language, used not only in liturgy or scriptures, but also the language widely used in diplomacy and culture (Lyons, 1968:14). The 13th century abounded with thoughts of the great scholastics (also known as Modists or speculative grammarians), who like the Stoics, understood language as a tool to analyse the reality. This highlights the main assumption of Modists that word, concept and thing have an influence on each other (Zupko, 2012). They claimed that language and grammar are grounded on the real world. As a consequence, they concluded that there was a need for a universal grammar to be created. The essence of Modists’ understanding is that language and grammar are based on reality which refers to the nature of the world. Modists claimed that if one world is the same for all human beings, there must be one universal grammar to function for all of them. This theory can be illustrated by a triadic scheme as follows:

- *modi significandi* – language, grammar, form
- *modi intelligendi* – thought, understanding, concept
- *modi essendi* – the world, being, thing.

The above-mentioned characteristics allow us to see how language and grammar are created if we begin to analyse them from the reverse order. The things and phenomena in the world (*modi essendi*), which surround us refer to our concepts and ideas we create in our minds (*modi intelligendi*). In order to express them, people need language and grammar (*modi significandi*) (Hejl, 2014: 17-18). The scheme created by Modists reveals the natural connection between world, humans and language, and highlights the importance of meaning, or “signification” (Lyons, 1968:14).

Modists’ other goal was to explore the parts of speech presented by Priscian to see if they can be proved by any theory of grammar (Hejl, 2014:18). The central problem is in the fact that Priscian’s model did not disclose what exactly caused particular categorization of parts of speech. What Modists managed to show was that different parts of speech were reflected in the ways humans conceptualize thoughts and ideas in the world. Modists concluded that parts of speech are independent of any language and treated them as universal, and claimed that the factors for division of parts of speech should be explored in ontology. Although Modists explained clearly the relationship between the world, humans and language, they were not able to explain the way how parts of speech can be divided. Similar to the previous works by, e.g., Plato, Dionysius Thrax, Dyscolous and Priscian, they were descriptions, but not explanations of why parts of speech can be subdivided.

In the 17th century, the two monks, Antione Arnauld and Claude Lancelot co-authored a book *Grammaire Generale et Raisonnee* (1660), in which they presented their concept on universal grammar. Their later research on logic evolved and as a result *La Logique de Port-Royal* appeared (1662). The Port Royal grammarians conception was that languages are based on the two universal principles (Hejl, 2014:19). They believed that languages underlie logic and vary in some aspects only, e.g., various words. They also claimed that reason was the power in language. The three major aspects were essential according to them:

- judging – “affirming the properties of something”
- conceiving – “attending or imagining”
- reasoning – “deducing a conclusion from judgements” (Thomas, 2011:58, quoted in Hejl, 2014:19).

The Port Royal grammarians categorize words in language into two groups: those which need to represent the objects of thought and the other group which represents forms of thought. As a result they distinguished nine parts of speech, the six of which belong to the first group and the two to the second (Thomas, 2011:58, quoted in Hejl, 2014:19). The group of the objects of thought included: nouns, articles, pronouns, participles, prepositions and adverbs. The second group - forms of thought consisted of: verbs, conjunctions and interjections. Similarly to Modists, the Port Royal grammarians thought that the factors influencing parts of speech division are language-external and should be looked for in ontology. But contrary to Modists, they used their own system which consists of two levels. The first level refers to our thoughts and concepts, while the second one is concerned with language that is produced to express these thoughts. In contrast to Modists, Port Royal grammarians did not use the tripartite system of modes, and, therefore, did not agree that parts of speech are strongly connected with objects and phenomena that surround us in the real world.

As Robins (1990:134) argues, the Latin tradition was that a noun class included adjectives as well and this class has its own rights. It was not until after the 19th century that the traditional grammarians began to set the scene for a refreshed view of parts of speech classification. Mainly, they based on Latin, and took over the categorisation presented by Priscian, however, this approach was regarded unsuitable in the long run, since English was regarded as dissimilar to Latin. One crucial step that deserves attention here is that adjectives appear as an independent class, independent from nouns. In his categorization, Murray (1860:30-31) distinguishes nine classes in the “modern traditional set” (Robins, 1990:135): articles, nouns, adjectives, pronouns, verbs, adverbs, propositions, conjunctions and interjections. On the one hand, Murray’s classification deserves our attention, because it treated adjectives as a separate class. But on the other hand, his definitions are not always precise, e.g., “a pronoun is a word used instead of a noun”, as Hejl (2014:22) puts it right.

In the first half of the 20th century parts of speech classified by Jespersen (1924, quoted in Hejl, 2014:24-25) appeared in *The Philosophy of Grammar*. The classification consisted of five classes, in which the thought of *adjectives* as a separate class was continued. Apart from these, we find *substantives*, *pronouns* *verbs*, and a very vague class of *particles*.

As far as American structuralists are concerned, they used morphological and syntactic factors to distinguish between parts of speech. One of the precursors of that time, Leonard Bloomfield, in *Language* (1935), claimed that there was no reason for looking for philosophical and universal factors in parts of speech categorization. The linguist emphasized that no consistent classification is possible to be formed, since parts of speech can overlap and cross

each other. As Hejl (2014:26) puts it, American structuralists took over the categorization which dates back as far as Aristotelian era.

A fundamental classification of parts of speech is presented by Huddleston and Pullum (2005:16-22), who identified nine classes:

- *nouns* – the largest category in any language which denotes words of persons, animals and physical objects dog, diamond, as well as a great many abstract nouns: idea, computation, etc.
- *verbs* – verbs express an action (*I opened the door*), other event (*The building collapsed*) or a state (*They know the rules*). The first distinctive feature of verbs is they inflect for tense: present and past. Verbs occur as a head of a VP and function themselves as a predicate in a clause. Being the head in the VP, verbs indicate what other elements follow them, e.g., *She left the airport*, but not *She arrived the airport*. The last aspect which remains to discuss is a distinction between auxiliary and lexical verbs. The former can precede the subject, which occurs in interrogatives, while this does not happen with the latter, e.g., *Can you speak French?* vs. **Speak you French?* In order to form an interrogative of the sentence *You speak French*, an auxiliary verb *do* is added, *Do you speak French?* One important thing to note is that auxiliaries are usually followed by other verbs, e.g., *She has gone home* or *It will rain*.
- *adjectives* – adjectives denote properties of people, and both concrete and abstract objects. They can also express state if combined with a verb *to be*, e.g., *The soup is hot*. The next property of adjectives is they can occur in attributive and predicative function. In the attributive function, adjective is a modifier of a noun in NP, e.g., *a handsome boy*, while a predicative use usually is found after the verb *to be*, or a small number of similar verbs, e.g., *become, feel, seem*, etc., e.g., *The soup is hot*. A vast majority of central adjectives are gradable (the ability to function both attributively and predicatively, Quirk, 1985:404), meaning that they express properties of various degrees, e.g., *big, good, old*. The degree can be preceded by a modifier, e.g., *very hot, extremely high*. The degree can be expressed by means of comparison, which means that adjectives can be inflected. The inflectional system of adjectives is called grade and has three forms:

Kim is old, *old* is the plain form,

Kim is older than Pat, *older* is the comparative form,

Kim is the oldest of them all, *the oldest* is the superlative form.

Huddleston and Pullum (2005:19) indicate that functionality, i.e., the attributive and predicative functions are more distinctive than gradability, since not only adjectives are gradable. The six remaining classes are:

- *determinatives* – this class of words enlists, e.g., *the, a, this, that, some, any, many, few, one, two*, of which *the* and *a* are the most common members. *The* and *a* function as a determiner in a NP, which is marked definite (*the*) when we can identify a referent, e.g. *Where's the dog?* or indefinite (*a*) when we cannot assume this, e.g., *I could hear a dog barking*. The above-mentioned determinatives can function as determiners, but they can also function as modifiers, e.g., *It wasn't that bad*. Huddleston and Pullum (2005:19) draw our attention to nomenclature, and as presented above, determinative is a category, while determiner is a function. One more thing to note is that traditional grammar does not use the term determinatives, which means that they are treated as a sub-class of adjectives. *The* and *a* are far more different than adjectives from grammatical and semantic perspectives, and as a result are implemented into a distinct category.
- *adverbs* – they are formed from adjectives by adding *-ly* ending, e.g., *careful – carefully, obvious-obviously*, however a great many of adverbs do not follow this rule, e.g., *almost, quite, rather, etc.* In contrast to adjectives, adverbs have neither attributive, nor predicative functions, e.g., **a jealously husband* or **He became jealously*. Instead, their main function is modifying verbs, adjectives, or adverbs, e.g., *She spoke clearly, a remarkably good idea, She spoke quite clearly*.
- *prepositions* – prepositions express different relations of space and time, e.g., *under the bridge, at the corner*, etc. the main function of prepositions is to occur as a head of a PP, which function as dependents especially of verbs (VPs), nouns or adjectives.
- *coordinators* – whose main function is to coordinate two or more elements; the central words that mark the coordination are: *and, or, but*, e.g., *We need a cup of tea and a can of coke*.
- *subordinators* include the words: *that, whether, if*, whose function is to express a clause as subordinate, e.g., *I realise that he did his best*.
- *prototypes* – the last class, but a very interesting one, which was not enumerated in the previous categorizations. As Huddleston and Pullum explain (2005:22), nouns or verbs do not have just one property thanks to which we can distinguish them from other categories, but they have a set of properties. It needs to be highlighted that there are words that do have a wide range of properties, but other do not. Words which are a

central member of a particular category and have a full set of properties are prototypical. *Cats* and *dogs*, for instance, are prototypical, but a word *equipment*, which is a noun, and does not have a plural form, is a non-prototypical noun.

Words are classified into closed and open (i.e., *function* and *content words*, Leech and Svartvik, 2013). The former include: *pronouns, articles, prepositions, conjunctions, and auxiliary verbs*. Their main role is carrying grammatical or functional information (Quirk, et al., 1985, Hartmann and Stork, 1972). To the latter group there belong: *nouns, main verbs, adjectives and adverbs*. Their main role is conveying semantic information. Open classes of words are constantly changing since new words can enter into language to name new phenomena and objects, they can disappear from general use and also existing words can gain new meaning (Kennedy, 2013:58).

3.1.1. Defining adjectives

The notion of adjective has been defined many times in literature. As Leech (1989) observed, adjectives belong to the largest class after nouns and verbs and this is an open set of words (Lyons, 1968:436). As observed by Raskin and Nirenburg (1995), adjectives are inherent elements of noun phrases, which are arguments of verbs. A clear definition is also presented by Dubois (2002): “words joint to the nouns to express a quality of the object, creature, or concept designated by noun”. As emphasized by Bhat (1994), Crystal (2006) and Dryer (2007), adjectives are used to describe other words and denote their properties and qualities. Payne, Huddleston and Pullum (2010:31) state generally that adjective’s function is modifying a noun.

3.1.2. Adjectives – the main features

As Quirk et al. (1985:402) observed, we cannot judge whether a word is an adjective or not, by looking at it in isolation. Sometimes this practice is however possible when a word has particular suffixes:

- -able: e.g., *comfortable*
- -ful: e.g., *meaningful*
- -ish: e.g., *childish*
- -ous: e.g., *mischievous*
- -al: e.g., *seasonal*
- -ic: e.g., *academic*

- -less: e.g., *speechless*
- -y: e.g., *happy*.

However, it is a common phenomenon that many adjectives do not have any identifying form, e.g., *good*, *young*. A typical feature of adjectives is that they are gradable, which means that their quality can be shown in different degrees (Biber et al., 2002:188). Adjectives can also be distinguished on the basis of their comparative and superlative inflection endings, e.g., *big – bigger- the biggest* or they follow the pattern: *comfortable - more comfortable - the most comfortable*. As emphasized by Quirk (1985:402-403), there are four main features characteristic of adjectives in English:

- attributive function – adjectives premodify a noun, and appear between the determiner (including zero article) and the head of a noun phrase, e.g., *a beautiful dog*, *the gold ring*;
- predicative function – adjectives function as subject complement, e.g., *The painting is ugly*, or as object complement, e.g., *He thought the painting ugly*.
- adjectives can also be premodified by the intensifier *very*, e.g., *The children are very happy*.
- adjectives can function in comparative and superlative forms as well. This is possible by means of inflection endings *-er* and *-est* or the premodifiers *more* and *most*.

This description leads us to the notion of *central adjectives*, which shares both first two functions, i.e., attributive and predicative. Adjectives which satisfy only one of these criteria are *peripheral adjectives*.

3.1.3. Adjectives and adverbs

Adjectives and adverbs can overlap in some cases. On the one hand, these two classes are represented by different forms: a *rapid* car (adjective) – drive *rapidly* (adverb, Quirk, 1985:405). The adverb is formed by adding a derivational suffix *-ly* to the adjective. On the other hand, though, adjectives and adverbs are represented by the same form, as in the examples: a *fast* car – drive *fast*. Here, an adverb *fast* lacks its derivational ending *-ly*. For the above characteristics to be complete, we need to focus on the third variant of forms, which is illustrated with the following examples:

She had *short* hair.

She cut her hair *short*.

I'll be back *shortly*

As we can see, adjective and adverb do take the same form (*short*). However, a form *shortly* is possible, but it has a different meaning, e.g., I'll be back *shortly*. The instance of adjective/adverb homomorphs does not occur very often, but is possible. One more variant is possible: in the example: a *slow* car – both drive *slow* and *slowly* are correct use as an adverb and can be used interchangeably, however as noted by Quirk and Greenbaum (1976:138) and Quirk et al. (1985:405), the adjective form may sound objectionable. From the syntactic perspective, the adjective form is then possible after the verb or the object, e.g., *He slowly drove the car into the garage* or *He drove the car slowly/slow into the garage*. In standard English, a very small number of adjectives have the same form as adverbs. Taking the adjectives *sudden* or *careful* as examples, we can see that they have different forms as adverbs, and thus, the following sentences are unacceptable: **He came back sudden* or **She buys her clothes careful*. It is worth adding that the following instance is possible in nonstandard English: *She pays her rent regular*.

Quirk et al. (1985:406-407) point out that other words than *fast* can also follow omission of *-ly* ending rule when they form adverbs, e.g., *She arrived in the late afternoon* and *She arrived late in the afternoon*. In the first case, *late* functions as an adjective, whereas in the second case, *late* is an adverb. The form *lately*, however, is also possible, but with a semantic difference, e.g., *Have you seen her lately?*

Significantly, there are words that naturally end in *-ly* and function as both adjectives and adverbs, e.g., *an early train* (adjective) and *We finished early today* (adverb). It is worth noting that verbs which refer to senses, e.g., taste, smell, impose an adjective phrase as a complement. This is illustrated in the example: *The flowers smell sweet*.

It remains to discuss adjectives and adverbs with *a-* beginning. For linguists they can belong either to adjectives or adverbs group. *A-words* tend to occur in the predicative function, rather than in the attributive one. Adverbs, in turn, are used predicatively rather rarely. Some of the adverb types, e.g., adverbs of place (*abroad*), or time (*now*) can be freely used predicatively. This imposes another rule that they can be used only after verb *to be*. *The patient was asleep/hungry/abroad/there*. This sentence can be said with a verb *seem* and adjective as a complement, *The patient seemed asleep/hungry*. But it is impossible to say *The patient seemed abroad/there*. Another distinctive feature of *a-words* is that *a-*adjectives describe states, while *a-*adverbs refer to motion or direction, e.g., *She went abroad* vs. *She went asleep*.

An inherent feature of a-adjectives is that they can function attributively if modified, e.g., *the fast asleep children*. It is worth emphasizing that some a-adjectives can have their synonyms or equivalents, which function attributively, e.g., The children were *asleep* vs. the *sleeping* children. The last issue to note about a-adjectives is that some of them can be premodified by *very* or comparison, e.g., *ashamed, awake*. Others undertake this rather occasionally, e.g., *asleep*.

Interesting observations come from Radford (1989:138), who proposed that adverbs can be implemented as a special class of adjectives. Adverbs are morphologically connected with adjectives which refers to the fact that adverbs are formed on the basis of adjectives, as was stated above, by adding *-ly* suffix. The second reason can be that thanks to the relationship between adjectives and adverbs, new words can enter language, e.g., two adjectives *gigantic* and *enormous* form a word *ginormous*, and as a result there is a corresponding adverb *ginormously*. Additionally, adverbs do not have their own *-er* ending in comparative form, but it derives from adjectives. Adverb *quickly* is formed on the basis of adjective *quick*. A comparative form of *quickly* can be expected to be formed by using *-er* to the adverb *quickly*, which gives an incorrect form *quicklier*. Instead of this, a comparative form of *quickly* is possible by adding *-er* ending to the stem of adjective *quick*, and thus we gain *quicker*. This means that both adjectives and adverbs can obtain the same comparative forms. It is worth emphasizing that the same range of premodifiers can be used with both adjectives and adverbs, e.g., *very, quite, rather*, e.g.:

His speech is **very/rather/quite slow**.

He talks **very/rather/quite slowly**.

In addition, adverbs and adjectives take the same set of complements:

Her decision was **independent of mine**.

She decided **independently of me**.

Radford draws our attention to a couple of notions, of which the first is *distribution*. To illustrate this, the following examples need to be studied:

There is **real** crisis. (Adj modifies N)

He is **really** nice. (Adv modifies A)

He walks **really** slowly. (Adv modifies Adv)

He is *really* down. (Adv modifies P)

He must *really* squirm. (Adv modifies V)

One crucial difference seen above is that adjectives and adverbs can modify different parts of speech. With regard to adjectives that are similar to *real*, they can modify nominals, and as far as adverbs similar to *really* are concerned, they modify adjectival, adverbial, prepositional and verbal constituents. Radford explains that due to the difference in distribution, it may be expected that adjectives and adverbs cannot be conflated into one speech category. However, the key issue here is that adjectives and adverbs are *in complementary distribution*, which can be compared to the arrangement of black and white squares on a chess board, since we can predict where a black or white square should be.

A question that arises at this point is whether adjectives and adverbs can be assigned as different members of the same linguistic category (Radford, 1989:141). To verify this, Radford introduces two working notions *adjective* or *adverb*. Radford clarifies that the main function of adjectives is to modify nominals, whereas adverbs are used to modify non-nominals. This means that adjectives and adverbs are in systematic complementary distribution and can be conflated into one category of *Adjective*. As discussed previously, it is possible to predict what kind of adjective is required to occur in a particular position of a sentence. The linguist proposes a further step in his considerations meaning that not only are adverbs a specific kind of adjectives, but so are determiners. At this point, a question is addressed: Is it possible that adjectives, adverbs as well as determiners can be implemented into one same speech category? Or as Radford asks directly “Are determiners adjectival transvestites?” (Radford, 1989:145). And what would be the name of such a category? *Adjecter* (Radford, 1989:142)? As a point of departure in this aspect, it is good to recall the types of determiners in English on the basis of Bloomfield’s (1935:203-206) categorization (quoted in Radford, 1989:142):

- articles: definite *the*, and indefinite, *a, an*
- demonstratives *this, that, these, those*
- interrogatives *which, that*
- quantifiers *every, each, any, some, no, etc.*
- possessives *my, your, our, etc.*

However, it is worth emphasizing that in Simpson’s classification (quoted in Radford, 1989:142), all determiners are classified as adjectives and this approach is also shared by

Verdieva (1980). If we look at the morphological aspect of adjectives and determiners, we can see that they have different properties. Adjectives have *-er* comparative ending, e.g., *quicker*, *nicer*, whereas determiners do not, e.g., *thiser*, *somer*. The second thing to note is that adjectives can form an adverb if we add *-ly* ending, e.g., *quickly*, *nicely*, but this has nothing to do with determiners, e.g., *thisly*, *somely*. As far as syntax is concerned, adjectives and determiners differ in distribution, e.g.:

- adjectives: *men*, *handsome men*, *dark handsome men*, *tall dark handsome men* – adjectives can be added to the left of the noun they modify;
- determiners: *the car*, **the my car*, **which my cars*, **my some cars*, *etc.* – determiners cannot be added in the same way adjectives are.

When adjectives and determiners modify a noun, they need to occur in the following order: determiner + adjective + noun, e.g., *the big band*, and it is impossible to say *big the band*. In addition to this, adjectives can be used with other adjectives, e.g., *a thoughtful and considerate person*, but determiners cannot be used together with adjectives in the following sense, e.g., *my and lazy son* (determiner and adjective), or *silly and these ideas* (adjective and determiner).

Adjectives and determiners differ from each other from a semantic perspective as well. Adjectives can be used to modify a limited class of nouns, because of their meaning, e.g., *a thoughtful person*, but not *a thoughtful cat/pot*. The restriction mentioned here is called *selection restriction* (Radford, 1989:144). Radford clarifies that determiners are more neutral than adjectives in a semantic sense, e.g., *a/the/this person/cat/problem* or *each/any foot/friend/garden*.

Last thing to note is the division of determiners in terms of the noun they modify (Radford, 1989:144-145). Determiners can modify any noun, i.e., a singular countable noun, a plural countable noun as well as uncountable nouns, e.g., *the tool*, *the tools*, *the furniture*. Determiners such as indefinite articles can modify only singular countable nouns, e.g., *a tool*, it is impossible to say **a tools* or **an equipment*. The third group incorporates determiners which modify uncountable nouns and plural countable nouns, e.g., *enough food*, *enough tools*, but not *enough tool*. As far as adjectives are concerned, such a division is not needed, because adjectives can modify any kind of noun, regardless its type, a mass noun, a singular countable noun, or a plural countable noun.

On the basis of this discussion, it can be claimed that adjectives differ from determiners from morphological, syntactic and semantic point of view, which leads to an inevitable conclusion that adjectives and determiners cannot be implemented into one speech category.

In his further discussion, Radford addresses two questions regarding fundamental nature of speech categories, namely “Are categories primitive elements?”, which means that they cannot be subdivided into smaller units, or “are they composite elements built up out of smaller units”? As proposed by Chomsky (1974, quoted in Radford, 1989:146-157), the four main parts of speech, i.e., nouns, verbs, adjectives and prepositions can be treated as having two syntactic features, which are nominal/non-nominal ($\pm N$) and verbal/non-verbal ($\pm V$). The following categories are broken into sets of features and can be illustrated in the following way:

- Verb = [+V, -N]
- Noun = [-V, +N]
- Adjective = [+V, +N]
- Preposition = [-V, -N].

Radford’s analysis opens with *supercategorical generalisations* which refer to generalisations in more than one category. We can observe that verbs and prepositions in English take noun phrase as complements (direct object noun phrases), which is not possible with nouns or adjectives. The following examples illustrate this:

John *loves* [Mary] (V + NP) - possible

John bought a present *for* [Mary] (P + NP) - possible

*John’s *admiration* [Mary] (N +NP) – impossible

*John is *fond* [Mary] (A +NP) – impossible

The verb *loves* and the preposition *for* take NP *Mary* as the complement, but the noun *admiration* or the adjective *fond* cannot take NP *Mary* as the complement. It is obvious that verbs and prepositions form *a natural supercategory*, since they both share the feature [-N]. This means that only [-N] constituents take NP as complements.

The second observation is that nouns and adjectives form *a supercategory* by virtue of the fact that they both use nouns as a direct object, meaning that they share the feature [+N]. Given the discussed approach, we should expect the following supercategories to be found in natural languages:

- a supercategory of [+V] categories, comprising V and A
- a supercategory of [- V] categories, comprising N and P
- a supercategory of [+N] categories, comprising N and A
- a supercategory of [-N] categories, comprising V and P.

Similarly to word-level categories which form supercategory sets, phrase-level also tend to form them. As observed by Jackendoff (1977), quoted in Radford (1989:148), these are NPs and PPs which occur in the head position of cleft sentences, e.g.:

It was *a car* that she bought (NP)

It was *in the shop* that I met her (PP)

*It is *very pretty* that she is (AP)

*It is *very quickly* that she writes (ADVP)

*It is *go home* that I will (VP).

NP and PP form a natural supercategory at the level of phrases, since they share [-V] function meaning that only the phrases which are headed by [-V] constituent, can occur in focused position in cleft sentences.

Interesting observations come from Stowell (1981:24, quoted in Radford (1989:148), who studied APs and VPs as they form a supercategory. APs and PPs in German can function as modifiers of the head noun, which is not possible with NPs and PPs, e.g.,

der [AP seiner Freundin uberdrussige] Student

ein [VP sein Studium seit langem hassender] Student

Our discussion in this section assumes that adjectives and adverbs are different variants within the same class. However, there was no evidence of implementing determiners as a sub-class of adjectives, since their morphological and syntactic differences. The main concern here is that the nature of categories is complex, which means they are not “primitive elements” (Radford, 1989:157), since they encompass various categorial features.

3.1.4. Adjectives and nouns

As stated by Quirk et al. (1985:410-412), nouns tend to be used in attributive function, and as a result can be similar to peripheral adjectives, e.g., *the bus station, a business friend*.

| | |
|--------------------------------|----------------------------------|
| the <i>large</i> station | the <i>bus</i> station |
| the station seems <i>large</i> | * The station seems <i>bus</i> . |
| a very <i>large</i> station | *a very <i>bus</i> station |
| a <i>larger</i> station | *a <i>busser</i> station |

Table 5. Adjective vs. noun comparison (Quirk et al., 1985:410)

It is important to bear in mind that this similarity is only superficial. On the basis of these examples (Table 5), we can see that the noun *bus* has the ability to be used neither predicatively,

nor with the intensifier *very*. Needless to say, the process of grading of *bus* is impossible as well. An interesting point to note here is that nouns written in bold in the examples below:

student performance

a ***London*** park

the ***biology*** syllabus

are “nouns used as attributive modifiers”, not “nouns used as adjectives” (Huddleston and Pullum, 2002:537). Any noun can be used as an attributive modifier, and proper nouns as well, as in the instance *a London park*. If we want to analyse them as adjectives, then, nouns and adjectives categories will have a huge and unnecessary overlap. The exception to this rule can be seen in the examples: *maiden voyage* vs. *a young maiden from Perth*. *Maiden* in the presented examples differs in meaning, and as a result *maiden* in *maiden voyage* is treated as adjective, although it does not have any adjective features.

However, as indicated by Quirk et al. (1985), nouns that can be used both in attributive and predicative functions, can be treated as adjectives, e.g.,

That *concrete* floor – That floor is *concrete*

Those *apple* pies – Those pies are *apple*.

It is also emphasized that nouns can be used as a subject complement after copular verbs, similar to adjectives, e.g.,

That man is a *fool*.

She became a *nurse*.

There are also nouns which function as a subject complement after the verb *seem*, e.g.,

He seems a *fool* (=foolish)

My stay there seemed sheer *bliss* (=blissful).

The second crucial aspect is that there are words that can function both as nouns and adjectives (Quirk et al., 1985:410). *Criminal* is an adjective that can be used both attributively (*a criminal attack*) and predicatively (*the attack seemed criminal*). *Criminal* is also a countable noun, because it can:

- be used with determiners, e.g., *the criminal pleaded guilty*
- make plural forms, e.g., *one criminal – several criminals*
- inflect in genitive case, e.g., *the criminal’s sentence*
- be premodified by an adjective, e.g., *a violent criminal*.

The criterion that a word such as *criminal* can be used attributively does not suffice to say it is an adjective. Quirk et al. explain that both nouns and adjectives have the ability to be used as premodifiers of nouns. In the sentence *His attack was criminal*, *criminal* is an adjective. Similarly to *a criminal attack*, *criminal* is adjective as well. It still belongs to the adjective class in *criminal law* or *criminal lawyer*. Henceforth, *criminal* is a homomorph, meaning it is both a noun and an adjective.

3.1.5. Adjectives and participles

As noted by Quirk et al. (1985:413) adjectives and participles can share *-ed* or *-ing* suffixes and are named *participial adjectives*. They can be used both attributively and predicatively (Table 6), e.g.,

| predicative | attributive |
|---|-----------------------------|
| His views were very <i>surprising</i> . | his <i>surprising</i> views |
| The man seemed very <i>offended</i> . | the <i>offended</i> man |

Table 6. Adjective vs. participle comparison (Quirk et al. 1985:413)

In addition, *participial adjectives* with *-ed* suffix are formed even when there is no corresponding verb, which automatically means that the form with *-ed* suffix is not a participle (Table 7).

| predicative | participial adjectives | lack of corresponding verb |
|--------------------------------------|-------------------------------|----------------------------|
| The results were <i>unexpected</i> . | the <i>unexpected</i> results | * <i>to unexpect</i> |
| All his friend are <i>talented</i> . | his <i>talented</i> friends | * <i>to talent</i> |

Table 7. Gerund-participle vs. past participle forms (Quirk et al. 1985:413-416)

The typical problem when analysing adjectives arises in the distinction between them and gerund-participle and past participle forms, since many adjectives are homophonous (Huddleston and Pullum, 2002:540). The central approach, as Huddleston and Pullum propose, is to consider the structure when a verb or an adjective follows a verb *to be* as well as and when it is a noun modifier.

The first thing to note is that gerund-participle and past participle forms of verbs follow a verb *to be*, while adjectives need to follow *to be* as a copula (Table 8). The following examples serve to illustrate the problem:

| Verb | Adjective |
|---|---|
| She was <i>sleeping</i> . | This was <i>disturbing</i> . |
| They were <i>seen</i> . | He was <i>drunk</i> . |
| She is <i>calculating</i> (our salaries). | She is <i>calculating</i> (but her husband is frank). |

Table 8. Adjective vs. verb comparison (Huddleston and Pullum, 2002:540-541; Quirk et al., 1985:414)

One possible solution to see adjectival status of a given word is to replace the verb *to be* with other complex-intransitive verb, e.g., *seem*, *become* or *appear*. In order to illustrate the difference, the following examples are presented (Table 9):

| Participle | Adjective |
|---|-------------------------------------|
| *She seemed <i>sleeping</i> . | This seemed <i>disturbing</i> . |
| *They appeared <i>seen</i> . | He appeared <i>drunk</i> . |
| *She seems <i>calculating</i> (our salaries). | She seems very <i>calculating</i> . |

Table 9. Participle and adjective distinction (Huddleston and Pullum, 2002:540-541; Quirk et al., 1985:414)

The second solution in stating whether we have a participle form or an adjective is to do a test with *too* or *very*. As can be seen, modification with *very* is possible in past participles, e.g., *very disturbing*, *very drunk*, *very calculating*, but cannot be used with gerund-participles, e.g., **very sleeping*, **very seen*, **very calculating (our salaries)*. The third solution to differentiate parts of speech is semantic perspective, e.g., *He was drunk* vs. *The milk had been drunk*.

As added by Quirk et al. (1985:414), it is easier to state whether *-ing* form is a verb when it is followed by a direct object. Similar, *-ed* form is a verb when a structure by + agent is present, as in the examples:

Her views were *alarming* her audience.

The man was *offended* by the policeman.

Huddleston and Pullum (2002:541) point out that gerund-participle and past participle can be distinguished from each other if we compare the complements they take. Gerund-participles of transitive verbs are complemented by objects, e.g., *She was mowing the lawn*, which never occurs in past participles. The last issue to note is that past participles that follow the verb *to be*

have passive meaning, not perfect, e.g., *He was very distressed* expresses the state that a person was distressed in the passive meaning.

As was stated at the beginning of the section, our second approach to distinguish between adjectives and gerund- and past participles is to identify a modifier of a noun. Huddleston emphasizes that the borderline between adjectives and verbs while taking a noun modifier approach is more fluid than in the case of the previous one.

| Verb | Adjective |
|---------------------------------------|---------------------------------|
| a <i>sleeping</i> child | some <i>disturbing</i> news |
| a rarely <i>heard</i> work by Purcell | her very <i>worried</i> parents |

Table 10. Verb vs. adjective comparison (Huddleston and Pullum, 2002:541)

The first thing to note is that there is no *to be* verb in the above-mentioned modifying structures (Table 10), thus the possibility of *seem* or *appear* replacement is out of question. If we do a *very* test, we can see that it occurs in some *very disturbing news* and *her very worried parents*, but the structure such as **a very sleeping child* is not used. As Huddleston states (1988:114), the form is a verb when it presents inability to occur in predicative function, e.g., *sleeping* does not have this and other examples that prove the rule are: *the sinking ship*, *a smiling face*. It is similar to *heard* in *a rarely heard work by Purcell*.

This draws our attention to past participles and adjectives that occur attributively and are understood passively, e.g., *a rarely heard work* means work that is heard rarely. As Huddleston and Pullum (2002:542) claim, it is worth to bear in mind that the divergence between adjectives and verbs is problematic, but while the problematic structures cannot be predicative adjectives, it is advisable to treat them as verbs.

3.1.6. A picture of adjectives in the English Language Corpus (ELC)

By virtue of the fact that the borderline between adjectives and other parts of speech is fuzzy, the following section is going to focus on 60 examples of adjectives from the English Language Corpus (ELC). It comprises 693 research articles written in English from seven academic disciplines: biotechnology, ecology, linguistics, material science, mathematics, medicine and political science. The corpus was analysed with *Sketch Engine* (<https://www.sketchengine.eu/>) for Windows using *Wordlist* and then *WordSketch* tools. The aim of the section is to provide 60 most frequently occurring adjectives in the ELC and to discuss their characteristic properties on the basis of which we can state if they are adjectives.

The lemmas in Table 11 are verified using Quirk et al.'s (1985) four main criteria of adjectives: attributive and predicative function, ability to be modified by the intensifier *very*

and ability to take the comparative and superlative forms (the function of gradability). The fifth criterion in adjective verification is, as indicated by Huddleston and Pullum (2002:528), taking adverbs as modifiers.

| | Lemma | Total number | | Lemma | Total number |
|----|-------------|--------------|----|---------------|--------------|
| 1 | high | 5,234 | 31 | standard | 929 |
| 2 | different | 4,333 | 32 | academic | 928 |
| 3 | low | 3,292 | 33 | linear | 889 |
| 4 | political | 2,688 | 34 | linguistic | 887 |
| 5 | large | 2,407 | 35 | constant | 881 |
| 6 | same | 2,378 | 36 | economic | 877 |
| 7 | significant | 2,345 | 37 | available | 836 |
| 8 | important | 2,065 | 38 | relative | 820 |
| 9 | small | 1,967 | 39 | experimental | 816 |
| 10 | similar | 1,801 | 40 | negative | 813 |
| 11 | new | 1,792 | 41 | major | 791 |
| 12 | good | 1,714 | 42 | independent | 773 |
| 13 | total | 1,591 | 43 | clear | 762 |
| 14 | great | 1,466 | 44 | English | 761 |
| 15 | present | 1,457 | 45 | final | 756 |
| 16 | specific | 1,430 | 46 | average | 725 |
| 17 | particular | 1,415 | 47 | effective | 724 |
| 18 | public | 1,320 | 48 | complex | 711 |
| 19 | possible | 1,295 | 49 | natural | 710 |
| 20 | social | 1,242 | 50 | certain | 700 |
| 21 | local | 1,236 | 51 | international | 696 |
| 22 | positive | 1,230 | 52 | able | 694 |
| 23 | initial | 1,189 | 53 | corresponding | 691 |
| 24 | previous | 1,161 | 54 | critical | 689 |
| 25 | strong | 1,130 | 55 | simple | 689 |
| 26 | direct | 1,029 | 56 | primary | 683 |
| 27 | various | 1,019 | 57 | national | 681 |
| 28 | main | 1,001 | 58 | normal | 679 |

| | | | | | |
|----|------------|-----|----|------------|-----|
| 29 | single | 988 | 59 | additional | 679 |
| 30 | individual | 969 | 60 | long | 677 |

Table 11. 60 adjectival candidates from the ELC

The lemmas in Table 11 can be divided into three groups. The first group comprises adjectives which have a full set of properties in the sense of Quirk et al. (1985) and Huddleston and Pullum (2002). They are “clearly distinct from words of other categories” (Huddleston and Pullum, 2002:528). As many as 19 instances belong here, which is 32% of 60 adjectives in the list. These adjectives are: *high, low, large, significant, important, small, similar, new, good, great, strong, long, negative, complex, positive, specific, effective, simple* and *clear*. Their usage in the corpus is illustrated with the following instances of lexico-grammatical structures:

The relatively **high** selectivity values to alkene (70%) of the catalyst may be because [...]

[...] a **very large** scale [...]

The uncentrifuged cells displayed **relatively low** lipid production [...]

[...] create a **more positive** attitude to language learning [...]

[...] most of the information security best practices documents are **very clear** [...]

Our task is to help pre-service teachers move towards **more complex** understandings [...]

This is not an entirely **new** argument [...]

Two adjectives, namely, *different* and *critical* are partially gradable, since they display four of the five properties. As observed in the ELC, *different* does not occur in the comparative constructions, while *critical* does not collocate with *very*.

Adjectives that exhibit fewer than four properties are classified as non-gradable. The characteristic feature of non-gradable adjectives is that they do not occur in the comparative constructions and are not premodified by *very*. All of the representatives in this group, 38 (63%), can freely occur in the attributive pattern: *political, total, academic, linear, linguistic, constant, economic, experimental, particular, public, social, same, certain, final, previous, available, standard, relative, local, initial, direct, various, present, possible, main, single, individual, average, natural, international, corresponding, additional, normal, national, primary, independent, major* and *English*. Some of the adjectives, e.g., *possible, available, present*, collocate with adverbs and occur in the predicative constructions.

[...] suggestions for maintaining **academic** biliteracy are devised to increase individual scholars' awareness level [...]

[...] a **certain** amount of data [...]
[...] the **same** mathematical family of indices [...]
[...] the **total** microbial biomass decreased by 15% [...]
[...] a central role in **initial** microbial attachment [...]
Briefly, **single** colonies of the transformants were randomly picked [...]
Only three **additional** steps were needed [...]
[...] consistent with the **previous** data [...]

Of the 60 adjectives in the list, *able* is the only example that is used predicatively, not attributively. It takes *to* + *infinitive* complementation, which is presented in the following examples:

the model solution is not **able to** completely account for this effect
they were only **able to** claim their victory

As can be seen in the above discussion, adjectives vary in the properties they have. They can have a full set of features or only some of them, and as a result can function as less prototypical instances of adjectives.

3.2. Adjectives - semantic classification

Beginning from the 70s of the 20th century, we have witnessed the emergence of research on adjectives in English, and especially on semantic classification of adjectives. As proposed by Quirk et al. (1985:434-436) and Quirk and Greenbaum (1976:124-125), adjectives can be classified using semantic scales and can be subdivided into the following:

- stative/dynamic – in general, adjectives tend to be stative, but a dynamic aspect is also possible. One distinction between them is that a stative adjective, e.g., *tall*, cannot be used in continuous and imperative forms, e.g., *He is being tall* or *Be tall!*
- gradable/nongradable – adjectives are gradable. Gradability can be illustrated in two ways, through comparison, e.g., *small* – *smaller* – *the smallest* or – and adverbs of degree, e.g., *very good*, *extremely practical*. Quirk et al. (1985:435) highlights that all dynamic adjectives are gradable. As far as the stative are concerned, only some of them are not gradable, especially denominal adjectives, e.g., *atomic scientist*, or *hydrochloric acid*, and adjectives which express origin, e.g., *German*.

- inherent/noninherent – the main difference is in the fact that inherent adjectives describe the referent of the noun directly, e.g., *that old man*, *My friend is old*, and those that do not do that are noninherent, e.g., *an old friend of mine* (Quirk et al., 1985:429). The vast majority of adjectives are inherent, e.g., *a wooden cross* means also *a wooden object*. But on the other side, in *a wooden actor*, *wooden* is a noninherent example of the adjective, since *a wooden actor* does not mean *a wooden man*. The explanation stated above clarifies that a basic sense of a noun can be extended by means of an inherent adjective. One more thing to note is that on the basis of an inherent adjective, a noun can be formed, e.g., in her *soft touch*, adjective *soft* can be derived into a noun *softness*. However, the process of derivation from an adjective into a noun is not possible with noninherent adjectives, e.g., *a firm handshake* cannot be transformed into *a firmness of handshake*.

One more classification comes from Aarts (1976:34), who proposes three features *static*, *physical and dimensional*, which are essential in three adjective categories: physical dimensional, non-dimensional, and non-physical. They are presented as follow:

- dimensional: horizontal, vertical, quantity, general size, time, duration, frequency, iteration
- non-dimensional: substance, solidity, liquidity, gaseousness, texture, luminosity, humidity, temperature, colour, weight, smell, taste, vision, touch, sound, musical sound, weather, fixity, property, content, velocity, activity.
- non-physical: emotion, attitude, intellect, truth, communication, manner, evaluation, degree, modality.

Shramm (1979) makes a detailed analysis of Russian adjectives, which are divided into empirical and rational. As Raskin and Nirenburg (1995:9-10) point out, empirical scalar adjectives are presented much more understandably, since they are clearly divided into categories and sub-categories:

- sight-related
 - surface
 - composition, shape, texture
 - spatial
- hearing-related

- properties of sounds
 - properties of the sound of an object
- olfactory
 - properties of smell
 - various smells
- taste-related
 - taste-related properties
 - changes of tastes
- tactile
 - temperature
 - humidity
 - surface
- muscular tension
 - weight
 - pressure
- complex sensory.

A very detailed classification of adjectives can be found in *The Systematic Dictionary of English Adjectives* (Verdieva, 1980). The dictionary distinguishes four main adjective classes, which then are subdivided into many detailed semantic sub-classes. The first class refers to adjectives having certain inherent properties (henceforth IP), which accounts for approximately 30% of all adjectives in the dictionary. The IP class comprises a wide range of semantic sub-classes. In general, the sub-classes refer to inherent and essential properties of objects and people and their existence, presenting how a particular thing is built both from internal and external sides, as well as they focus on emotions, feelings, motion and tendencies. The first sub-class in IP refers to: existence, material, dimension and substances, e.g., *existent, gold, high, dirty, watery*. The second sub-class consists of adjectives which refer to: properties of animals, plants and human beings, e.g., *alive, spinless, healthy, hairy, healthy, asleep*. One of the first sub-classes comprises emotive adjectives, e.g., *homesick, angry, content*. The second one refers to knowledge, e.g., *learned, skilled*. As far as the third sub-class is concerned, it contains adjectives which refer to measure, e.g., *only, much, many, big, proportionate*. This is followed by adjectives of ability, e.g., *possible, capable*, and intelligence, e.g., *witty, wise*. This sub-group enumerates adjectives that refer to capability of one's senses and emotions, e.g., *discernible, specific, imaginable*. In the further part of IP classification, adjectives of action and

endurance are enlisted, e.g., *mobile, disposable*, as well as power and change, e.g., *explosive, remedial*. IP class finishes with adjectives of presence or lack of air, e.g., *windy*, success, e.g., *lucky*, consisting of parts, e.g., *partial, complex*. The classification closes with a sub-class which enlists adjectives which express particularity, e.g., *other, both, all, which, each*.

The second class in Verdieva's (1980) classification comprises adjectives "acting in a certain way" (henceforth AP). It is far less numerous than the previous one, and as a result its semantic range is not so wide. The AP class encompasses adjectives which express acting and behaving in a particular way as well as various mental states. The sub-classes refer generally to vigour, readiness, feelings, maturity and culture, emotions, control, seriousness, progress and changes, e.g., *violent, heroic, rude, temperate, gracious, solemn, conservative*.

Adjectives that stand in relationship or are characterized by relation form the third class, henceforth RP. Adjectives which express any kind of relationship belong to this group. The following semantic sub-classes can be enumerated: fact and reality, agreement, accordance to events, law, equality, cause of waste, loss; effect of someone's emotions, place or position, being apart, order, temporal relation, meaning or value, social relations, e.g., *harmonious, identical, normal, excellent, harmful, painful, pathetic, solitary, chaotic, modern, significant*.

The entire picture of adjective classification would not be complete without the fourth class, which concerns adjectives "pertaining to a certain class of natural or social phenomena" (henceforth CP). Similarly to the AP class, this one is not a large one. The classes of adjectives can be subdivided into:

- external conditions that influence the life of organisms and society, e.g., *tropical, parental*
- man in society, which concentrates on phenomena that occur naturally as well as phenomena that refer to man and its function and role in society, e.g., *industrial, institutional*.

A few difficulties became apparent when using Verdieva's classification. The first problem that arises here is that Verdieva enumerates four main classes only, and as a result a great many sub-classes occur, which lack in common semantic point, e.g., *rainy* and *nervous* or *difficult* and *fragrant* are enlisted in one IP class. The second thing to note is that determiners are treated as adjectives and are incorporated into IP class, e.g., *both, some, any, which, either*, together with pronoun *other*. As stated by Quirk et al. (1985:251-261) the words *both, some, any, which, either* are determiners, not adjectives. Another pivotal issue that arises here is that emotion sub-class occurs in as many as three classes, namely the IP, AP, and RP. *Tense* (IP) and *impulsive* (AP) both express emotional states of a person, but occur in two different classes. The last

thing to note in Verdieva's classification is the problem of sub-division of adjectives that refer to science and disciplines. This sub-class enlists 30 adjectives merely, e.g., *economic, chemical, medical, or scientific*, but adjectives such as *academic* or *political* are incorporated into different semantic sub-classes with no visible reason. This approach presents some impediments in widespread usage of Verdieva's model for classifying adjectives.

A different perspective on adjectives classification is taken by Kerbratt-Orecchioni (1980: 79-86), who makes a clear sub-division into objective and subjective adjectives. To the former group belong, e.g., *single/married, male/female* and adjectives that express colours. The latter group is further divided into affective adjectives (*affectifs*), which manifest emotional state, and reaction, e.g., *funny, bizarre, pathetic*, and evaluative adjectives (*evaluatifs*), which have 2 sub-groups non-axiological and axiological. Non-axiological adjectives refer to evaluation in terms of a norm, quality and quantity (Kerbratt-Orecchioni, 1980:81) and the following adjectives serve as examples: *big, distant, warm*. As far as axiological adjectives are concerned, they express subjective value, which can be both positive or negative, e.g., *good, pretty*. In her study, Kerbratt-Orecchioni makes the most clearly marked division of adjectives, since they gained separate semantic classes with distinctive borderlines between affective, non-axiological and axiological adjectives.

The core research on semantic classification of adjectives is undertaken by Dixon (1982). In his work *Where have all the adjectives gone* (1982), he enumerates seven main classes of adjectives in English, which are:

- dimension, e.g., *big, large, long, short*
- physical property, e.g., *hard, soft, heavy, light*
- colour, e.g., *white, beige*
- human propensity, e.g., *happy, wise*
- age, e.g., *young, new*
- value, e.g., *good, bad* and a couple hyponyms of *good* and *bad*: *excellent, poor, etc.*
- speed, e.g., *fast, quick*, and a few more items.

The *position* class of adjectives such as *high, low, near, far*, is omitted in the following classification, since it is defined as a further semantic type and in languages other than English is expressed using adverbs.

In his later study Dixon (2004:5) enumerates six more adjective sub-classes for languages which have large adjective classes:

- difficulty, e.g., *difficult, simple*

- similarity, e.g., *like, similar, other, different*
- qualification, e.g., *common, definite*
- quantification, e.g., *all, some, few*
- position, e.g., *high, low*
- cardinal numbers, e.g., *first, last*

An even more detailed analysis was undertaken by Hundsnurscher and Splett (1982), who identified 13 semantic classes, which are further subdivided into several sub-classes. The division is as follows:

- perceptual
- spatial
- temporarily-related
- spatio-temporal
- material-related
- body-related
- mood-related
- spirit-related
- behaviour-related
- social-related
- quantity-related
- relational
- general.

It may be of interest to see the categorization proposed by Okada (1990, quoted in Raskin and Nirenburg, 1995:8) who classified Japanese scalar adjectives into the following semantic classes:

- emotion
- sense
- location
- direction
- shape
- quality
- quantity
- light

- colour
- heat
- force and energy
- voice and sound
- appearance and disappearance
- start, end, stop
- continuation
- state
- abstract
- other.

As compared to Hundsnurscher and Splett's (1982) work, the classification of Okada is enriched with heat, force and energy, voice and sound semantic classes. There is, however, an important caveat regarding both classifications. Neither the former nor the latter classification explain what sub-classes called *general* or *other* mean, and what adjectives they contain.

The classification undertaken by Frawley (1992:447:480) corresponds to the two presented by Dixon, with human propensity and physical property classes in a more extended version, however the other classes are barely mentioned. The classes are as follow:

- value, e.g., *good, bad*
- human propensity
 - mental state, e.g., *happy, ashamed, jealous*
 - physical state, e.g., *weak, thirsty*
 - behaviour, e.g., *funny, wild, interruptive*
- physical property
 - sense – adjectives related to taste, sense, etc.
 - consistency, e.g., *hard, soft, flexible*
 - texture, e.g., *rough, smooth, scaly*
 - temperature
 - edibility, e.g., *ripe, raw, cooked*
 - substantiality, e.g., *hollow, full, thick*
 - configuration, e.g., *sharp, broken, whole*
- colour
- age
- quantity

- possession

One more study on adjective classification was taken by Huddleston and Pullum (2002:553-559), who group them into eight classes:

- degree and quantifying attributives
- temporal and locational attributives
- associative attributes
- process-oriented attributives
- modal attributives
- particularising attributives
- expressive attributives
- transferred attributives.

An interesting classification comes from Biber et al. (2002:197), as compared to the previous classifications, e.g., Verdieva (1980), Dixon (1982, 2004), Hundnurscher and Splett (1982), Okada (1990), and Frawley (1992), has only two main semantic classes, namely, descriptors and classifiers. Each of the two categories is divided into several sub-classes, which are clearly distinct from each other in terms of semantics, and from this reason are easier to use. The main function of the first semantic category, descriptors, is describing particular characteristics of colour, size, age, chronology, time, emotion and other features. As Biber et al. emphasize, descriptors unlike classifiers, are gradable. The examples which illustrate descriptors are:

- colour descriptors, e.g., *black, white, red*
- size/quantity/extent descriptors, e.g., *big, deep, short, large*
- time descriptors refer to chronology, age and frequency, e.g., *annual, new, early, late*
- evaluative and emotive descriptors express judgements, emotions, and emphasis, e.g., *bad, beautiful, good, poor*
- miscellaneous descriptors denote a variety of other kinds of characteristics, e.g., *positive, appropriate, sudden, free, hard, serious, private.*

As far as classifiers are concerned (the second semantic category), they are non-gradable in most cases. Accordingly, they do not take the comparative or superlative forms and modifiers of degree, e.g., *more additional* or *more chemical* are not possible. Their function is to “limit or restrict a noun’s referent” (Biber, et al. 2002:197). As proposed by Biber et al., classifiers can be subdivided into the following categories:

- relational/classificational/restrictive classifiers and they act as limiters of a noun's referents, which relate to other referents, e.g., *additional, complete, different, final, general, maximum, necessary, various*
- affiliative classifiers whose function is to identify the national or social origin of a referent, e.g., *English, Chinese, French, United*
- topical and other classifiers which denote the subject or particular type of a noun, e.g., *chemical, environmental, legal, medical, mental, political, visual*.

It is clear that some adjectives can share two functions of descriptor and classifier and this depends on the context, in which they are used. *Primary* in *a primary issue* describes a particular issue as a basic one. While *primary* in *primary school* functions as a classificational classifier, which denotes a kind of school. A wider meaning of an adjective is also possible within the same semantic category. *Poor* can be used as a descriptor which denotes a negative financial condition, e.g., *a poor state*, or *not good* in the example *poor health*.

Biber et al. (2002:198) point out that common adjectives can have a wider meaning. This means that *old* in *an old radio* is a descriptor of age, but in *poor old Rusty* it acts as an evaluative descriptor. It is worth noting that meanings can differ regarding the role or the register. In the sentence *We're very poor*, the adjective *poor* is used in the predicative position and refers to a financial situation, whereas its attributive position in the *poor little kid* indicates emotive meaning.

It may be of interest to see semantic classes of adjectives taken from a syntactic perspective (Jassem, 2002). In his study, the description of lexical units follows collocations with subordinate categories only which are called "syntactic-semantic features of the word" (Jassem, 2002:19). The classification focuses on basic semantic features which are: human, animate non-human, concrete, and abstract, and one more sub-class is mentioned which refers to abstract terms "measure" used for spatial adjectives. A unit for the classification refers to a lexeme and its meaning. Jassem explains it using the example of Polish verb *uwagać* which represents as many as five possible meanings: *to pay attention to something, to be careful, to beware of something, to think (that), to consider someone as someone*. Each of these meanings forms different collocations and this is the reason why it is assigned to a separate class (Jassem, 2002:20). The meaning of a given lexeme is represented by an English equivalent. It is worth noting that one class contains lexemes which have the same collocations both in Polish and in English.

The adjective classes are divided into eight main groups, and as reported by Jassem (2002:24), each group has assigned a vague semantic interpretation. Then, the groups are

divided into 56 classes, with a further subdivision into 68 subclasses. The main eight classes are as follow:

- adjectives referring to humans
- adjectives describing subjective characteristics of non-human objects
- adjectives describing relations between two non-abstract objects
- adjectives referring to various types of objects
- unmarked spatial adjectives
- deverbial adjectives (participles)
- other classes of collocations.

The above-mentioned classification divides adjectives into semantic groups, which are rather broad in their nature. The main criterion for adjective selection to a particular class is syntactic structure, in which an adjective can occur.

Khamying (2007:174-179) proposes a general classification of adjectives, which includes determiners, quantifiers and pronouns. This, in turn, has a common point with Verdieva's classification. Adjectives are divided into eleven types:

- descriptive adjectives which describe people, animals, or objects, e.g., *a big house*
- proper adjectives – proper nouns which describe origin, e.g., *an English book*
- quantitative adjectives – modifies nouns in terms of quantity, e.g., *much food*
- numeral adjectives – these are subdivided into cardinal numbers, e.g., *eight pencils*, ordinal number, e.g., *Alice is the seventh in the list*, and multiplicative adjectives, e.g., *a double salary*.
- demonstrative which includes determiners, e.g., *I met that man*
- interrogative which are directly followed by a noun they refer to (Dahami, 2012:88), e.g., *What dress are you wearing?* Interrogative adjectives cannot function on their own (Rudyk, 2017:13)
- possessive, which express possession, they are possessive pronouns e.g., *This is my toy*.
- distributive adjectives, which function with a noun directly, e.g., *each country*, *neither journal* (Dahami, 2012:87)
- emphasizing adjectives, used to modify the noun by highlighting the text, e.g., *Suzan is my own girlfriend*.
- exclamatory adjectives, which need to use interjections, e.g., *What a book it is!*
- relative adjectives, e.g., modifies a noun and implies the meaning of other sentences, e.g., *Give me what money you have*.

The above-mentioned analysis is in fact not a classification of adjectives, since it carries classification of separate parts of speech.

One more classification to confer is undertaken by Cetnarowska (2015), in which adjectives are divided into relational and qualitative from a cross-linguistic perspective. Relational adjectives are derived from nouns and can be understood as “relating to noun” (Cetnarowska, 2015:115), e.g., *muzyczny*, which means “relating to music”. As far as qualitative adjectives are concerned, they are either non-derived or can be derived not only from nouns, but also from verbs and adjectives. This group of adjectives pertains to quality of objects, people or phenomena, e.g., *muzykalny* which means *presenting talent for music*, *yellowish* (derived from an adjective *yellow*), *eatable* (has origin in a verb *to eat*). As highlighted by Levi, 1976, Bosque and Picallo 1996, Fabregas, 2007, quoted in Cetnarowska (2015), the most visible difference between relational and qualitative adjectives is that the former behave more like nouns and are considered as pseudo adjectives or even “nouns in disguise” (Postal 1969, Levi 1976). Cetnarowska (2015:5) draws our attention to the pivotal thought while classifying adjectives, mainly that the borderline between nouns and adjectives is fluid.

3.3. Concluding remarks

This chapter has begun with the presentation of different categorizations of parts of speech, which dates back to the ancient times, in which the category of adjective was not perceived as a separate category. Then, the chapter presents characteristic features of adjectives and provides a clear distinction between adjective and other parts of speech: nouns, adverbs and participles. The first section closes with the analysis of 60 adjectives in the ELC, showing adjectives that have a full set of properties as proposed by Quirk et al. (1985) and Huddleston and Pullum (2002:528), as well as those which present only some of the features. The second section of the chapter has dealt with semantic classification of adjectives.

The next chapter will present the aims of the study with its research questions, describe *the English Language Corpus*, and clarify the procedure adopted while analysing the data.

Chapter 4 - Methodology

The following chapter describes the aims of the present research, introduces the corpus and procedures used in the study.

4.1. Aims of the research

This study concentrates on adjectives in written academic discourse, especially in Research Articles (RAs).

The study addresses the following research questions to be investigated:

- What are the ten most frequent adjectives in the ELC?
- What are the five most frequent adjectives for each of the seven disciplines?
- What is the distribution of the most frequent adjectives across the seven disciplines?
- What adjectives are shared by the disciplines and what are discipline-specific?
- Do classifiers prevail over descriptors in the corpus?
- What lexico-grammatical constructions do the most common adjectives enter?
- What lexico-grammatical constructions are most commonly used? Are these structures shared across disciplines?
- Are attributive adjectives more frequently used than predicative in the ELC?
- What lexical bundles do the most common adjectives enter?

4.2. Description of the corpus

The English Language Corpus (henceforth the *ELC*) used in this study is a collection of 693 research articles, all published in the years 2006-2016. All research articles are stored in electronic form. The total number of running words in the ELC is 3,258,824. It is subdivided into seven sub-corpora, which comprise seven academic disciplines: *BIOTECHNOLOGY*, *ECOLOGY*, *LINGUISTICS*, *MATERIAL SCIENCE*, *MEDICINE*, *MATHEMATICS* and *POLITICAL SCIENCE*. The corpus was compiled in 2016 in accordance with the division of knowledge of The Polish Ministry of Science and Higher Education dated 8th September 2011 (Appendix 1). In this framework, areas of knowledge are subdivided into fields and then into disciplines. For each particular area of knowledge one discipline has been chosen, which are the following:

- Humanities – *LINGUISTICS*

- Social sciences – *POLITICAL SCIENCE*
- Science – *MATHEMATICS*
- Environment – *ECOLOGY*
- Technology – *MATERIAL SCIENCE*
- Farming, Forest and Veterinary Sciences – *BIOTECHNOLOGY*
- Medicine, Health and Physical Sciences – *MEDICINE*

Each discipline is represented by 9 journals, and each journal, in turn, collects 11 research articles, published in the years 2006-2016 (one article from each year). This means that each discipline is represented by 99 journal articles. The list of journal titles is presented in Appendix 2. The size of a particular sub-corpus is demonstrated in Table 12 (the names of disciplines are abbreviated):

| Sub-corpus | BIO | ECO | LING | MATER | MED | MATHS | POLIT |
|-----------------|---------|---------|---------|---------|---------|---------|---------|
| Number of words | 410,941 | 456,241 | 624,492 | 386,455 | 290,438 | 443,906 | 645,196 |

Table 12. The size of the seven sub-corpora

One important caveat in the analysis is a disharmony of sub-corpora in size. *POLITICAL SCIENCE* has the highest number of running words, while *MEDICINE* has the lowest.

The original articles in PDF documents were converted into text files, and it was necessary to remove the following data: titles, name of authors, abstracts, keywords, footnotes, tables, figures, mathematical data and equations, acknowledgements and lists of references.

4.3. The analysis

The first step of the analysis was compiling eight wordlists by means of *SketchEngine* tools. The first wordlist presented lemmas for the entire ELC, i.e., 693 journal articles, while the remaining seven demonstrated lemmas for the seven sub-corpora. The next step was selecting the ten top-frequency adjectives in the ELC from wordlist 1, and five top-frequency adjectives for each sub-corpus from the lists 2-8. This resulted in 45 top-frequency adjectives for the analysis. To verify if particular lemma is adjective Quirk et al.'s (1985:402-403) features of adjectives were followed:

- attributive function – adjectives can appear between a determiner and a noun, which means they can premodify a noun;

- predicative function – adjectives can fulfil a role of a subject complement or object complement, which denotes that they can occur in predicative function;
- intensifier *very* – adjectives have the ability to be premodified by *very*;
- comparative and superlative degree – adjectives can also take comparative and superlative degrees.

Huddleston and Pullum (2002:531-532) draw our attention to grading of adjectives. It is emphasized that prototypical adjectives are gradable, which denotes their ability to be premodified by adverbs of degree, e.g., *very*, *rather*. Non-gradable adjectives do not have the ability to take comparison, and are not used with modifiers of degree. Huddleston and Pullum (2002:528) add another criterium of adjectives: the ability to take adverbs as modifiers. Huddleston and Pullum (2002:536-542) also clarify how to differentiate between adjectives and other parts of speech. This issue was discussed in Chapter 3 in Sections 3.1.1. – 3.1.5. Using the above-mentioned criteria for adjective selection, the following adjectives have been found as the ten most frequent ones for the entire ELC (Table 13). The frequency of adjectives is presented per million words (henceforth pmw), which is defined as “a number of occurrences (hits) of an item per million tokens” (https://www.sketchengine.eu/my_keywords/freqmill/).

| Adj | pmw |
|-------------|----------|
| high | 1,606.10 |
| different | 1,329.62 |
| low | 1,010.18 |
| political | 824.83 |
| large | 738.61 |
| same | 729.71 |
| significant | 719.58 |
| important | 633.66 |
| small | 603.59 |
| similar | 552.65 |

Table 13. The ten most common adjectives in the ELC

Table 14 demonstrates the five top-frequency adjectives for each of the seven sub-corpora (35 adjectives altogether). The frequency and pmw value is presented in Chapter 5.

| BIO | ECO | LING | MATER | MED | MATHS | POLIT |
|------|------|----------|-------|------|--------|-----------|
| high | high | academic | high | high | finite | political |

| | | | | | | |
|-----------|-------------|------------|--------------|-------------|----------|-----------|
| different | low | linguistic | different | clinical | convex | public |
| low | different | different | low | significant | same | economic |
| fatty | large | social | large | low | constant | different |
| total | significant | particular | experimental | different | linear | social |

Table 14. The most common adjectives in the seven sub-corpora

The adjective representatives in Tables 13 and 14 were used for the analysis in Chapter 5. The 45 selected lemmas are presented in accordance with their frequency, which was also normalised per million occurrences.

The next step to begin the analysis required running the *WordSketch* tool to see what lexico-grammatical structures the top-frequency adjectives enter. This procedure was adopted for each of the 45 top-frequency adjectives. *WordSketch* tool enables to perform quantitative and then qualitative analyses for adjectives in the corpus. Thanks to its Concordance tool it was possible to observe the most significant collocates of the top-frequency adjectives.

The top-frequency adjectives were also investigated in terms of 4- and 5-word lexical bundles. This required to use the *N-Grams* tool in *SketchEngine*. For each of the top-frequency adjective 4- and 5-word lexical bundles were downloaded to be presented in Chapter 5. Next, it was verified what structural types of lexical bundles occur most frequently in the corpus using the criteria proposed by Biber et al. (2004:381). The classification is subdivided into the three main types:

- type 1 – lexical bundles which incorporate verb phrase fragments, which are further subdivided into types 1A – 1G. Types 1A and 1B start with a person pronoun, type 1C begins with a discourse marker. Types 1D and 1E start with a verb phrase, but 1D has a non-passive verb, while 1E has a passive verb. Types 1F and 1G are fragments of questions;
- type 2 – lexical bundles which incorporate dependent clause fragments with sub-types 2A – 2E. The beginning of type 2A is a main clause followed by a fragment of a dependent clause. Types 2B – 2E are fragments of dependent clause which start with a complementizer or subordinator;
- type 3 – lexical bundles which incorporate noun phrase and prepositional phrase fragments with sub-types 3A – 3E. Each of the types 3A-3C incorporate a noun phrase followed by a different post-modifier. Type 3D is a prepositional phrase with embedded modifiers, while 3E is a comparative expression.

As noted by Biber et al. (2004:380), lexical bundles of types 1 and 2 contain clausal components, while type 3 has phrasal components. A detailed list of structural types of lexical bundles with examples is presented in Table 15.

| | |
|----------|---|
| 1 | Lexical bundles that incorporate <i>verbs phrase</i> fragments |
| 1A | (connector +) 1 st /2 nd person pronoun + VP fragment, e.g., <i>you don't have to, I'm not going to</i> |
| 1B | (connector +) 3 rd person pronoun + VP fragment, e.g., <i>it's going to be, that's one of the</i> |
| 1C | Discourse marker + VP fragment, e.g., <i>I mean you know, you know it was</i> |
| 1D | Verb phrase (with non-passive verb), e.g., <i>is one of the, have a lot of</i> |
| 1E | Verb phrase with passive verb, e.g., <i>is based on the, shown in figure N</i> |
| 1F | <i>yes-no</i> question fragments, e.g., <i>are you going to, do you want to</i> |
| 1G | WH-question fragments, e.g., <i>what do you think, how many of you</i> |
| 2 | Lexical bundles that incorporate <i>dependent clause</i> fragments |
| 2A | 1 st /2 nd person pronoun + dependent clause fragment, e.g., <i>I want you to, I don't know if</i> |
| 2B | WH-clause fragments, e.g., <i>what I want to, when we get to</i> |
| 2C | <i>If</i> -clause fragments, e.g., <i>if you want to, if you have a</i> |
| 2D | (verb/adjective+) <i>to</i> -clause fragment, e.g., <i>to be able to, to come up with</i> |
| 2E | <i>That</i> -clause fragments, e.g., <i>that there is a, that this is a</i> |
| 3 | Lexical bundles that incorporate <i>noun phrase and prepositional phrase</i> fragments |
| 3A | (connector +) Noun phrase with <i>of</i> -phrase fragment, e.g., <i>on of the things, a little bit of</i> |
| 3B | Noun phrase with other post-modifier fragment, e.g., <i>a little bit about, the way in which</i> |
| 3C | Other noun phrase expressions, e.g., <i>a little bit more, and stuff like that</i> |
| 3D | Prepositional phrase expressions, e.g., <i>of the things that, at the same time</i> |
| 3E | Comparative expressions, e.g., <i>as far as the, greater than or equal</i> |

Table 15. Structural types of lexical bundles (Biber et al. 2004:381)

The framework for analysing functional types of lexical bundles is also discussed by Hyland (2008b), but it is presented in this section for informational purposes, since functional lexical bundles lie outside the scope of this dissertation. The classification focuses on three areas, namely: research, text and participants, each of which is subdivided into several sub-categories. The instances of lexical bundles are presented in brackets:

- research-oriented – aid authors organise their experiences and activities of the real world: location (*at the same time*), procedure (*the use of the*), quantification (*a wide range of*), description (*the size of the*), and topic (*the currency board system*);
- text-oriented – refer to text organisation and the meaning it carries: transition signals which mark additional or contrastive links between elements (*on the other hand*), resultative signals which express inferential or causative relations (*these results suggest*

that), structuring signals that organise sections of discourse (*in the present study*), framing signals whose role is to present arguments by specifying restricting conditions (*in the case of*);

- participant-oriented – they concentrate on the author or reader: stance features – express writer’s attitude (*are likely to be*) and engagement features – address readers (*as can be seen*).

The last issue which remains to be discussed in terms of methodology is the semantic classification of the top-frequency adjectives applied further. A variety of semantic classes of adjectives have been presented in Chapter 3, but in my view one of the most clear classification is that of Biber et al. (2002). In terms of usefulness, Biber et al.’s classification fits best adjectives collected in academic texts (see Chapter 3). Other classifications such as Aarts (1976), Shramm (1979), Hundsnurscher and Splett (1982), Okada (1990), Frawley (1992), are divided into many sub-classes and for this reason are very detailed, and pertain to senses, perception, spirit, emotions. Since the representatives of the above-mentioned semantic groups have not been found among the 45 adjectives, the need to use these classifications does not arise. Classifications by Verdieva (1980) and Khamying (2007) incorporate determinatives as adjectives, which causes a basic impediment to use them.

The results of the analysis are presented in Chapter 5. They concentrate on lexicogrammatical patterns of adjectives, illustrate the statistical data with figures as well as instances of use from the corpus.

Chapter 5 - The top-frequency adjectives in the corpus

The chapter presents results of both quantitative and qualitative analysis of the top-frequency adjectives in the corpus. It is divided into two main parts. The first part describes the ten top-frequency adjectives in the *English Language Corpus* (ELC). The second part is subdivided into seven sections, each of which corresponds to one of the seven disciplines, i.e., biotechnology, ecology, material science, linguistics, mathematics, medicine and political science, focusing on the five top-frequency adjectives for each discipline. The analysis provides a picture of the lexical and grammatical behaviour of these adjectives. The analysis presents the three most-frequent lexico-grammatical patterns for each adjective, which are chosen from the following: adjective in a nominal phrase, modifiers of adjective, adjective + preposition as well as *and/or* construction, which refers to adjectival collocates of particular adjective often conjoined by a linking word *and* or *or* (Szczygłowska, 2020:54). This is followed by the comparison of the attributive and predicative functions of a particular adjective. Each of the above-mentioned patterns is illustrated with three instances of use from the corpus. The next stage of the analysis leads us to the ten most common collocates of a given adjective arranged using *LogDice* index. In its last part, the analysis focuses on the ten instances of 4- and 5-word lexical bundles with particular adjectives. The most common lexical bundles will be classified in accordance with Biber et al.'s (2004) classification of structural types of lexical bundles. General conclusions are presented at the end of each section.

5.1. The ten top-frequency adjectives in the English Language Corpus

Table 16 presents the ten top-frequency adjectives for the ELC in the decreasing order. These adjectives will be discussed in sections 5.1.1.–5.1.10.

| Adjective | Total number | Pmw |
|-------------|--------------|----------|
| high | 5,234 | 1,606.10 |
| different | 4,333 | 1,329.62 |
| low | 3,292 | 1,010.18 |
| political | 2,688 | 824.83 |
| large | 2,407 | 738.61 |
| same | 2,378 | 729.71 |
| significant | 2,345 | 719.58 |

| | | |
|-----------|-------|--------|
| important | 2,065 | 663.66 |
| small | 1,967 | 603.59 |
| similar | 1,801 | 552.65 |

Table 16. The ten top-frequency adjectives in the ELC

5.1.1. High in the ELC



Figure 2. Lexico-grammatical patterns of *high* in the ELC

The adjective of the highest frequency in the ELC is *high* (pmw=1,606.10). Its lexicogrammatical patterns were extracted from the ELC by means of *SketchEngine* (<https://www.sketchengine.eu/>). The most significant pattern that *high* enters is a nominal phrase, in which *high* functions as a modifier (Fig. 2). This pattern accounts for 75% of all lexicogrammatical structures with *high* in the entire corpus (Fig. 3). It is worth emphasizing that *high* occurs in all three morphological forms: plain, comparative and superlative. The most frequent nouns that enter patterns with *high* are *level* (392 occurrence), *rate* (225 occurrences) and *value* (136 occurrences):

- 1 might be one of the reasons for relatively **high level** of SD leakage during the washing out
- 2 **The highest** biomass production **rates** were similar at 0.1 and 0.15
- 3 As expected, increased temperature and time caused **higher** solubilization **values** due to the enhanced effect on the removal of non-structural components.

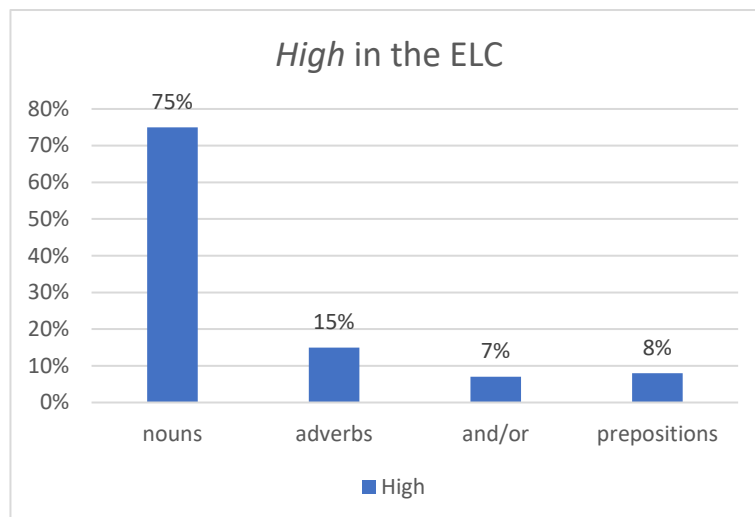


Figure 3. The distribution of lexico-grammatical patterns of *high* in the ELC

High collocates with adverbs as well, and the most frequently used ones are *significantly* (177 occurrences), *much* (81) and *relatively* (76). This is illustrated with the following examples:

- 4 emphasis on the economy was **significantly higher** when he was gaining in the polls, in both the
- 5 efficient in vitro PHA synthesis at **relatively high** temperatures.
- 6 The serum insulin level was **much higher** in HF group mice compared to the LF group

The third construction identified by means of *WordSketch* is *and/or*, which consists of adjectival collocates of the adjective often conjoined by *and* or *or* (Szczygłowska, 2020:54). It is worth adding that adjectival collocates can occur without linking words *and* or *or*. This pattern accounts for 7 % of all structures with *high*. The examples are:

- 7 A species was defined as present between its **highest** and lowest reported elevations (range
- 8 comparison would be to compare lower and **higher** grade assignments to identify changes as
- 9 liquid. This is an aqueous solution of TA and **high** molecular weight PAA.

8% occur in constructions with prepositional complementation. The top prepositional phrase is *high in* (185 occurrences) and is used both in the plain and comparative forms. This is followed by a comparative form *higher + than* (155 occurrences). There are other prepositions used with *high*, but their total number is lower, e.g., *high for* (38 occurrences) and *high on* (18). The instances of *high + preposition* are presented below:

10 3 day old cultures, the chlorophyll content was **higher in** cells from aged
 11 cultures after 14 days of
 12 of clays. Since the stiffness of clays is much **higher than** the epoxy,
 the clays act as stress
 median relative dose intensity was comparably **high for** both treatment
 regimens ; however, the

| verbs before "high" | | | subjects of "be high" | | |
|-----------------------------------|-----|----------|--|----|-----------|
| be | 643 | 9.78 ... | rate | 25 | 10.09 ... |
| was higher | | | rates were higher | | |
| remain | 13 | 8.57 ... | time | 20 | 9.75 ... |
| remained high | | | times higher than that | | |
| become | 8 | 7.67 ... | level | 15 | 9.41 ... |
| the arch rise becomes higher. The | | | levels were significantly higher | | |
| score | 7 | 8.31 ... | temperature | 14 | 9.38 ... |
| score high | | | at temperatures higher than | | |
| have | 4 | 7.24 ... | value | 14 | 9.24 ... |
| have high | | | value was still higher | | |
| | | | group | 12 | 8.96 ... |
| | | | of the BDL group were significantly higher than those of | | |
| | | | concentration | 10 | 8.93 ... |
| | | | concentrations higher | | |
| | | | point | 10 | 8.89 ... |
| | | | points higher than the | | |
| | | | density | 9 | 8.8 ... |
| | | | densities were higher | | |
| | | | m | 8 | 8.47 ... |
| | | | m high | | |
| | | | magnitude | 7 | 8.48 ... |
| | | | one order of magnitude higher than | | |
| | | | patient | 7 | 8.3 ... |

Figure 4. Verb + high pattern in the ELC

The picture of lexico-grammatical structures of *high* must be completed with verb patterns (Fig. 4). Predicative adjectives do not belong to a noun phrase, but their role is to describe it, and it is a separate element in a clause (Karasu, 2020). Predicative adjectives tend to occur as a subject predicative and follow a verb. The structure *verb + high* or *verb + adverb + high* is shown by as many as 708 examples, 14% of all verb patterns in the entire corpus (Fig. 5). The pattern *be + high* heavily outnumbered other verbs, such as *remain + high* (13 occurrences) or *become + high* (8). The above-mentioned structures are presented in the following instances:

13 Eupergit® C 250L **are** significantly **higher** (up to 107 IU g?1 of dry mass of
 14 immobilized
 15 decentralization has **remained high** on the French political agenda
 Closer inspection shows that the value of Q? ? Y;3...10;1...2 **becomes** significantly
higher for real per capita GNP and employment when the extended data set is used

In the case of the attributive position, “an adjective is a part of a noun phrase: precedes and modifies the noun” (Biber et al., 2002:188, quoted in Karasu, 2020). This means that the attributive pattern is more common than the predicative one.

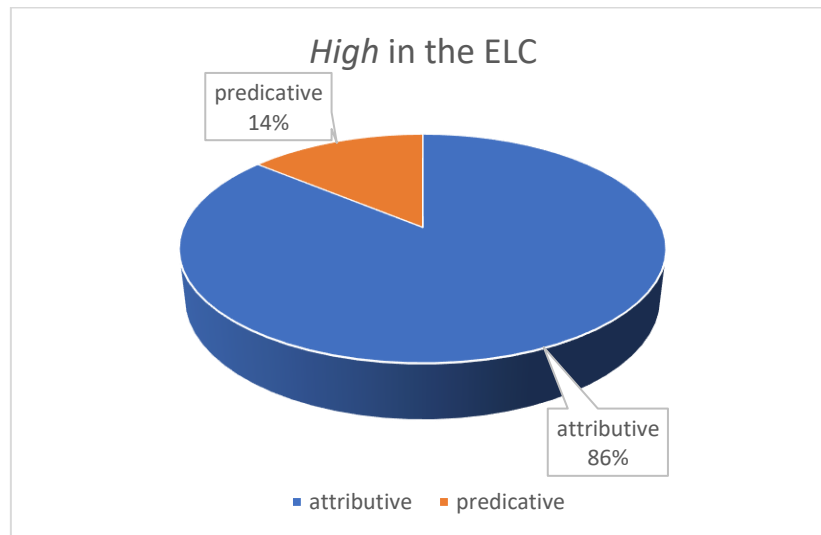


Figure 5. The attributive vs. predicative structure of *high* in the ELC

Table 17 lists the ten most common collocates of *high* that were identified in the 5/5 context, i.e., in the range of 5 lemmas to the left and to the right. A collocate, as explained in SketchEngine’s Glossary, is defined as “a part of a collocation that is not the node; a collocate is dependent on the node” (<https://www.sketchengine.eu/guide/glossary/?letter=C>). A definition of the node, in turn, is “a central word in a collocation” (<https://www.sketchengine.eu/guide/glossary/?letter=N>). In the example *high level*, *high* is the collocate of the node *level* and creates a collocation *high level*. A collocate can directly precede or follow the node, but it does not necessarily have to be clustered to the node. In the example: *at least threefold higher than in minimal medium*, preposition *at* is a collocate of the node *high*, but it does not directly precede *high*, it occurs as the third lemma to the left. The collocates in our analysis are arranged in the decreasing order using *LogDice* index. *SketchEngine LogDice* indicates the level of typicality of a particular collocation, and its base is the frequency of both the node and the collocate as well as the frequency of the entire collocation (<https://www.sketchengine.eu/guide/glossary/?letter=L>). It shows that the most common collocates of *high* are nouns, which are related to research process, e.g., *level*, *rate*, *concentration*, or object under analysis, e.g., *temperature*. As far as other parts of speech are concerned, *significantly* is the most frequent adverbial modifier, and *low* is most frequently used adjective.

| Lemma | Cooccurrences | Candidates | T-score | LogDice |
|---------------|---------------|------------|---------|---------|
| level | 495 | 3,962 | 24.83 | 10.79 |
| rate | 318 | 2,997 | 17.62 | 10.31 |
| significantly | 194 | 1,508 | 13.79 | 9.88 |
| temperature | 200 | 2,379 | 13.93 | 9.75 |
| low | 223 | 3,342 | 14.65 | 9.73 |
| concentration | 184 | 2,042 | 13.37 | 9.69 |
| density | 152 | 1,175 | 12.21 | 9.60 |
| value | 184 | 4,180 | 13.17 | 9.32 |
| have | 491 | 19,919 | 21.01 | 9.32 |
| score | 132 | 1,731 | 11.30 | 9.28 |

Table 17. The ten most common collocates of *high* in the ELC

Table 18 presents 4- and 5-word lexical bundles with *high*. The main difference between collocates and lexical bundles is that the latter are “the most frequently occurring sequences of words” (Biber, 2006:134). The second definition that is worth mentioning is: the multi-word sequences that recur frequently and are distributed widely across different texts” (Biber, 2010:170). As Szajewski (2014:22) stresses, in both definitions, frequency is the crucial factor that characterizes lexical bundles.

Lexical phrases which overlap are underlined. Lexical bundles were analysed in terms of structural types as proposed by Biber et al. (2004), which have been discussed in Chapter 4. As of 4-word bundles, the structural type which prevails over others is *noun phrase with of-phrase* (type 3A according to Biber et al.’s (2004) classification; pmw=27.00). In 5-word group, the most productive is *prepositional phrase* (type 3D, pmw=5.22).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|----------------------------|--------------|--------------------------------------|--------------|
| 1 | <u>a high level of</u> | 34 | with <u>a high degree of</u> | 7 |
| 2 | <u>a high degree of</u> | 25 | species richness at high levels | 6 |
| 3 | with high levels of | 14 | <u>richness at high levels of</u> | 6 |
| 4 | due to the high | 14 | <u>high levels of soil resources</u> | 6 |
| 5 | a high number of | 14 | <u>have a high level of</u> | 6 |
| 6 | <u>at high levels of</u> | 9 | a high position and power | 5 |
| 7 | a high proportion of | 8 | in species richness at high | 5 |
| 8 | that high levels of | 8 | greater in whites with high | 5 |
| 9 | <u>whites with high TS</u> | 7 | <u>in whites with high TS</u> | 5 |
| 10 | a high percentage of | 7 | in blacks with high TS | 5 |

Table 18. The most frequent 4- and 5-word lexical bundles of *high* in the ELC

5.1.2. Different in the ELC

As far as the second top adjective is concerned, it is *different* (freq=1,329.62 pmw). Figure 6 presents that *modifier + noun* is the most frequently used pattern with adjective

different in the ELC, which accounts for 85% of all lexico-grammatical structures. *Different* collocates with adverbs (10% of all structures) as well as *and/or* category (12%, Fig. 7).

different as adjective 4,333× Sorted by frequency

| modifiers of "different" | nouns modified by "different" | "different" and/or ... | prepositional phrases |
|---|---|--|--------------------------------------|
| significantly 135 11.04 ... not significantly different | type 163 10.08 ... different types of | many 30 9.97 ... many different | "different" from ... 107 2.47% ... |
| very 76 10.27 ... very different | level 85 8.58 ... different levels of | developmental 23 10.32 ... at different developmental stages | "different" in ... 34 0.78% ... |
| quite 43 10.65 ... quite different from | way 73 9.06 ... in different ways | linguistic 16 9.38 ... different linguistic | "different" between ... 23 0.53% ... |
| slightly 28 10.2 ... slightly different | condition 59 8.31 ... different conditions | political 15 8.65 ... with different political | "different" for ... 17 0.39% ... |
| completely 14 9.15 ... is completely different | stage 54 8.63 ... different stages of | several 12 8.88 ... several different | "different" to ... 6 0.14% ... |
| somewhat 11 9.15 ... is somewhat different | temperature 52 8.35 ... at different temperatures | initial 11 8.92 ... with different initial | "different" among ... 6 0.14% ... |
| statistically 9 8.4 ... not statistically different | value 48 7.83 ... different values of | functional 9 8.76 ... different functional | "different" on ... 5 0.12% ... |
| not 9 4.19 ... was not different between | kind 43 8.52 ... different kinds of | bacterial 8 8.68 ... different bacterial | "different" with ... 4 0.09% ... |
| rather 8 8.33 ... a rather different | group 43 7.69 ... different groups | experimental 8 8.63 ... two different experimental | "different" across ... 4 0.09% ... |
| entirely 7 8.6 ... entirely different | context 38 8.04 ... in different contexts | electric 6 8.44 ... laminated plate under different electric loads | |
| fundamentally 6 8.66 ... fundamentally different from | aspect 36 8.13 ... different aspects of | molecular 6 8.22 ... different molecular weights of | |
| distinctly 5 8.42 ... distinctly different from | specie 36 7.69 ... different species | geographical 5 8.18 ... in different geographical | |

Figure 6. Lexico-grammatical patterns of *different* in the ELC

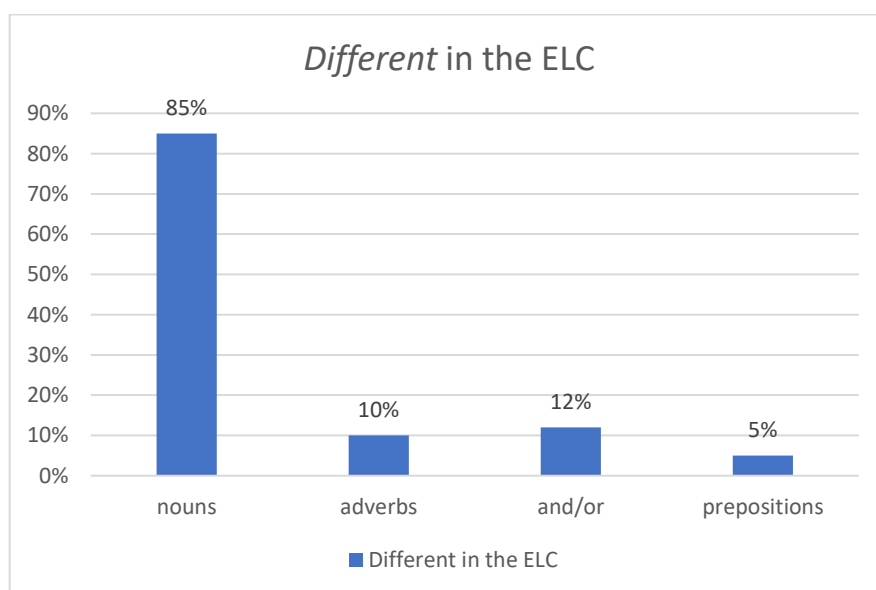


Figure 7. The distribution of lexico-grammatical patterns of *different* in the ELC

The most frequently used nouns include *type* (163 occurrences), *level* (85 occurrences), *way* (73 occurrences), *stage* (54 occurrences), and *kind* (43 occurrences) and the examples include:

- 16 water disinfection research on the **different types** of Fusarium spores to find out whether
- 17 Boxplot diagram of A260/A280 values by **different extraction ways** for all analysed samples. CTAB
- 18 complex ideas in an economical way, to mark **different stages** in their discourse, and to show the

In the ELC, adjective *different* can also be modified by adverbs. The top adverb *significantly* is used 135 times in the corpus, 46 of which function in a phrase *not significantly different*. This is followed by *very* (76) and *quite* (43 occurrences):

- 19 of free 15:0 was the only *significantly different* when the yellow beeswaxes were confronted with
- 20 and the pore sizes of two layers were *quite different*, as mentioned above. Briefly, a solution of LSR
- 21 be effective. If students actually draw on *very different* linguistic resources, different tasks will

Another lexico-grammatical pattern identified in the corpus refers to *and/or*, which accounts for 12% of all structures. The pattern is illustrated with the following instances:

- 22 green plants, under both drought stress and at **different developmental stages**.
- 23 of the given equations. For instance, **different initial guesses** for the parameters will result
- 24 correction, per contra, evolves in accord with **different linguistic aspects**.

One more structure to note is *different + preposition*. It occurs 206 times which is nearly 5 % of all constructions. The examples are:

- 25 in Figure 8. The results obtained were markedly *different from* the maximum productivity results (Figure
- 26 is needed in these settings. This is obviously *different in* multiparty contexts .Yet the government has
- 27 sample curves at discrete points that could be *different for* each sample individual.

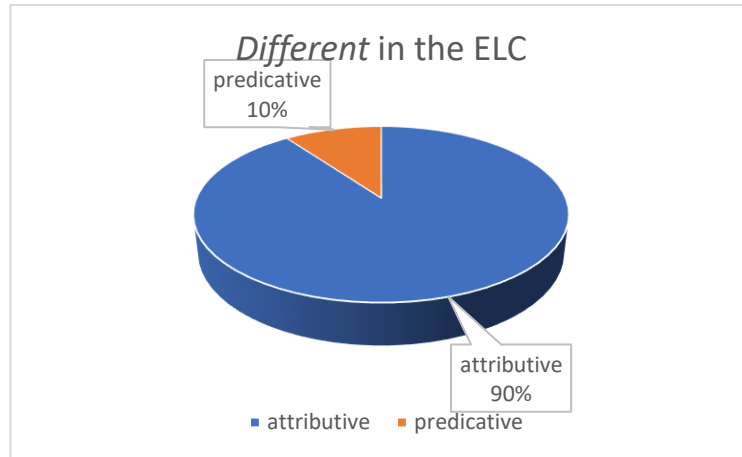


Figure 8. The attributive vs. predicative structure of *different* in the ELC

As can be seen in Fig. 8, *different* is used in the attributive function in the vast majority of cases (90%). The predicative function of *different* is found in only 10 % of examples. If *different* is used in the predicative function, it enters the following patterns: *be different* (385 occurrences), which is followed by two more verbs *look* and *have*, but their total number is of marginal importance, since they occur 6 and 4 times, respectively (Fig. 9). The examples are shown below:

- 28 the outcomes of second HCT after NGF and NNGF **are different** with much worse
 29 outcomes for NGF necessitating
 29 reads [] and, at least at a first glance, it **looks different** from those listed above.
 Nevertheless, it is in
 30 against various substrate structures and **have different** in their modes of action (17, 30).

| verbs complemented by "different" | | | | verbs before "different" | | | |
|-----------------------------------|---|------|-----|--------------------------|-----|------|-----|
| be | 5 | 8.65 | ... | be | 385 | 9.06 | ... |
| be something measurably different | | | | is different | | | |
| | | | | look | 6 | 8.8 | ... |
| | | | | looks different | | | |
| | | | | have | 4 | 7.84 | ... |
| | | | | have different | | | |

Figure 9. Verb + *different* pattern in the ELC

Table 19 summarises the statistics of the ten most common collocates of *different* in the ELC. The majority of collocates are nouns (7 of 10), with *type* used as the most significant noun according to *LogDice* index. The nouns refer to research process, e.g., *type*, *way*, *level*, *value*. Interestingly, *different* is the most common adjectival collocate, e.g., *different storage times at different storage conditions*. As far as adverbial collocates are concerned, *significantly*

collocates most frequently with *different*, e.g., *the 18:2 concentration was significantly different* ($p, 0.05$).

| Lemma | Cooccurrences | Candidates | T-Score | Log Dice |
|---------------|---------------|------------|---------|----------|
| different | 273 | 4,333 | 16.25 | 10.01 |
| type | 195 | 2,124 | 13.80 | 9.95 |
| significantly | 142 | 1,508 | 11.78 | 9.64 |
| way | 94 | 1,791 | 9.50 | 8.97 |
| use | 267 | 14,328 | 15.42 | 8.87 |
| very | 83 | 1,644 | 8.92 | 8.83 |
| level | 113 | 3,926 | 10.42 | 8.81 |
| value | 112 | 4,180 | 10.17 | 8.75 |
| temperature | 88 | 2,379 | 9.11 | 8.75 |
| group | 108 | 4,189 | 9.97 | 8.70 |

Table 19. The ten most common collocates of *different* in the ELC

The lexical bundles that adjective *different* enters are presented in Table 20. With reference to 4-word bundles, the most productive pattern is *prepositional phrase* (type, 3D; pmw=18.65), whereas among 5-word bundles the most frequent is *noun phrase with other post-modifier* (3B; pmw=8.59).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|---|--------------|---|--------------|
| 1 | <u>were not significantly different</u> | 20 | <u>with different cascade heat exchangers</u> | 10 |
| 2 | of different types of | 17 | populations with different stem densities | 8 |
| 3 | was not significantly different | 15 | different from that of the | 8 |
| 4 | different cascade heat exchangers | 14 | scenarios with different design matrices | 5 |
| 5 | at different levels of | 12 | at different distances along a | 5 |
| 6 | at different developmental stages | 12 | Ti samples at different temperatures | 5 |
| 7 | different from that of | 12 | CP Ti samples at different | 5 |
| 8 | not significantly different from | 11 | <u>were not significantly different from</u> | 5 |
| 9 | the effect of different | 10 | at different temperatures such as | 5 |
| 10 | <u>with different cascade heat</u> | 10 | samples at different temperatures such | 5 |

Table 20. The most frequent 4- and 5-word lexical bundles with *different* in the ELC

With regard to gradability of *different* in the ELC, we have seen that it enters the pattern *adverb + different*. It is also found in the predicative structure. The analysis has not revealed any instances of comparative constructions with *different* in the ELC. *Different* is classified as a partially gradable adjective.

5.1.3. Low in the ELC

The third adjective that ranks high in the list of the ten top adjectives is *low* (freq=1,010.18 pmw, Fig. 10).

| modifiers of "low" | | nouns modified by "low" | | "low" and/or ... | | prepositional phrases | |
|---|---------------|-------------------------|---------------|---|--------------|-----------------------|---------------|
| very | 104 10.65 ... | level | 203 10.15 ... | high | 55 11.39 ... | "low" in ... | 107 3.25% ... |
| very low | | lower levels | | low and high | | "low" than ... | 91 2.76% ... |
| significantly | 102 10.55 ... | temperature | 107 9.84 ... | molecular | 17 10.39 ... | "low" for ... | 18 0.55% ... |
| significantly lower than | | low temperatures | | low molecular weight | | "low" on ... | 11 0.33% ... |
| relatively | 70 10.77 ... | rate | 91 8.98 ... | normal | 12 9.7 ... | "low" to ... | 10 0.3% ... |
| relatively low | | low rate | | At low normal stress | | "low" at ... | 7 0.21% ... |
| much | 62 10.46 ... | concentration | 77 9.23 ... | medium | 6 9.27 ... | "low" among ... | 5 0.15% ... |
| much lower than | | low concentration | | low and medium levels of | | "low" as ... | 4 0.12% ... |
| slightly | 21 9.59 ... | value | 61 8.5 ... | intermediate | 6 9.25 ... | "low" with ... | 4 0.12% ... |
| slightly lower than | | low values | | at a low intermediate level of proficiency | | | |
| extremely | 15 9.43 ... | density | 41 8.63 ... | current | 5 8.65 ... | | |
| extremely low | | low density | | low current velocity | | | |
| as | 15 6.51 ... | number | 37 8.22 ... | thermal | 5 8.5 ... | | |
| is as low as | | low number | | of materials with low thermal expansion coefficient | | | |
| even | 12 8.19 ... | score | 32 8.12 ... | economic | 5 7.99 ... | | |
| even lower | | low ACT scores | | periods of low economic growth | | | |
| too | 10 8.53 ... | frequency | 29 8.46 ... | elastic | 4 8.62 ... | | |
| was too low to | | lower frequency | | low elastic modulus | | | |
| generally | 10 8.11 ... | bound | 28 8.53 ... | middle | 4 8.52 ... | | |
| generally low | | lower bounds | | high , middle , and low) to accurately | | | |
| consistently | 9 8.67 ... | cost | 24 8.2 ... | relative | 4 8.49 ... | | |
| were consistently lower in the omalizumab | | low cost | | relative low | | | |
| considerably | 7 8.33 ... | layer | 22 7.87 ... | similar | 4 8.18 ... | | |
| considerably lower | | the lower layer | | low and similar | | | |

Figure 10. Lexico-grammatical patterns of *low* in the ELC

The pattern in which *low* modifies nouns accounts for 70% of all its structures (Fig. 11). The three most frequently used nouns are: *level* (203), *temperature* (107) and *rate* (91), as in:

- 31 with high as well as moderate or **low** infestation **levels** occurring in each of these phenological host categories
- 32 defined as the **lowest temperature** required to kill all microorganisms in the medium in 10 min, is 60 °C
- 33 At the **lowest** shear **rates** tested, a 25-fold difference was found between the flow curves

Well represented is also the pattern *adverb* + *low* (17%), in which the top three adverbs are: *very*, *significantly*, and *relatively*. They are illustrated with the following instances:

- 34 Also the decrease of Mw would be **very low** and linear.
- 35 had **significantly lower** Papp values for the permeability of FDs compared to liquid covered
- 36 The optimal mixture in this study contained a **relatively low** dosage of Celluclast for biomass saccharification in biorefinery process

Similar to *high* and *different*, *low* also enters *and/or* structure, which constitutes 9 % of all structures with *low*. Typical instances are shown below:

- 37 A species was defined as present between its highest and **lowest** report elevations
- 38 Many of the **low** molecular compounds in fermented food are odor and taste-active

39 The **low** current output is similar to the biological current that is naturally found

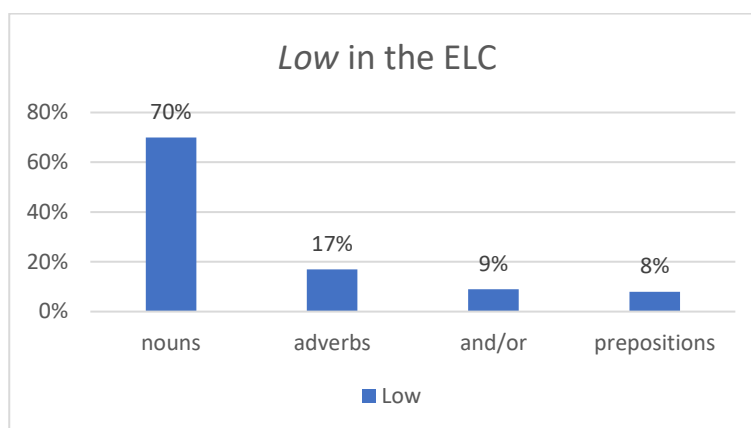


Figure 11. The distribution of lexico-grammatical patterns of *low* in the ELC

One more construction identified by *WordSketch* is *low + preposition*, which represents 8% of all its patterns. It is almost as productive as *and/or* pattern.

- 40 Mean patient age was **lower in** the no-RVT group
- 41 The average G² values were **lower for** all samples cross-linked from proteins purified from lysates.
- 42 Alternatively, quadrant II–high on the behavior control concern and **low on** the solution concern

| Verb | Count | Score |
|-----------------------------------|-------|-------|
| be is lower | 486 | 9.39 |
| have have lower | 6 | 8.16 |
| remain remained relatively low | 6 | 7.72 |
| become becomes lower | 5 | 7.21 |

Figure 12. *Verb + low* pattern in the ELC

As indicated in Fig. 12 above, the most frequent verb with which *low* collocates is *to be*, especially in the comparative construction *is lower* (527 occurrences). Two more verb patterns *have lower* and *remain relatively lower* do occur in the corpus, but only 6 times. As many as 15 % of verb constructions occur in the predicative position, while in the vast majority of cases they occur in the attributive function (Fig. 13). This is similar to the outcome of *high*, discussed in section 5.1.1. The examples are:

- 43 carried out but yield and productivity **were lower** than LHT-13. LHT-10 enzyme produced 2.0?mM
- 44 **had** significantly **lower** both 5-year survival probability and median survival time of 58.4% and 64.8 months, respectively
- 45 the female participation as a percentage has **remained** very **low**

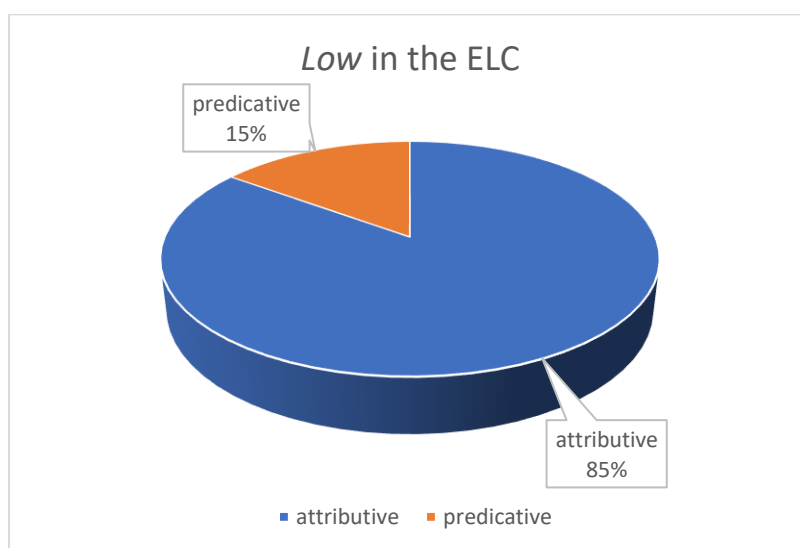


Figure 13. The attributive vs. predicative structure of *low* in the ELC

Table 21 summarises the statistics of the most significant lemmas which collocate with *low* according to *LogDice* index. The preposition *than* seems to be the most significant collocate (10.29). As far as the nouns are concerned, they prevail over other parts of speech, of which the most frequent semantic type refers to research process nouns, e.g., *level*, *rate*, *concentration*. This is similar to the collocates of the two previously discussed adjectives, *high* and *different*. With reference to adjectival collocates of *low*, the most productive is the lemma *high*, e.g., *all factors were varied at three levels (high, middle, and low)*. The most significant adverbial collocate is *very*, e.g., *operate very effectively at low concentrations of substrates*.

| Lemma | Cooccurrences | Candidates | T-score | Log Dice |
|---------------|---------------|------------|---------|----------|
| than | 356 | 6,042 | 18.61 | 10.29 |
| level | 269 | 3,926 | 16.21 | 10.25 |
| temperature | 154 | 2,379 | 12.26 | 9.80 |
| high | 217 | 5,280 | 14.44 | 9.70 |
| rate | 155 | 2,997 | 12.26 | 9.66 |
| very | 115 | 1,644 | 10.60 | 9.58 |
| significantly | 110 | 1,508 | 10.37 | 9.55 |
| concentration | 114 | 2,042 | 10.52 | 9.45 |
| at | 346 | 13,853 | 18.00 | 9.37 |
| relatively | 77 | 753 | 8.71 | 9.28 |

Table 21. The ten most common collocates of *low* in the ELC

Table 22 demonstrates 4- and 5-word lexical bundles of *low*. Here the most common pattern is *prepositional phrase* (type 3D in Biber et al.'s (2004) classification). The frequency

of 4- and 5-word bundles of this type differs from each other and amounts to 15.03 pmw in 4-word bundles, and 5.83 pmw in 5-word bundles.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|---------------------------|--------------|---|--------------|
| 1 | due to the low | 12 | <u>at the low food level</u> | 5 |
| 2 | a low level of | 11 | associated with low ACT scores | 5 |
| 3 | with low levels of | 8 | in the low productivity zone | 4 |
| 4 | at low normal stress | 6 | in the low-gradient watershed groups | 4 |
| 5 | at a very low | 6 | aggregations in the low-productivity zone | 4 |
| 6 | <u>at the low food</u> | 6 | very low birth weight infants | 4 |
| 7 | <u>the low food level</u> | 6 | low birth weight infants born | 3 |
| 8 | low birth weight infants | 5 | for factors associated with low | 3 |
| 9 | <u>due to its low</u> | 5 | <u>due to its low supply</u> | 3 |
| 10 | associated with low ACT | 5 | low supply as well as | 3 |

Table 22. The most frequent 4- and 5-word lexical bundles of *low* in the ELC

5.1.4. Political in the ELC

The fourth most frequently occurring adjective is *political* (freq=824.83 pmw). In the case of lexico-grammatical constructions of *political*, only two seem to be significant: *political* + *noun* and *and/or* pattern (Fig. 14 and 15).

| political as adjective 2,688* | | | Sorted by frequency | | |
|-------------------------------|-----|-------|-------------------------------------|----|-------|
| nouns modified by "political" | | | "political" and/or ... | | |
| party | 183 | 10.63 | social | 40 | 10.14 |
| political parties | | | social and political | | |
| interest | 76 | 9.67 | economic | 38 | 10.22 |
| political interest | | | political and economic | | |
| system | 71 | 8.54 | new | 24 | 9.55 |
| the political system | | | new political | | |
| trust | 64 | 9.61 | domestic | 17 | 9.47 |
| political trust | | | domestic political | | |
| actor | 64 | 9.49 | other | 16 | 8.28 |
| political actors | | | and other political | | |
| elite | 45 | 9.11 | institutional | 15 | 9.13 |
| political elites | | | institutional and political | | |
| economy | 44 | 9.06 | different | 15 | 8.65 |
| political economy | | | with different political | | |
| institution | 39 | 8.76 | administrative | 12 | 9.01 |
| political institutions | | | political and administrative | | |
| authority | 38 | 8.77 | major | 10 | 8.59 |
| political authorities | | | the major political parties | | |
| control | 37 | 8.5 | international | 10 | 8.57 |
| of political control | | | the international political economy | | |
| competition | 29 | 8.4 | american | 10 | 8.57 |
| of political competition | | | of American political | | |
| environment | 28 | 8.14 | specific | 10 | 8.39 |
| the political environment | | | a specific political | | |

Figure 14. Lexico-grammatical patterns of *political* in the ELC

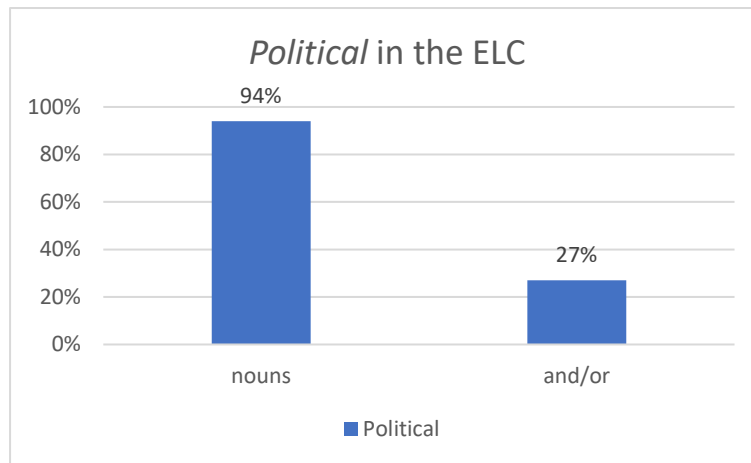


Figure 15. The distribution of lexico-grammatical patterns of *political* in the ELC

In general, the structure *political* + *noun* is found in *POLITICAL SCIENCE* (2,605 occurrences). This pattern comprises 94% of all structures, in which the most frequently used lemmas are: *party* (183 occurrences), *interest* (76), and *trust* (71):

- 46 position and behaviour, regardless of which **political party** has held power in
 47 Canberra. That this has
 48 uninformed voters who know the parties' **political interests** relative to their own
 interests and
 48 direct democratic rights lead to higher **political trust**. More extensive use of these
 rights,

Another structure which *political* enters is *and/or*, which comprises 27% of all structures with this adjective. *Political and economic* as well as *social and political* are the two examples used most frequently in the corpus, 40 and 38 occurrences, respectively. They are followed by *new + political* and *domestic + political*, Examples are as follow:

- 49 as a means to providing access to social, **political and economic** participation
 and community
 50 institutions should be defended, even amid **political or social** costs.
 Acknowledgments Earlier
 51 may result in lower levels of nationalisation through the emergence of **new**
political forces, which we expect to have more heterogeneous electoral support

100% of adjectives are found in the attributive pattern of *political* (Fig. 16).

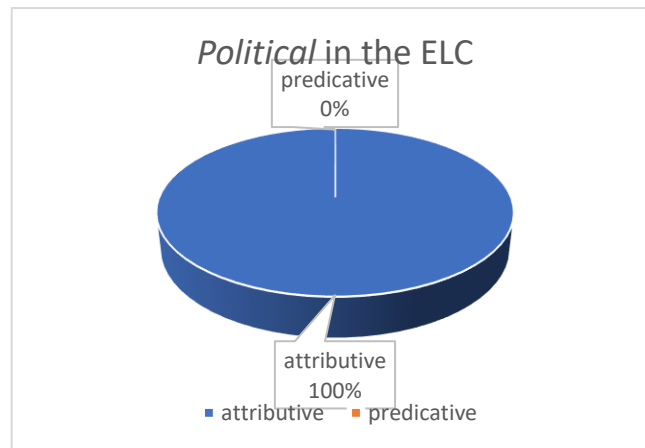


Figure 16. The attributive vs. predicative structure of *political* in the ELC

As far as the ten most common collocates of *political* are concerned, they are listed in Table 23. It presents seven nominal collocates of *political*, which refer to objects under study, e.g., *party*, *actor*, *institution*, and mental issues, e.g., *trust*. Among adjectival collocates the most significant are: *economic*, *political* and *social*. In contrast to the previous adjectives, *political* does not have any adverbial collocates.

| Lemma | Cooccurrences | Candidates | T-Score | Log Dice |
|-------------|---------------|------------|---------|----------|
| party | 261 | 3,360 | 16.02 | 10.45 |
| trust | 89 | 501 | 9.40 | 9.82 |
| interest | 105 | 1,089 | 10.18 | 9.81 |
| actor | 84 | 485 | 9.13 | 9.74 |
| economic | 71 | 877 | 8.36 | 9.33 |
| institution | 64 | 566 | 7.95 | 9.31 |
| elite | 57 | 246 | 7.53 | 9.29 |
| political | 100 | 2,688 | 9.82 | 9.24 |
| social | 64 | 1,245 | 7.90 | 9.04 |
| economy | 47 | 317 | 6.82 | 8.98 |

Table 23. The ten most common collocates of *political* in the ELC

The lexical bundles containing *political* are summarised in Table 24. *Other noun phrase* (type 3C; pmw=7.67) is the most productive among 4-word bundles, and *noun phrase with other post-modifier* (3B, pmw=5.52) outnumbers other types of 5-word lexical bundles.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|---|---|--------------|--|--------------|
| 1 | <u>between political interest and</u> | 12 | <u>direct democracy and political trust</u> | 9 |
| 2 | <u>democracy and political trust</u> | 10 | <u>relationship between political interest and</u> | 7 |
| 3 | <u>of the political system</u> | 9 | <u>the emergence of new political</u> | 6 |
| 4 | <u>levels of political interest</u> | 9 | <u>the relationship between political interest</u> | 6 |
| 5 | <u>levels of political in the political process</u> | 9 | <u>direct democracy on political trust</u> | 5 |
| 6 | <u>direct democracy and political</u> | 9 | <u>of direct democracy on political</u> | 5 |

| | | | | |
|----|---|---|--|---|
| 7 | the relationship between political | 7 | between citizens and political authorities | 5 |
| 8 | attention to political news | 7 | political consequences of party system | 4 |
| 9 | relationship between political interest | 7 | in the political penal-labor camps | 4 |
| 10 | language and political economy | 6 | political news were more likely | 4 |

Table 24. The most frequent 4- and 5-word lexical bundles of *political* in the ELC

On the basis of the analysis presented in this section, we see that *political* occurs neither in the comparative, nor predicative constructions. It is not modified by adverbs. It is used as a non-gradable adjective in the ELC.

5.1.5. Large in the ELC

The fifth adjective in the list is *large* (pmw=738.61). The data presented in Figures 17 and 18 indicate that *large* is a modifier of noun, and this construction amounts nearly to 80% of all constructions with this adjective:

- 52 Too many articles just report a **large number** of experiments
- 53 with a clear increase in body depth and a relatively **larger head size** for perch from Ängersjön
- 54 At the **largest scale** (250 m), broad-leaved and conifer forest coverages and their interaction were the key factors.



Figure 17. Lexico-grammatical patterns of *large* in the ELC

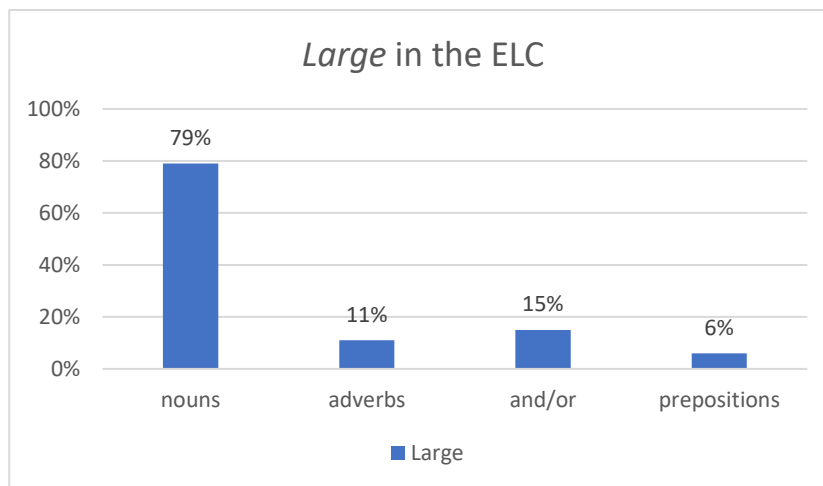


Figure 18. The distribution of lexico-grammatical patterns of *large* in the ELC

As many as 259 tokens occur in patterns in which they collocate with modifiers of degree (11%), of which the three most frequently used are: *very* (38 occurrences), *sufficiently* (37), and *much* (36):

- 55 Although **very large** expansions were observed, the majority of gap
 expansions and formation of random new gaps in our study area
 56 and we will also have 2H/P q for **sufficiently large** q
 57 However, these juveniles were **much larger** than the tautog larvae that we
 investigated (2.3–7.7 mm SL)

Significantly rarer is the structure *and/or*, which is represented by 359 tokens (15%).

- 58 There is a wide variety of **large** wild herbivore species in Gonarezhou, and
 these include buffalo (*Syncerus caffer*)
 59 In our study, the prevalence of Hymenoptera sting reactions, systemic and
large local reactions in adults was found as 9.9%, 1.58% and 8.32%,
 respectively,
 60 Specimens with small and **large** cutouts

The pattern *large + preposition* is less frequent, since it accounts for as many as 132 tokens (5%).

- 61 Only uninjured humpback whitefish **larger than** 360 mm were used for
 tagging because male and female fish are generally
 62 Moreover, this gap was **larger in** EP than national elections.
 63 The local geomembrane strains are believed to be **larger with** a wrinkle
 because of the redistribution of vertical stresses

As shown in Figure 19, a verb that collocates with *large* in the predicative function is *to be* (80%), which heavily outnumbers *become* (6%) and *loom* (4%). As compared to the predicative function (9%), we can see that *large* is mainly used in the attributive pattern (91%). The overall results are presented in Fig. 20.

- 64 The contribution of ammonium N is **larger** than that of nitrate N to soil acidification
- 65 As it becomes **larger**, it erodes the surrounding bone, primarily by a mass compression effect,
- 66 In both of those campaigns war loomed **large** for the American public, and the U.S. would enter the on-going war soon afterwards.

| verbs complemented by "large" | verbs before "large" | subjects of "be large" |
|---|--|--|
| be 5 8.7 ... was 15-fold larger | be 180 8.0 ... is larger | n 7 9.8 ... contribution of ammonium N is larger than that of |
| | become 14 9.2 ... becomes larger | value 6 9.3 ... value is larger |
| | loom 9 10.3 ... looms large | time 6 9.3 ... times larger than that of |
| | | size 5 9.4 ... size is larger than |
| | | group 5 8.9 ... healing in SRM-B group was larger than all the |
| | | regenerator 4 9.4 ... regenerator is too large |
| | | difference 4 8.9 ... difference being relatively large |

Figure 19. Verb + large pattern in the ELC

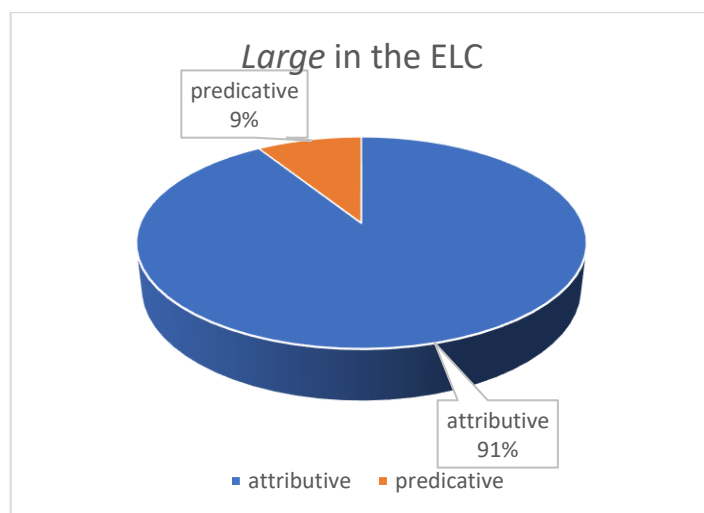


Figure 20. The attributive vs. predicative structure of large in the ELC

Table 25 summarises the most important collocates of *large*, in which we see that nouns outnumber other parts of speech (7 of 10). Nominal collocates are related to research process and tools, e.g., *number*, *size*, *scale*, as well as objects of study, e.g., *herbivore*. We also see one preposition, *than*, e.g., *This value is larger than that inferred from the measured surface area and SEM*, one adjectival collocate, *wild*, e.g., *the most common wild large herbivores*, and one modifier of degree, *sufficiently*, e.g., *the temperature margin was sufficiently large*.

| Lemma | Cooccurrences | Candidates | T-Score | Log Dice |
|--------------|---------------|------------|---------|----------|
| number | 193 | 3,781 | 13.73 | 10.00 |
| than | 194 | 6,042 | 13.67 | 9.56 |
| herbivore | 56 | 146 | 7.47 | 9.56 |
| size | 92 | 2,106 | 9.46 | 9.49 |
| scale | 68 | 962 | 8.18 | 9.38 |
| gap | 49 | 701 | 6.94 | 9.37 |
| juvenile | 40 | 233 | 6.30 | 9.01 |
| sufficiently | 39 | 192 | 6.23 | 8.96 |
| population | 64 | 2,010 | 7.85 | 8.94 |
| wild | 34 | 121 | 5.82 | 8.89 |

Table 25. The ten most common collocates of *large* in the ELC

The lexical bundles with *large* are listed in Table 26. The most frequent type of 4-word lexical bundles is *noun phrase with of-phrase fragment* (type 3A; pmw=27.62), and of 5-word bundle is 3D, *prepositional phrase* (pmw=6.75).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|-----------------------------------|--------------|--|--------------|
| 1 | <u>a large number of</u> | 67 | <u>of a large number of</u> | 11 |
| 2 | <u>large juveniles and adults</u> | 18 | and distribution of wild large | 10 |
| 3 | to a large extent | 16 | <u>distribution of wild large herbivores</u> | 9 |
| 4 | <u>the large number of</u> | 12 | <u>of large juveniles and adults</u> | 9 |
| 5 | <u>of wild large herbiovres</u> | 11 | <u>with a large number of</u> | 6 |
| 6 | <u>of a large number</u> | 11 | large herbivore densities and distribution | 6 |
| 7 | distribution of a wild large | 11 | large juvenile and adult <i>Pristis</i> | 5 |
| 8 | <u>of large juveniles and</u> | 9 | systemic and large local reactions | 5 |
| 9 | large juvenile and adult | 9 | <u>of large juvenile and adult</u> | 5 |
| 10 | for all large n | 8 | a large influence on the | 4 |

Table 26. The most frequent 4- and 5-word lexical bundles of *large* in the ELC

5.1.6. Same in the ELC

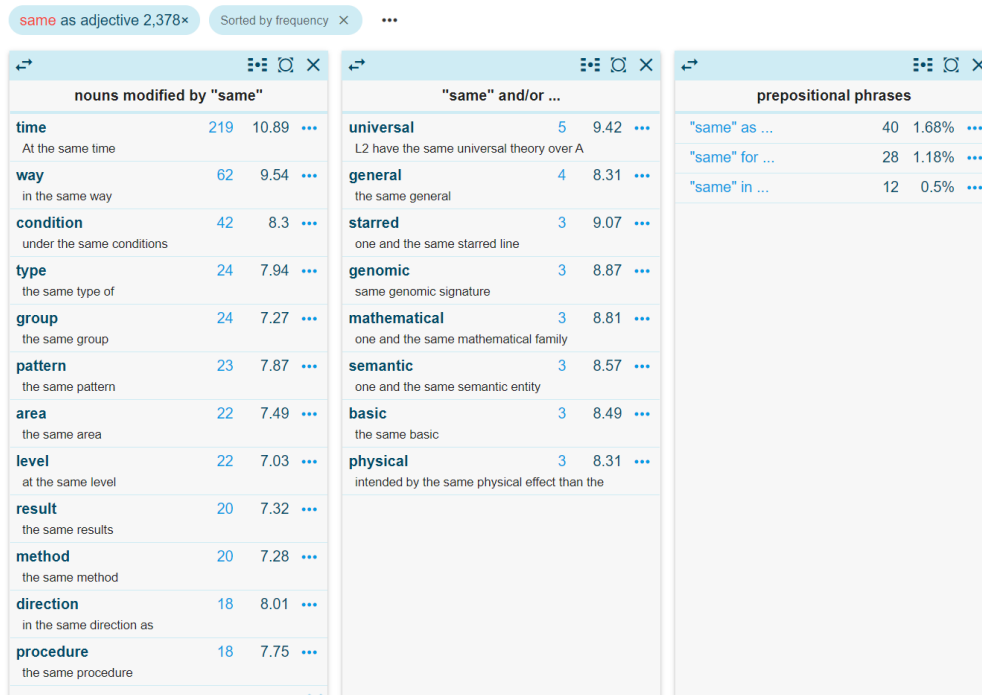


Figure 21. Lexico-grammatical patterns of *same* in the ELC

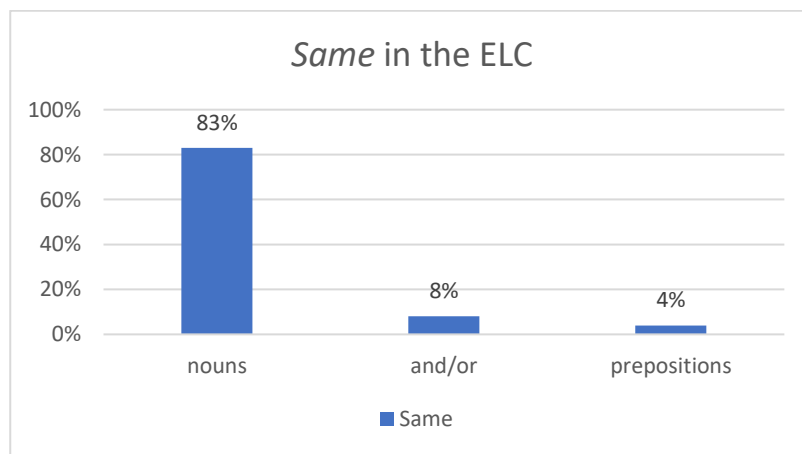


Figure 22. The distribution of lexicogrammatical patterns of *same* in the ELC

Same is the sixth adjective to be discussed in this chapter. Its frequency in the entire corpus is 729.71 pmw (Fig. 21). The first pattern highlighted by means of *WordSketch* is *same* + *noun*, which comprises 83% of all structures with *same* (Fig. 22). Interestingly, *same* tends to be used in 4-word lexical bundles, e.g., *at the same time*, *in the same way*, and *under the same conditions*, which comprise nearly 20%.

67 **At the same time**, 24 also depicted over its eight seasons seven presidents and their administrations

- 68 The produced biomass can be dried **in the same way** as the animal feed products produced by the dry mill ethanol facilities, commonly known as DDGS
- 69 However, these **same conditions** may produce molecular degradation reactions generating lower molecular weight compounds

The second construction is *and/or*, which accounts for 8% of all structures with *same*.

It can be illustrated with the following examples:

- 70 then they have the **same** universal theory over A as Lie-differential fields
- 71 How can we make sense of the multiplicity of proofs of the **same** mathematical fact and the general feeling among mathematicians
- 72 Thus, when Suchman remarks that "even those occupying the **same** physical space, insofar as their orientations are different

With regard to prepositional phrases, 3 patterns are predominant: *same as* (40 occurrences), *same for* (28 occurrences) and *same in* (12 occurrences). They constitute 4% of all patterns with this adjective, as in:

- 73 was observed at 20 L min⁻¹, which was the **same as** the catalyst lost during the treatment (Fig.
- 74 maintenance cost). Initial size (S₀) was the **same for** all species (although we relax this
- 75 as conservatives, and Republicans may do the **same in** these states. Correlation statistics

Only three instances of the predicative use of *same* have been found in the ELC. They represent less than 1% of all constructions with this adjective (Fig. 23).

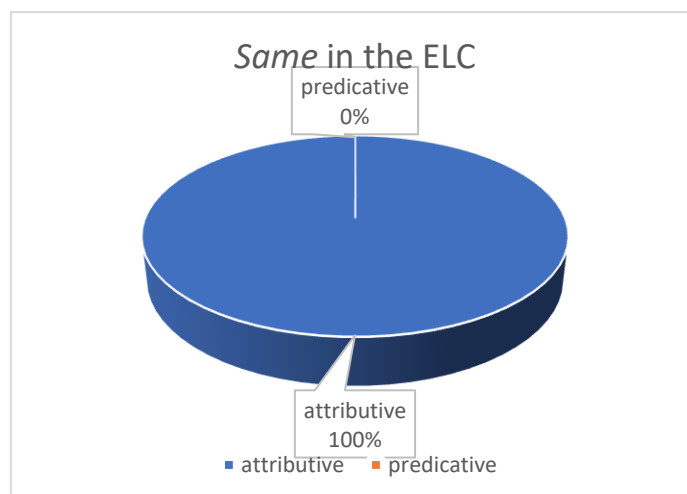


Figure 23. The attributive vs. predicative structure of *same* in the ELC

| Lemma | Cooccurrences | Candidates | T-Score | Log Dice |
|-------|---------------|------------|---------|----------|
| time | 254 | 4,676 | 15.77 | 10.20 |
| at | 349 | 13,853 | 18.25 | 9.46 |

| | | | | |
|-----------|-----|--------|-------|------|
| way | 66 | 1,791 | 8.00 | 9.02 |
| as | 421 | 26,057 | 19.78 | 8.92 |
| condition | 63 | 2,782 | 7.73 | 8.64 |
| under | 47 | 2,229 | 6.67 | 8.38 |
| within | 49 | 2,443 | 6.80 | 8.38 |
| share | 29 | 554 | 5.33 | 8.34 |
| exactly | 25 | 211 | 4.98 | 8.31 |
| use | 154 | 14,328 | 11.74 | 8.24 |

Table 27. The ten most common collocates of *same* in the ELC

Table 27 shows the ten most common collocates of *same*, in which we can see three nouns: *time*, *way* and *condition*, which belong to research process lexis. Of these, the most significant, according to *LogDice* parameter, is *time* (10.20). With regard to prepositions, they comprise the most numerous group of parts of speech: *at*, *as*, *under* and *within*. As far as verbs are concerned, *same* collocates with *share* and *use*. Among the ten collocates, we can notice the adverb *exactly*, e.g., *Exactly the same result was found for 0+ perch*.

Table 28 (below) provides lexical bundles with adjective *same*. The most common structural type of both 4- and 5-word lexical bundles is *prepositional phrase* (type 3D), which amounts to 87.76 pmw for 4-word grams, and 18.10 pmw for 5-word bundles.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--------------------------|--------------|-------------------------------|--------------|
| 1 | <u>at the same time</u> | 113 | <u>while at the same time</u> | 17 |
| 2 | <u>At the same time</u> | 99 | the same as that of | 15 |
| 3 | <u>in the same way</u> | 43 | <u>is the same as the</u> | 11 |
| 4 | <u>is the same as</u> | 33 | <u>in the same way as</u> | 11 |
| 5 | <u>the same as the</u> | 30 | and at the same time | 10 |
| 6 | <u>the same as that</u> | 23 | but at the same time | 8 |
| 7 | <u>while at the same</u> | 18 | <u>at the same time as</u> | 7 |
| 8 | same as that of | 16 | <u>is the same as that</u> | 7 |
| 9 | are the same as | 14 | the same as in the | 6 |
| 10 | in the same direction | 13 | in the same way that | 6 |

Table 28. The most frequent 4- and 5-word lexical bundles of *same* in the ELC

As the analysis shows, *same* is used as a non-gradable adjective in the ELC, since it is not modified by adverbs and *very* and does not occur in comparative structures.

5.1.7. Significant in the ELC

| modifiers of "significant" | | nouns modified by "significant" | | "significant" and/or ... | | prepositional phrases | |
|--------------------------------|---------------|-----------------------------------|---------------|--|--------------|--------------------------|--------------|
| statistically | 341 13.55 ... | difference | 464 12.15 ... | positive | 32 10.71 ... | "significant" in ... | 36 1.54% ... |
| statistically significant | | significant difference | | a significant positive | | "significant" at ... | 34 1.45% ... |
| not | 61 6.94 ... | effect | 150 10.19 ... | negative | 17 10.08 ... | "significant" for ... | 24 1.02% ... |
| was not significant | | a significant effect | | a significant negative | | "significant" as ... | 5 0.21% ... |
| highly | 20 9.07 ... | increase | 54 9.37 ... | main | 16 10.43 ... | "significant" to ... | 4 0.17% ... |
| highly significant | | a significant increase in | | significant main effect of discipline | | "significant" with ... | 4 0.17% ... |
| also | 11 5.51 ... | improvement | 50 9.71 ... | only | 8 9.23 ... | "significant" on ... | 4 0.17% ... |
| also significant (Table | | significant improvement in | | The only significant | | "significant" across ... | 4 0.17% ... |
| only | 10 6.82 ... | correlation | 49 9.58 ... | strong | 8 9.12 ... | "significant" if ... | 4 0.17% ... |
| only significant for | | significant correlation between | | strong and significant | | | |
| marginally | 6 8.52 ... | change | 47 8.84 ... | other | 8 7.69 ... | | |
| is only marginally significant | | significant change in | | or other significant | | | |
| still | 5 6.83 ... | relationship | 43 9.16 ... | moderate | 4 8.69 ... | | |
| still significant | | significant relationship | | a significant and moderate correlation between | | | |
| very | 5 6.3 ... | interaction | 42 9.15 ... | economic | 4 7.7 ... | | |
| very significant | | a significant interaction between | | significant economic | | | |
| quite | 4 7.14 ... | predictor | 38 9.33 ... | | | | |
| quite significant | | was a significant predictor of | | | | | |
| as | 4 4.61 ... | impact | 35 9 ... | | | | |
| show up as significant in | | a significant impact on | | | | | |
| | | role | 31 8.66 ... | | | | |
| | | a significant role in | | | | | |
| | | decrease | 30 8.87 ... | | | | |
| | | a significant decrease in | | | | | |

Figure 24. Lexico-grammatical patterns of *significant* in the ELC

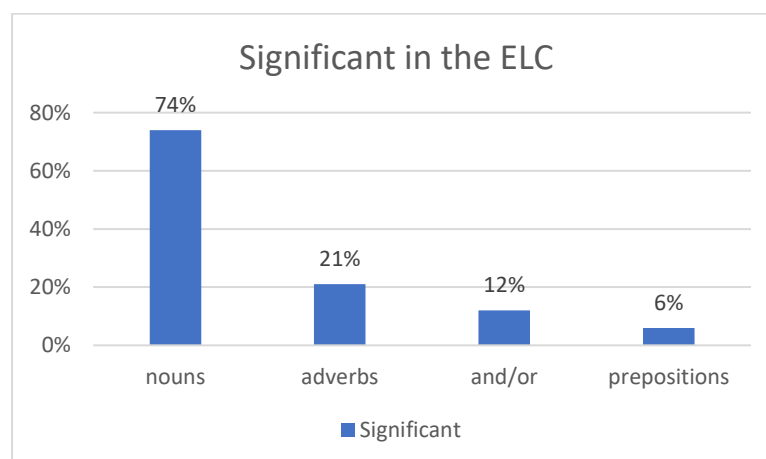


Figure 25. The distribution of lexico-grammatical patterns of *significant* in the ELC

Significant ranks seventh in the list of the top adjectives, with the frequency of 719.58 pmw (Fig. 24). Similar to *high*, *different*, and *low*, *significant* collocates mainly with nouns, but we also find *and/or* structures as well as adverbs of degree.

Out of 2,345 tokens, as many as 1,743 occur in constructions with *significant* + *noun*, which accounts for 74 % of all lexico-grammatical structures with this adjective (Fig. 25).

- 76 the results of the present work showed that there was no **significant difference**
- 77 in proamarant in accumulation between both *Pichia* strains
- 77 Polyethylene glycol (PEG) and lactose were shown to have **significant effects**
- 78 on maintaining protein stability at the screening stage and optimization
- 78 The other surface texture parameters behaved similarly with a **significant increase**
- 78 of R_{max} from 2.36 to 2.7.

467 tokens are modified by adverbs of degree, which stands for 21% of all structures here:

- 79 relative to pFR3, but not in a statistically **significant** manner ($p = 0.105$ and $p = 0.315$ at 24 and 48 h).
- 80 polarization on voting turnout are highly **significant** on voting turnout and activism beyond voting.⁵
- 81 The professionals' attitude towards the linguistic code is also **significant**

The third lexical pattern which *significant* follows is *and/or*, represented by 271 tokens (12%).

- 82 Correlational data In this study, there were **significant positive** correlations between n human scorers
- 83 independent variables are now **positive and significant**.
- 84 or adsorption onto microparticulates confers a **significant adjuvant effect**

The pattern *significant + preposition* comprises 6% of all its structures, and is represented with the following examples:

- 85 Moreover, the direct democracy variables remain **significant in** Models4 and 5 even after controlling for contextual characteristics of cantons.
- 86 Very **significant for** this particular conceptualization are those verbs which carry both "in" and "out" at the same time like: [] As shown
- 87 Day-night difference in diastolic BP ? 2.9% ($p = 0.089$) was borderline **significant as** an independent predictor for new-onset DM

| verbs before "significant" | | | subjects of "be significant" | | |
|--|-----|-----------|--|----|-----------|
| be | 358 | 8.96 ... | difference | 38 | 11.67 ... |
| was significant | | | difference was not statistically significant | | |
| consider | 39 | 10.97 ... | effect | 11 | 9.83 ... |
| considered statistically significant | | | effects are significant | | |
| become | 9 | 8.19 ... | relationship | 10 | 9.96 ... |
| becomes significant | | | relationship was significant | | |
| remain | 7 | 8.1 ... | model | 10 | 9.75 ... |
| remained significant | | | model was significant | | |
| indicate | 4 | 8.22 ... | group | 9 | 9.37 ... |
| upper case letters indicate significant. (P | | | for both groups was significant (P | | |
| | | | variable | 6 | 9.07 ... |
| | | | variable was significant | | |
| | | | particularism | 4 | 8.84 ... |
| | | | and particularism is statistically significant | | |

Figure 26. Verb + *significant* pattern in the ELC

Figure 26 lists verbs that occur before *significant*, when the adjective is used in its predicative function of this adjective. The main verb is *to be*, which is followed by *consider*

and *become*. The predicative function of *significant* accounts for 19% of all patterns here, while the attributive function reaches the level of 81%. The results are illustrated in Figure 27.



Figure 27. The attributive vs. predicative structure of *significant* in the ELC

| Lemma | Cooccurrences | Candidates | T-Score | Log Dice |
|---------------|---------------|------------|---------|----------|
| statistically | 343 | 440 | 18.51 | 11.98 |
| difference | 532 | 2,882 | 22.99 | 11.70 |
| no | 339 | 3,387 | 18.31 | 10.92 |
| there | 277 | 4,629 | 16.48 | 10.35 |
| between | 280 | 6,846 | 16.50 | 9.96 |
| effect | 194 | 4,189 | 13.76 | 9.93 |
| find | 134 | 3,452 | 11.41 | 9.57 |
| interaction | 74 | 1,296 | 8.52 | 9.38 |
| correlation | 61 | 699 | 7.76 | 9.36 |
| improvement | 52 | 398 | 7.18 | 9.28 |

Table 29. The ten most common collocates of *significant* in the ELC

As illustrated in Table 29, the ten most significant collocates of *significant* include one adverb (*statistically*), five nouns (*difference*, *effect*, *interaction*, *correlation*, *improvement*), one negation (*no*), one pronoun (*there*), one preposition (*between*) and one verb (*find*). *Statistically* is the most significant collocate (*LogDice*=11.98). The collocation *statistically significant* is used in analysing the results of the study, and as the instances of Concordances in the ELC show, it refers to, e.g., *manner*, *data*, *effect*, or *difference*. With regard to the nominal collocates, they are related to research processes, e.g., *effect*, *correlation*, *interaction*.

Significant is also found in 4- and 5-word lexical bundles, which are shown in Table 30. The most productive type of 4- bundles is *noun phrase with other post-modifier* (type 3B,

pmw=44.80). *Pronoun + verb phrase* (type 1B; pmw=19.94) occurs most frequently among 5-word bundles.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--------------------------------------|--------------|--|--------------|
| 1 | <u>was no significant difference</u> | 41 | <u>there was no significant difference</u> | 26 |
| 2 | <u>no significant difference in</u> | 37 | <u>was no significant difference in</u> | 22 |
| 3 | <u>there was no significant</u> | 35 | <u>There was no significant difference</u> | 15 |
| 4 | there was a significant | 31 | no significant difference between the | 13 |
| 5 | significant difference between the | 30 | a significant effect on the | 13 |
| 6 | a significant increase in | 27 | was no significant difference between | 13 |
| 7 | significant difference in the | 27 | was a significant predictor of | 12 |
| 8 | significant effect on the | 25 | <u>no significant difference in the</u> | 12 |
| 9 | were no significant differences | 24 | There were no significant differences | 12 |
| 10 | <u>There was no significant</u> | 24 | there were no significant differences | 12 |

Table 30. The most frequent 4- and 5-word lexical bundles of *significant* in the ELC

As regards the gradability of *significant*, it can be seen that it can freely occur in the pattern: *adverb + significant*. *Significant* is also found in comparative structures, e.g., *The low values of P of less than 0.05 point to a more significant correlation of the coefficients.* *Significant* is a gradable adjective in the ELC.

5.1.8. *Important* in the ELC

As shown in Figure 28, *important* is another top adjective in the list, with 2,065 occurrences (pmw=663.66). Almost 60% of the occurrences are within structures in which *important* modifies nouns, followed by patterns with prepositions (13%), degree adverbs (13%), and *and/or* construction (12%), all presented in Fig. 28 and 29.

| modifiers of "important" | nouns modified by "important" | "important" and/or ... | prepositional phrases |
|--|---|--|-------------------------------------|
| very is very important 49 9.77 ... | role an important role in 124 11.01 ... | other and other important 17 8.81 ... | "important" for ... 104 5.04% ... |
| also is also important to 38 7.34 ... | factor an important factor 83 9.85 ... | explanatory important explanatory variables 11 10.26 ... | "important" in ... 63 3.05% ... |
| particularly is particularly important 33 10.7 ... | issue important issue in 30 8.93 ... | several in several important 10 9.24 ... | "important" to ... 27 1.31% ... |
| especially is especially important 17 10.04 ... | aspect important aspect of 29 9.14 ... | second The second important 6 8.52 ... | "important" as ... 19 0.92% ... |
| as as important as 16 6.68 ... | variable important explanatory variables 25 8.16 ... | single is the single most important 5 8.52 ... | "important" than ... 19 0.92% ... |
| equally Equally important 14 9.97 ... | question important question 23 8.53 ... | many that many important 5 7.89 ... | "important" because ... 7 0.34% ... |
| extremely is extremely important 12 9.84 ... | component an important component of 22 8.44 ... | ecological an important ecological 4 8.69 ... | "important" if ... 4 0.19% ... |
| increasingly an increasingly important role 7 8.67 ... | difference important differences between 21 7.93 ... | environmental important environmental weeds 4 8.35 ... | |
| not is not important 7 3.84 ... | implication have important implications for 20 8.87 ... | | |
| critically is critically important 4 8.68 ... | step is an important step 18 8.32 ... | | |
| potentially potentially important 4 7.94 ... | part is an important part of 18 8.24 ... | | |
| | source most important source of 17 8.18 ... | | |

Figure 28. Lexico-grammatical patterns of *important* in the ELC

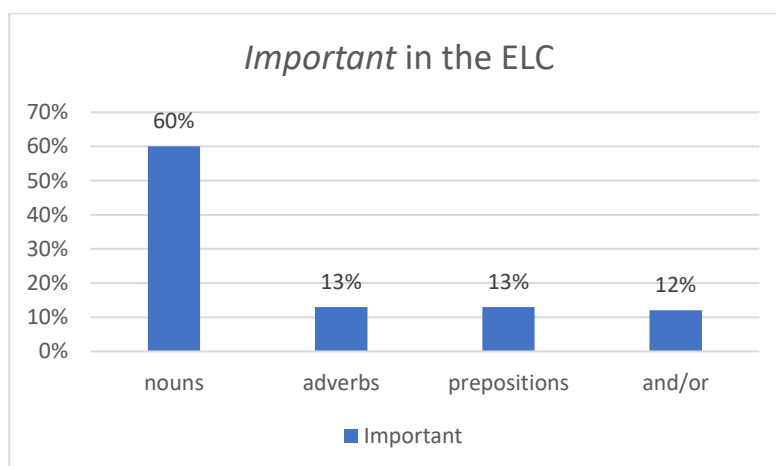


Figure 29. The distribution of lexico-grammatical patterns of *important* in the ELC

Among the nominal collocates, *role* is most frequently used in the corpus (124 occurrences). This is followed by *factor* (83), and *aspect* (29). The lexico-grammatical patterns of these nouns are presented below:

- 88 factors. Sulfate reducing bacteria (SRB) play **important roles** in the treatment of sulfate-enriched
- 89 overall loss of juvenile salmon habitats as an **important factor** of disturbance on a large global scale
- 90 did not supply any shear resistance. Another **important aspect** of Maubeuge and Ehrenbergs research

As far as degree adverbs are concerned (13%), they are represented with the following instances:

- 91 we illustrate this procedure through a very **important** example arising in
 biochemistry
- 92 Spatial structures, such as habitat size and connectivity, are particularly **important**
 in river and freshwater networks because such ecosystems are highly vulnerable to
 human activities.
- 93 Equally **important** areas which need thought when designing FRP-prestressed
 concrete anchorage

263 tokens (13%) occur in constructions in which they are modified by
 prepositions:

- 94 An understanding of the salience of left–right appeals, however, is **important** for
 several reasons.
- 95 Therefore, what a person wears is **important** in terms of reducing the amount and
 type of weed seeds that can attach and be dispersed
- 96 Therefore, it is in Kalinzu Forest Reserve that two keystone fruit genera **important**
 to chimpanzee coexist,

Another category, which is *and/or*, is represented by 244 tokens (12%). The examples
 are:

- 97 There are other equally **important** questions to ask: for example, how do students
 perform the kinds of linguistic and authorial intertextual
- 98 The three most **important** explanatory variables were temperature, in-stream
 vegetation cover and size of stream-bed material.
- 99 Decapod species play an **important** ecological trophic role in megabenthic
 ecosystems

Also worth noting is the distribution of the attributive and predicative patterns of
important, in which the former amounts to 67%, and the latter 33% (Fig. 30 and 31). The
 predicative use is illustrated below:

- 100 the tree-row management factor **was more important** than the type of fertilizer
 applied (Tables 3
- 101 As a result, the remaining non-crop biotopes in farmland **are becoming more**
important as a habitat for a wide variety of biota.
- 102 Tests Given the incremental nature of vocabulary learning, it **was considered**
important to measure learning gains at different levels of sensitivity.

| verbs before "important" | | | | subjects of "be important" | | | |
|--------------------------|-----|------|-----|---|----|------|-----|
| be | 628 | 9.75 | ... | factor | 10 | 9.59 | ... |
| is important to | | | | factors are important | | | |
| become | 24 | 9.28 | ... | finding | 5 | 8.85 | ... |
| become important | | | | these findings are important because they suggest | | | |
| consider | 15 | 9.1 | ... | condition | 5 | 8.74 | ... |
| considered important | | | | conditions is very important | | | |
| | | | | writing | 4 | 8.71 | ... |
| | | | | writing is important | | | |
| | | | | feature | 4 | 8.63 | ... |
| | | | | features are important | | | |
| | | | | variable | 4 | 8.46 | ... |
| | | | | variables were most important | | | |

Figure 30. Verb + important pattern in the ELC

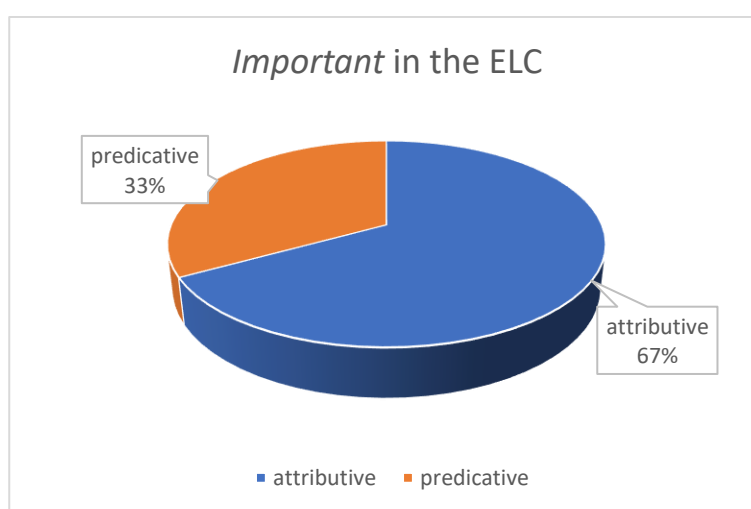


Figure 31. The attributive vs. predicative structure of *important* in the ELC

It may be of interest to see that as many as 228 tokens include a 5-word lexical bundle *it is important to + infinitive*. The examples are:

- 103 **It is important to note** that this study did not directly investigate the extent to which the group oral provided a valid estimate of test
- 104 **it is important to understand** how these character evaluations of the president vary over time
- 105 **It is important to emphasize** that the partisan make-up of the cantonal governments remained

Table 31 indicates the most significant collocates of *important*, among which we can find 5 verbs, 3 nouns, and 2 modifiers of degree. *Play* is the most significant collocate, as *LogDice* index provides (10.29). The collocation: *play an important role* is also a lexical bundle which draws the reader's attention to the importance of particular object or phenomenon. As far as the semantics of the nominal collocates is concerned, the nouns: *role*, *factor* and *aspect*

refer to research process. The adverb *very* (8.90) is more significant than *particularly* (8.71) according to *LogDice* parameter.

| Lemma | Cooccurrences | Candidates | T-Score | Log Dice |
|--------------|---------------|------------|---------|----------|
| play | 220 | 666 | 10.17 | 10.29 |
| role | 104 | 1,572 | 11.51 | 10.24 |
| factor | 107 | 2,117 | 10.24 | 9.71 |
| note | 52 | 1,432 | 7.11 | 8.93 |
| become | 51 | 1,367 | 7.05 | 8.93 |
| very | 54 | 1,644 | 7.24 | 8.90 |
| aspect | 37 | 700 | 6.02 | 8.78 |
| consider | 63 | 2,649 | 7.77 | 8.77 |
| particularly | 35 | 673 | 5.86 | 8.71 |
| understand | 35 | 797 | 5.85 | 8.65 |

Table 31. The ten most common collocates of *important* in the ELC

With regard to the lexical bundles with *important* (Table 32) the most frequent structural types of 4- and 5-word lexical bundles are verb phrases (1B, pmw=44.49 and 1D, pmw=21.17).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--------------------------------|--------------|-----------------------------------|--------------|
| 1 | <u>it is important to</u> | 86 | play an important role in | 31 |
| 2 | an important role in | 65 | <u>is important to note that</u> | 31 |
| 3 | <u>It is important to</u> | 59 | <u>one of the most important</u> | 25 |
| 4 | play an important role | 44 | <u>It is important to note</u> | 25 |
| 5 | <u>is important to note</u> | 39 | <u>plays an important role in</u> | 23 |
| 6 | <u>of the most important</u> | 34 | an important role in the | 22 |
| 7 | <u>important to note that</u> | 33 | <u>it is important to note</u> | 14 |
| 8 | <u>plays an important role</u> | 29 | to be the most important | 8 |
| 9 | important role in the | 25 | important to note that the | 7 |
| 10 | an important part of | 15 | it is also important to | 7 |

Table 32. The most frequent 4- and 5-word lexical bundles of *important* in the ELC

As the analysis of *important* in the ELC reveals, this adjective is gradable, since it is premodified by adverbs and occurs both in the comparative and predicative constructions.

5.1.9. *Small* in the ELC

Small (1,967 occurrences, pmw=603.59) is the ninth adjective to analyse in this chapter. It is clear from Fig. 32 that the main function of *small* is modifying nouns, which accounts for nearly 70% of all structures. Most frequently used nouns accompanied by *small* are: *number* (80 occurrences), *size* (67) and *amount* (60):

- 106 he following **small number** of spectra can make a classification prone for high error rates
- 107 whereas others stayed in **small tributaries** and matured at a smaller size, a phenomenon known as partial migration

108 On the other hand, this fungus accumulates a **small amount** of eicosapentaenoic acid

| modifiers of "small" | nouns modified by "small" | "small" and/or ... | prepositional phrases |
|--|---|--|-------------------------------------|
| relatively (67, 10.95%) a relatively small | number (80, 9.7%) a small number of | large (15, 9.69%) small and large | "small" than ... (47, 2.39%) |
| very (67, 10.16%) a very small | size (67, 9.49%) small sample size | small (10, 9.45%) very small and small P. pectinata | "small" in ... (20, 1.02%) |
| sufficiently (47, 11.45%) sufficiently small | amount (60, 9.99%) a small amount of | many (7, 8.4%) many small | "small" for ... (12, 0.61%) |
| much (29, 9.58%) much smaller than the | population (36, 8.86%) small populations | other (6, 7.31%) and other small | "small" to ... (6, 0.31%) |
| too (18, 9.76%) too small to | state (29, 8.61%) small states | only (5, 8.68%) only small amounts of | "small" of ... (5, 0.25%) |
| arbitrarily (10, 9.69%) an arbitrarily small | scale (27, 8.68%) smaller scales | peripheral (4, 8.9%) small peripheral | "small" as ... (4, 0.2%) |
| even (10, 8.16%) even smaller | group (26, 7.57%) small group of | residual (4, 8.84%) had persistent small residual shunt during follow-up | |
| rather (7, 8.31%) is rather small | value (25, 7.48%) small values | few (4, 8.3%) few small | |
| significantly (7, 6.83%) significantly smaller absolute angle errors | mammal (23, 9.05%) of small mammals | positive (4, 7.79%) small positive | |
| extremely (5, 8.34%) extremely small | proportion (19, 8.6%) a small proportion of | big (3, 8.62%) moving force is smaller or bigger than the | |
| slightly (5, 7.9%) is slightly smaller | difference (18, 7.63%) small differences | isolated (3, 8.55%) small isolated | |

Figure 32. Lexico-grammatical patterns of *small* in the ELC

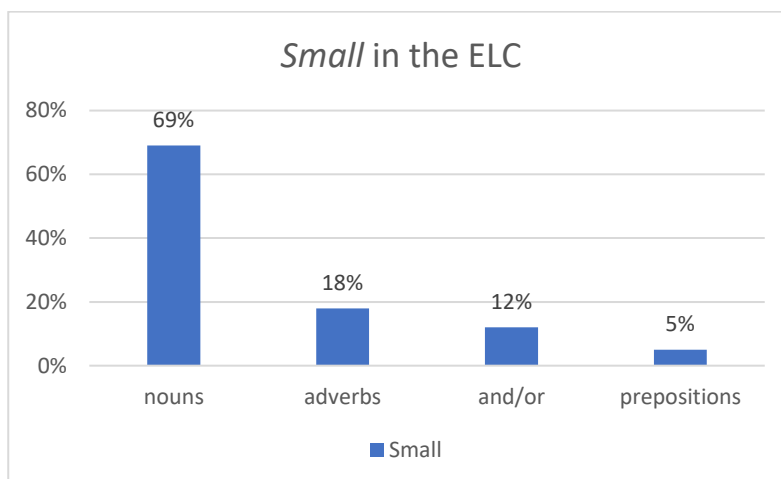


Figure 33. The distribution of lexicogrammatical patterns of *small* in the ELC

With regard to structures *modifier of degree + small* as well as *and/or*, they are much less numerous than the previous one, since they account for 18% and 12%, respectively (Fig. 33). The top-frequency adverbs are *relatively* (67 occurrences), *very* (67) and *sufficiently* (47), and are represented with the following examples:

- 109 Hainan faced a **relativelysmall** pressure on environment caused by emissions from tourism.
- 110 As the time of induction heating is **very small** (less than 2.5 min) compared to the total time when the temperature of the sample is above Tnewt (can be more than 500 min).
- 111 To do so, we show that for all $u \in S_n$ and all sufficiently small $\epsilon > 0$, $[\text{As } \text{int}(K)$, the interior of K , there exists $x > 0$ such that for all **sufficiently small** $[\]$.

Small has been found in *and/or* pattern as well. The top-frequency collocates are *large*, *small* and *many*:

- 112 However mining companies, **large and small**, objected to the tax's size and design, and demanded fuller consultation.
- 113 The majority of **very small and small** juvenile *P. pectinata* were encountered in shallow coastal habitats, while large juveniles and adults tended to be
- 114 It is possible that **many small** populations exchange individuals with neighbouring small populations, collectively acting as population

Small also collocates with prepositions, but this construction is less frequently found (5%) in the corpus:

- 115 a bestworst choice experiment which is smaller than the Db-error of the orthogonal design
- 116 when predicting approval of the president, but the effect was still relatively small in comparison to respondent partisanship.
- 117 Members of *Plesionika* are small to intermediate sized shrimps (6–29 mm carapace length) with a benthic or nektob

| verbs complemented by "small" | | | |
|-------------------------------|---|------|-----|
| have | 3 | 9.97 | ... |
| had a value smaller | | | |

| verbs before "small" | | | |
|---------------------------------------|-----|------|-----|
| be | 256 | 8.48 | ... |
| is smaller | | | |
| become | 9 | 8.41 | ... |
| becomes smaller | | | |
| take | 5 | 9.04 | ... |
| Lemma 4.4 is taken sufficiently small | | | |
| choose | 3 | 8.33 | ... |
| chosen sufficiently small | | | |
| make | 3 | 7.76 | ... |
| made as small | | | |

| subjects of "be small" | | | |
|---|----|-------|-----|
| size | 12 | 10.35 | ... |
| size smaller | | | |
| length | 8 | 9.87 | ... |
| of canaliculi with lengths smaller than | | | |
| number | 6 | 9.42 | ... |
| layer number is small | | | |
| study | 6 | 9.03 | ... |
| this study was small | | | |
| force | 5 | 9.21 | ... |
| of the moving force is smaller or bigger than | | | |
| difference | 5 | 8.9 | ... |
| differences are relatively small | | | |
| value | 5 | 8.76 | ... |
| value smaller | | | |
| time | 5 | 8.75 | ... |
| times smaller than | | | |
| group | 5 | 8.65 | ... |
| time in SRM-B group was smaller than all the | | | |
| papilla | 4 | 9.03 | ... |
| giant papillae were smaller and | | | |
| effect | 4 | 8.52 | ... |
| effect was small | | | |
| diameter | 3 | 8.6 | ... |
| diameters smaller than | | | |

Figure 34. *Verb + small* pattern in the ELC

The data on the use of verbs before *small* are presented in Fig. 34. Most frequently used is *to be*, which is followed by *become* and *take*. The proportion of the attributive and predicative function of *small*, is very much tilted to the former, since the former comprises 85%, and 15% the latter (Fig. 35). The instances of the predicative function are shown below:

- 118 The results confirmed that porcine erythrocytes were **smaller** than human erythrocytes.
- 119 At the iterations where a_1 does not change, p becomes **smaller**
- 120 The constant $r > 0$ from part 4 can be taken sufficiently **small** so that there exists a constant $1 > 0$ so that for $[\] < r$ the set $[\]$ is confined to the interval $[\]$.

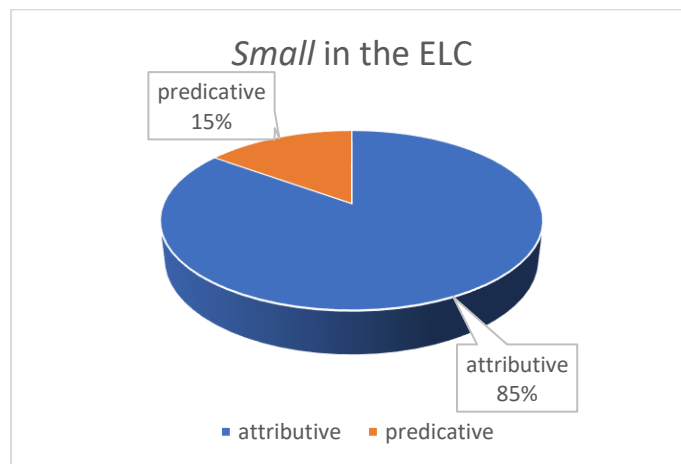


Figure 35. The attributive vs. predicative structure of *small* in the ELC

| Word | Cooccurrence count | Candidate count | T-score | logDice |
|--------------|--------------------|-----------------|---------|---------|
| relatively | 71 | 753 | 8.38 | 9.74 |
| size | 103 | 2,106 | 10.05 | 9.69 |
| sufficiently | 48 | 192 | 6.91 | 9.51 |
| very | 80 | 1,644 | 8.86 | 9.50 |
| amount | 62 | 1,035 | 7.81 | 9.40 |
| number | 115 | 3,781 | 10.56 | 9.36 |
| than | 159 | 6,042 | 12.38 | 9.35 |
| population | 68 | 2,010 | 8.13 | 9.13 |
| mammal | 32 | 67 | 5.65 | 9.01 |
| scale | 41 | 962 | 6.33 | 8.84 |

Table 33. The ten most common collocates of *small* in the ELC

Table 33 demonstrates the ten most common collocates of *small*, in which it can be seen that nouns outnumber modifiers of degree with the ratio of 6 to 3. In terms of the semantics of nouns, they refer to research process, e.g., *size*, *amount*, *number*, *scale*, or the objects of study, e.g., *population*, *mammal*. The most significant collocate of *small* is the adverb *relatively* (9.54), e.g., *Hainan faced a relatively small pressure on environment*.

As far as the lexical bundles containing *small* are concerned (Table 34), it can be seen that the most frequent is *noun phrase with of-phrase fragment* (type 3A), which amounts to 24.85 pmw for 4-word bundles, and 8.90 for 5-word grams.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|----------------------------|--------------|--------------------------------|--------------|
| 1 | a small number of | 28 | segment of the small intestine | 7 |
| 2 | a small amount of | 18 | a relatively small number of | 6 |
| 3 | the small sample size | 9 | a small amount of the | 6 |
| 4 | of the small intestine | 9 | proximal segment of the small | 6 |
| 5 | the small number of | 8 | to a small number of | 4 |
| 6 | a small part of | 8 | on a small number of | 4 |
| 7 | segment of the small | 7 | the influence of small states | 4 |
| 8 | a relatively small number | 6 | to the small sample size | 4 |
| 9 | small amount of the | 6 | of very small and small | 3 |
| 10 | relatively small number of | 6 | of the small number of | 3 |

Table 34. The most frequent 4- and 5-word lexical bundles of *small* in the ELC

5.1.10. *Similar* in the ELC



Figure 36. Lexico-grammatical patterns of *similar* in the ELC

Similar is the last in the list of the top adjectives for the entire corpus, and its frequency is 552.65 pmw. Compared to the nine adjectives discussed in this chapter whose main function is modifying head nouns, it is also true of *similar* (Fig. 36). This structure comprises 56% of all structures that *similar* enters in the ELC (Fig. 37). The examples are:

- 121 **Similar results** have been observed in *P. somniferum* cell cultures, where differentiated tissues (roots or somatic embryos)
- 122 During 2003, *E. lehmanniana* treatments on both soil surfaces followed a **similar pattern**

123 Nobody has looked to see whether **similar trends** occur in mountain beech stands, but Hollinger (1989) has reported that the canopy organization of mature trees

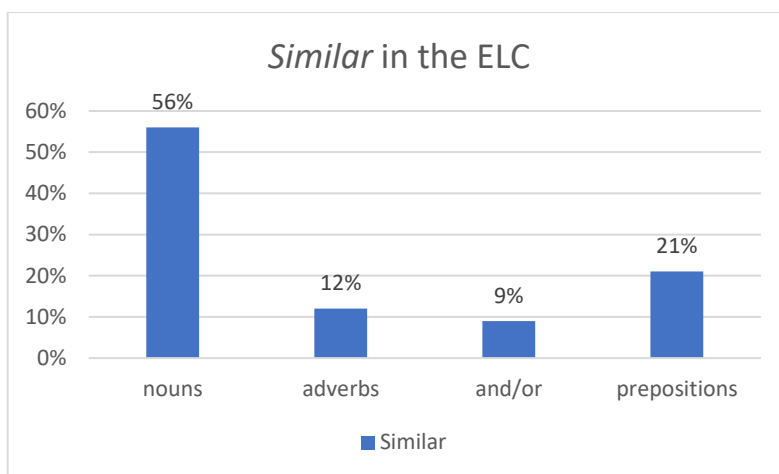


Figure 37. The distribution of lexico-grammatical patterns of *similar* in the ELC

As can be seen in Fig. 36, well represented is also the pattern *similar + preposition* (21%), as in:

- 124 **Similar to** our results, earlier studies using predator exclusion barriers have not revealed any differences in egg predation
- 125 The chronology of emergence was **similar in** all treatments of brown trout and Danube salmon (Fig. 2).
- 126 The content of the feedback was **similar across** studies, however, with elementary teachers in two studies

With regard to degree adverbs, they enter patterns with *similar* in as many as 12 % of all patterns. *Very* is the most common one (73 occurrences), which is followed by *quite* (17) and *also* (14):

- 127 and based on Example 4.4, it gives results *very similar* to the two-particle scheme in [5].
- 128 these, we can thus expect the results to be *quite similar* to those in the mixed condition. The
- 129 of FPLSLR for curve discrimination *is also similar to* FPCLR and better than other competitors.

| verbs before "similar" | | |
|---|-----|----------|
| be is similar | 506 | 9.45 ... |
| look looks remarkably similar | 3 | 7.48 ... |

Figure 38. *Verb + similar* pattern in the ELC

Among verbs, *to be* is the main verb which occurs before *similar* (506 occurrences). This constitutes 30% of all structures (Fig. 38). One more verb identified by *WordSketch* is *look*, but it occurs 3 times only.

- 130 behaviour of total recovered protein **was** very **similar** to that reported in the
 characterisation of
 131 position of these molecules. The results **are similar** to the positional fatty
 acid distributions in
 132 the political histories of Catalonia and Quebec have often **looked similar**.

The data presented in Fig. 39 reveal that the predicative function of *similar* constitutes 29% of all patterns with this adjective in the entire ELC. As compared to the previous nine adjectives in this chapter, in the case of the attributive function of *similar*, it also heavily outnumbers the predicative pattern.

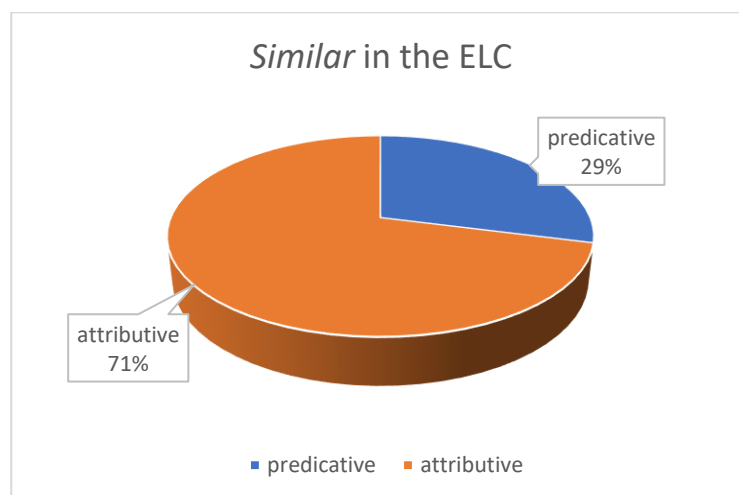


Figure 39. The attributive vs. predicative structure of *similar* in the ELC

Table 35 presents the ten most common collocates of *similar* for the ELC. The collocation candidates are varied in terms of parts of speech: 4 of them are nouns (*result, pattern, trend,*

finding), 3 are verbs (*observe, report, obtain*), 2 are prepositions (*to, across*) and one is an adverb (*very*). Of these the most significant collocate of *similar* is *very* ($LogDice=9.50$). As far as the semantics of the collocates is concerned, they refer to research process, e.g., *report, obtain*, tools, e.g., *pattern, trend*, and outcome of the study, e.g., *finding, result*.

| Lemma | Cooccurrences | Candidates | T-Score | Log Dice |
|---------|---------------|------------|---------|----------|
| very | 76 | 1,644 | 8.64 | 9.50 |
| observe | 63 | 1,850 | 7.84 | 9.14 |
| result | 145 | 7,060 | 11.78 | 9.07 |
| report | 67 | 2,437 | 8.05 | 9.02 |
| pattern | 48 | 1,372 | 6.84 | 8.95 |
| trend | 30 | 450 | 5.44 | 8.77 |
| finding | 34 | 1,266 | 5.74 | 8.50 |
| obtain | 46 | 2,446 | 6.62 | 8.47 |
| to | 690 | 69,273 | 25.11 | 8.31 |
| across | 29 | 1,210 | 5.29 | 8.30 |

Table 35. The ten most common collocates of *similar* in the ELC

The most common structural type of the lexical bundles with *similar* (Table 36) is verb phrase with non-passive verb (type 1D). *Similar* creates more 4-word bundles of this type (29.46 pmw) than 5-word grams (pmw=12.27).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|------------------------------|--------------|---------------------------------|--------------|
| 1 | <u>similar to that of</u> | 33 | <u>is similar to that of</u> | 14 |
| 2 | <u>similar to those of</u> | 32 | <u>were similar to those of</u> | 9 |
| 3 | is similar to the | 32 | similar to that of the | 8 |
| 4 | <u>is similar to that</u> | 24 | <u>are similar to those of</u> | 7 |
| 5 | <u>are similar to those</u> | 21 | <u>which is similar to the</u> | 6 |
| 6 | <u>were similar to those</u> | 19 | similar to those of the | 6 |
| 7 | <u>very similar to the</u> | 13 | was similar to those of | 5 |
| 8 | <u>which is similar to</u> | 12 | similar to those observed in | 5 |
| 9 | in a similar way | 11 | similar to the proof of | 5 |
| 10 | similar to the one | 9 | <u>is very similar to the</u> | 5 |

Table 36. The most frequent 4- and 5-word lexical bundles of *similar* in the ELC

Similar is a gradable adjective. It is modified by adverbs and occurs in comparative constructions, e.g., *compared to mucus without lipid, had a more similar microstructure to PIM*.

5.1.11. Concluding remarks

On the basis of the analysis of the ten adjectives in the ELC, we can draw the following picture of their lexico-grammatical behaviour:

- the main function of adjective is the function of modifier in a nominal phrase, which means that *adjective + noun* collocations outnumber other patterns;

- the large majority of adjectives (8 of 10) are modified by adverbs of degree as well as prepositions, and enter the pattern *and/or*. There are, however, two exceptions of this rule, namely, *political* and *same*, which enter two structures only, i.e., *adjective + noun* and *and/or*;
- as can be seen in the above analysis, the findings corroborate Biber's (2006:15) and Karasu's (2020) observation that the attributive adjectives are more common than predicative ones in academic prose;
- as shown by *LogDice* index, the ten adjectives use varied collocates in terms of the type of parts of speech. More than a half of the collocates are nouns. Among less common collocates, we find adverbs, adjectives, prepositions as well as verbs. *Political* collocates only with nouns and adjectives;
- in terms of gradability, 7 adjectives: *high*, *low*, *large*, *small*, *significant*, *important* and *similar* are used as gradable adjectives in the ELC. *Political* and *same* are used as non-gradable adjectives; *different* is used as a partially gradable adjective;
- all ten adjectives enter lexical bundles. Understandably, 4-word lexical bundles occur more frequently in the ELC than 5-word bundles. Table 37 summarises the most common structural types of 4- and 5-word lexical bundles for the ELC. The three structural types that occur most frequently are highlighted in yellow. The most common structural type of 4-word bundles is *prepositional phrase* (3D, pmw=169.69). With regard to 5-word bundles, the most productive type is 1D – *verb phrase with non-passive verb* (pmw=59.53).

| | 4-word | | 5-word | |
|----|--------------|--------|--------------|-------|
| | Total number | pmw | Total number | pmw |
| 3A | 323 | 99.11 | 89 | 27.31 |
| 3B | 264 | 81.01 | 126 | 38.66 |
| 3C | 123 | 37.74 | - | - |
| 3D | 553 | 169.69 | 169 | 51.86 |
| 3E | 179 | 54.93 | 58 | 17.80 |
| 1B | 169 | 51.85 | 142 | 43.57 |
| 1D | 393 | 120.60 | 194 | 59.53 |
| 1E | - | - | - | - |
| 2B | 12 | 3.68 | 6 | 1.84 |
| 2C | - | - | - | - |
| 2D | - | - | - | - |

| | | | | |
|----|---|------|---|---|
| 2E | 8 | 2.45 | - | - |
|----|---|------|---|---|

Table 37. Structural types of 4- and 5-word lexical bundles in the ELC

5.2. The top-frequency adjectives in the seven sub-corpora

The second part of the chapter will concentrate on the lexico-grammatical patterns of the top-frequency adjectives in the seven sub-corpora: *BIOTECHNOLOGY*, *ECOLOGY*, *LINGUISTICS*, *MATERIAL SCIENCE*, *MEDICINE*, *MATHEMATICS* and *POLITICAL SCIENCE*. It will also present the most significant collocates of the adjectives as well as lexical bundles that top-frequency adjectives create.

5.2.1. The five top-frequency adjectives in *BIOTECHNOLOGY* sub-corpus

The total number of words of *BIOTECHNOLOGY* sub-corpus is 410,941, which corresponds to 13% of the entire ELC.

As presented in Table 38, the top three adjectives, i.e., *high*, *different*, *low*, for the entire corpus and *BIOTECHNOLOGY* sub-corpus are the same, but, they differ in frequency.

| Adjective | Total number | Pmw |
|-----------|--------------|----------|
| high | 1,130 | 2,749.79 |
| different | 675 | 1,642.57 |
| low | 607 | 1,477.10 |
| fatty | 378 | 919.84 |
| total | 304 | 739.76 |

Table 38. The five top-frequency adjectives in *BIOTECHNOLOGY* sub-corpus

5.2.1.1. High in BIOTECHNOLOGY

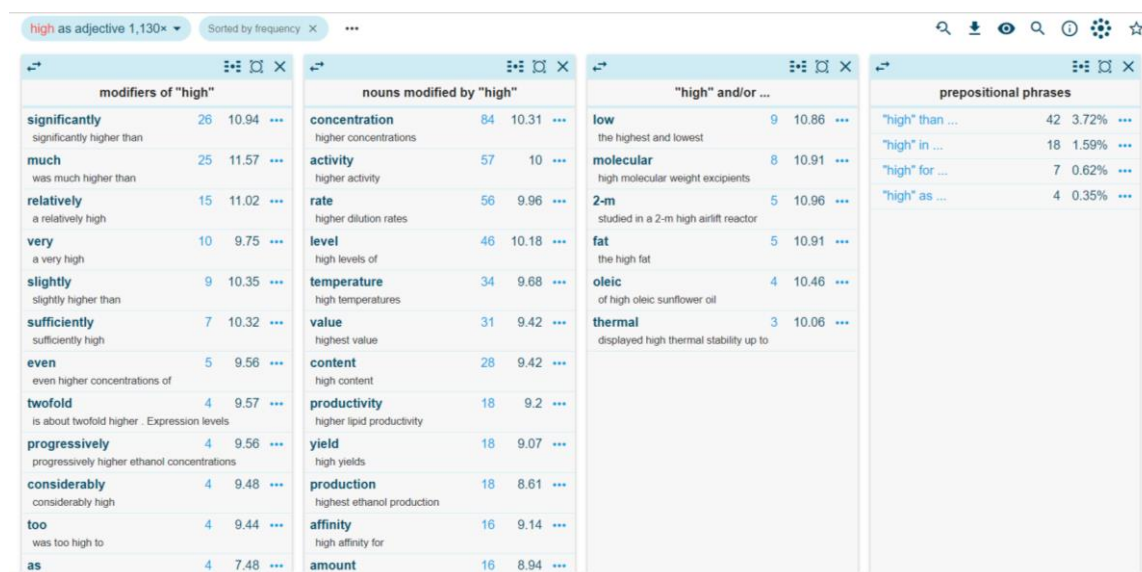


Figure 40. Lexico-grammatical structures of *high* in BIOTECHNOLOGY

The first adjective to discuss is *high*, which occurs as many as 1,130 times including the three forms: *high*, *higher* and *the highest*. Nearly 80% of all structures with *high* are nouns (Fig. 40). The three most frequently used nouns are *concentration* (84 occurrences), *activity* (57) and *rate* (56). Typical examples of the pattern *high* + *noun* are shown in the concordances below:

- 133 was due to the formation of free micelles at **higher concentrations** as the protein reduces the free
- 134 Two mutants at the presumed Pdx interaction interface (R8-5C/N363Y and R8-5C/T119N) had the **highest** whole cell biotransformation **activity** among these mutants,
- 135 At progressively **higher** dilution **rates** namely from 0.1 to 0.15 and 0.2 h⁻¹, the ethanol production was reduced by around 1 g/L and the production

As far as adverbial modifiers are concerned, they comprise 14% of all lexico-grammatical structures in BIOTECHNOLOGY (Fig. 41). The top three adverbs which collocate with *high* are: *significantly* (26 occurrences), *much* (25), and *relatively* (15). The examples can be seen below:

- 136 ITZ composition resulted in **significantly higher** systemic bioavailability
- 137 *C. vulgaris* ESP-31 strain exhibited a **much higher** lipid content of 55.9%, thereby having a high
- 138 but the two genes, nfa12130 and nfa33880, showed **relatively high** activities for A-ring hydroxylation of daidzein.

Equally productive are the patterns, *and/or* and *high* + *preposition*, since each of them represents 7% of all structures with *high* in BIOTECHNOLOGY:

139 **Lower or higher** concentrations did not produce significant improvements
 compared to the control
 140 In contrast, **high molecular** weight excipients, such as (low-molecular
 weight) dextrans
 141 the production of ethanol and biomass from thin stillage was studied in a **2-**
m high airlift reactor (Fig. 2A and B).

142 hydrolysis upon 1, 2 and 5 h of incubation were significantly **higher than**
 the solubility of abiraterone determined by incubation of abiraterone (Fig.
 1).
 143 The palmitate mean concentrations – except for C16–22 – were **higher in**
 yellow bees waxes than in white ones.
 144 The catalytic efficiencies (kcat/Km) of LHT-10 for LA were 1.6-fold **higher**
for OA.

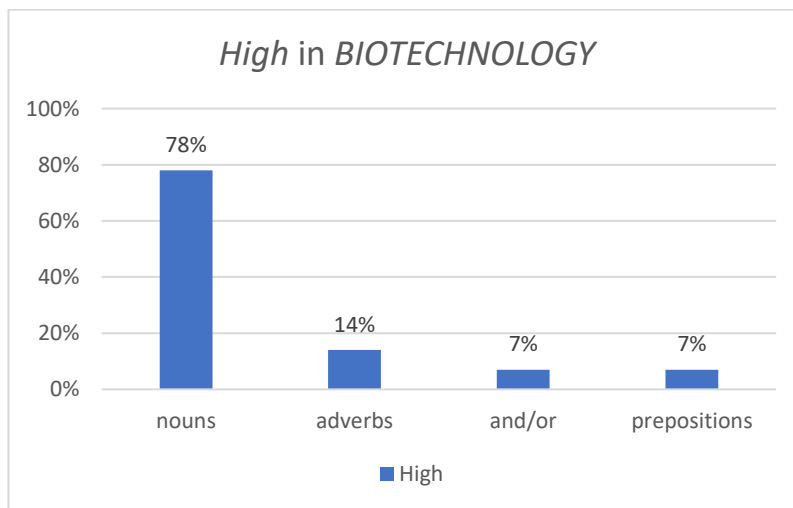


Figure 41. The distribution of lexico-grammatical patterns of *high* in *BIOTECHNOLOGY*

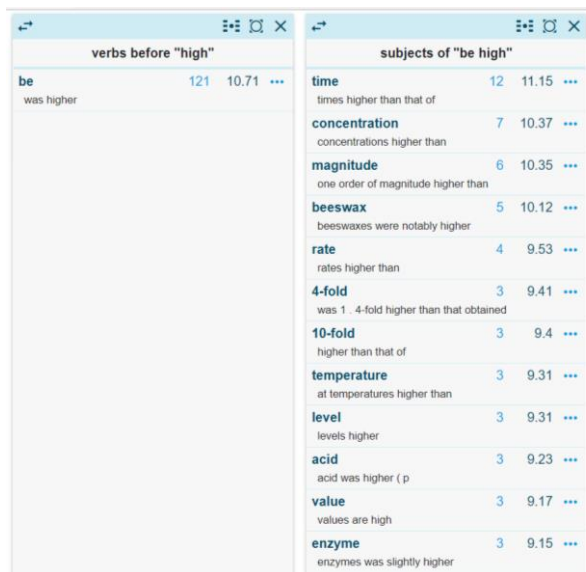


Figure 42. *Verb + high* pattern in *BIOTECHNOLOGY*

Another pattern that emerged from the *WordSketch* analysis is *verb + high*, which comprises 11% of all structures in this sub-corpus (Fig. 42 and 43). Its importance lies in the fact that *high* is used in the predicative function. The examples are as follow:

- 145 These values **are** more than 10 times **higher** than typically seen at room
 146 temperature for the
 147 but nonetheless **are** sufficiently **high** to enable materials production and
 characterization, a goal previously out of reach with this production system.
 147 the viscosity **was** too **high** for the nozzle atomization

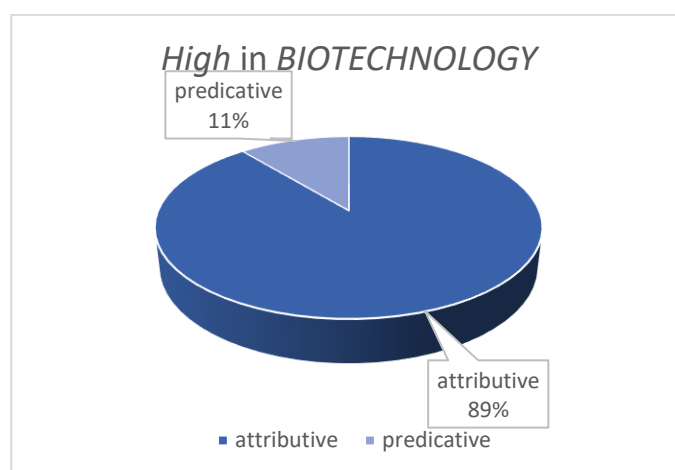


Figure 43. The attributive vs. predicative structure of *high* in *BIOTECHNOLOGY*

| Word | Cooccurrence count | Candidate count | T-score | logDice |
|---------------|--------------------|-----------------|---------|---------|
| than | 158 | 611 | 12.47 | 11.54 |
| concentration | 119 | 1,336 | 10.65 | 10.63 |
| level | 63 | 388 | 7.83 | 10.41 |
| rate | 74 | 723 | 8.42 | 10.35 |
| activity | 81 | 1,010 | 8.75 | 10.28 |
| at | 140 | 2,973 | 11.30 | 10.13 |
| temperature | 57 | 660 | 7.36 | 10.03 |
| with | 151 | 4,069 | 11.58 | 9.89 |
| have | 76 | 1,766 | 8.29 | 9.75 |
| show | 60 | 1,265 | 7.40 | 9.68 |

Table 39. The ten most common collocates of *high* in *BIOTECHNOLOGY*

Table 39 summarises the ten most common collocates of *high* in *BIOTECHNOLOGY*. The most significant collocation is a comparative structure *higher than* (*LogDice*=11.54), e.g., *HS treatments at 60°C gave a higher plumbagin production than those of at 50°C*. As can be seen, five of the collocates are nouns. With regard to the semantics of nominal collocates, these nouns are used to describe research processes, e.g., *level*, *rate*, *temperature*. The two verbal

collocates, *have* and *show*, are universal verbs that can be used to refer to various phenomena across *BIOTECHNOLOGY* sub-corpus.

The most common structural type of 4-word lexical bundles is *a noun phrase with of-phrase fragment* (type 3A, 29.20 pmw). There are no instances of 5-word bundles with *high* (Table 40).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--|--------------|----------------|--------------|
| 1 | due to the high | 7 | - | |
| 2 | due to its high | 4 | | |
| 3 | high oleic sunflower oil | 4 | | |
| 4 | high performance liquid chromatography | 4 | | |
| 5 | high affinity for terbium | 4 | | |
| 6 | a high level of | 3 | | |
| 7 | the high content of | 3 | | |
| 8 | high molecular weight excipients | 3 | | |
| 9 | high levels of activity | 3 | | |
| 10 | a high degree of | 3 | | |

Table 40. The most frequent 4- and 5-word lexical bundles of *high* in *BIOTECHNOLOGY*

5.2.1.2. *Different* in *BIOTECHNOLOGY*

The second top adjective in *BIOTECHNOLOGY* sub-corpus is *different* (pmw=1,624.57, Fig. 44). Of all collocations with *different*, nearly 90 % are nouns, followed far behind by *and/or* pattern and *adverb + different*, 14 % and 7 % respectively (Fig. 45).



Figure 44. Lexico-grammatical patterns of *different* in *BIOTECHNOLOGY*

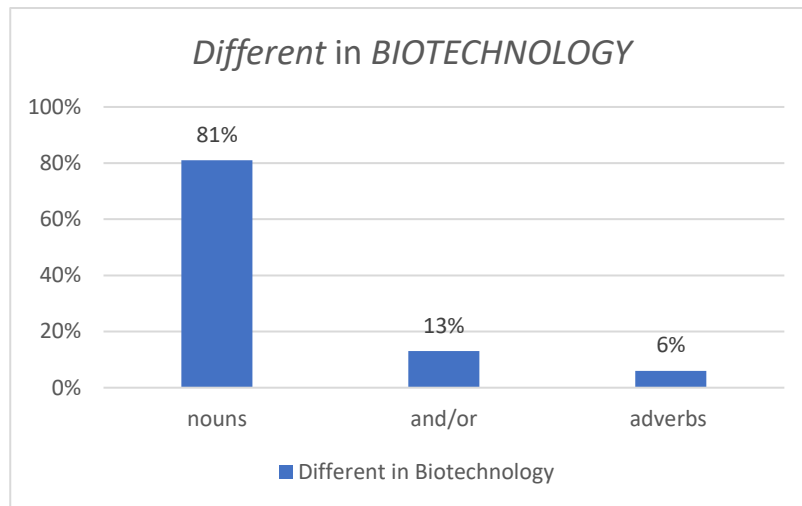


Figure 45. The distribution of lexico-grammatical patterns of *different* in *BIOTECHNOLOGY*

The most frequent nominal collocates are *condition* (26 occurrences), *concentration* (23) and *temperature* (22):

- 148 suggests differences in metabolism for these **different conditions**
 149 For batches L1 and L2, GFN was loaded at two **different** theoretical
concentrations
 150 freeze-dried products was determined by differential scanning calorimetry
 at two **different temperatures**

As stated at the beginning of this section, *different* enters *and/or* pattern as well, but it is far less numerous than *different* + *noun* pattern. The examples are as follow:

- 151 For instance, **different initial** guesses for the parameters will result in
 completely different values
 152 There are **many different** substrates for soilless cultivation such as perlite
 153 Table 3 shows the mean accuracy of **different bacterial** BWA and
 simulant bacteria of five separate experiments.

The structures with modifiers of degree were rare, since merely 48 instances were found, which constitutes 7 % of all patterns with *different* in *BIOTECHNOLOGY*.

- 154 HS treated root culture was not **significantly different**. In contrast, HS
 enhanced plumbagin
 155 As a result, a **very different** stratification in terms of substrate
 concentrations and bacterial activities could be
 156 whereas their distribution in different tocopherol types was **quite different**

| verbs before "different" | | | |
|------------------------------|----|-------|-----|
| be | 49 | 9.45 | ... |
| were significantly different | | | |
| have | 2 | 10.02 | ... |
| have different | | | |

Figure 46. *Verb + different* pattern in *BIOTECHNOLOGY*

An overview of the *verbs before different* pattern is presented in Fig. 46, in which it can be seen that the main verb is *to be* (49 occurrences), followed by *have*, with 2 occurrences only. The instances with verbs *be* and *have* present the predicative function of *different*, which constitutes 7 % of all patterns with high in *BIOTECHNOLOGY*.

- 157 weight gain (batch C2) **were** significantly **different** ($f2 = 47.93 \pm 0.3$; $f1 =$
 158 27.93 ± 0.83), while the
 158 rheological properties, which **were** clearly **different** from the desired
 behavior matching PIM (Fig. 3)
 159 of many compounds resulted to **be** statistically **different** for white and
 yellow beeswaxes, while the

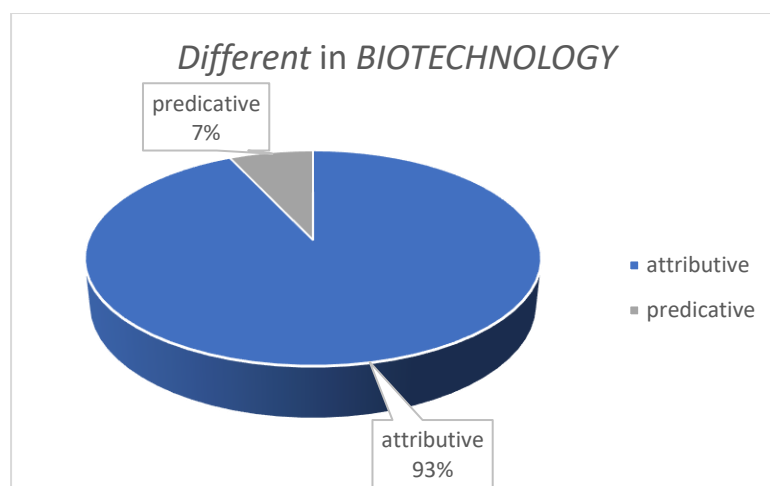


Figure 47. The attributive vs. predicative structure of *different* in *BIOTECHNOLOGY*

The distribution of the attributive and predicative functions of *different* is presented in Fig. 47.

| Word | Cooccurrence count | Candidate count | T-score | LogDice |
|---------------|--------------------|-----------------|---------|---------|
| significantly | 28 | 233 | 5.24 | 9.98 |
| condition | 36 | 604 | 5.87 | 9.85 |

| | | | | |
|---------------|----|-------|------|------|
| two | 32 | 485 | 5.55 | 9.82 |
| time | 37 | 830 | 5.91 | 9.65 |
| at | 84 | 2,973 | 8.75 | 9.56 |
| different | 31 | 675 | 5.41 | 9.56 |
| under | 25 | 430 | 4.89 | 9.53 |
| type | 19 | 200 | 4.30 | 9.47 |
| concentration | 43 | 1,336 | 6.30 | 9.45 |
| three | 20 | 288 | 4.39 | 9.41 |

Table 41. The ten most common collocates of *different* in *BIOTECHNOLOGY*

The data for the ten most significant collocates of *different* are summarised in Table 41. The most salient lemma is the degree modifier *significantly* ($LogDice=9.98$), which can be found in *significantly different*. We can also notice four nominal collocates, which in terms of their semantics, belong to research lexis, e.g., *time*, *type*, *concentration*. The third most productive pattern for *different* is the one in which it is modified by cardinal numerals, e.g., *two*, as in: *two different coating levels*. It can be also seen that *different* collocates with prepositions, e.g., *at different magnifications*. Interestingly, in the range of 5 lemmas to the left and right, it can be observed that the adjective *different* is repeated, e.g., *the mixing time at different growth stages for different viscosities*.

Table 42 presents the most common 4- and 5-word lexical bundles with adjective *different*. *Noun phrase* (type 3A, pmw=31.63) and *prepositional phrase* (3D, pmw=31.63) are the most frequent structural types of 4-word lexical bundles. The most common type of 5-word lexical bundles is *other noun phrase* (type 3C, pmw=29.20).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--------------------------------------|--------------|--|--------------|
| 1 | <u>at different temperatures and</u> | 8 | <u>three different MWs of DS</u> | 4 |
| 2 | containing different amounts of | 5 | <u>different from that of the</u> | 3 |
| 3 | with different ligand sensitivities | 5 | <u>cells at different temperatures and</u> | 3 |
| 4 | different functionality of thiols | 5 | and unstressed cells at different | 3 |
| 5 | <u>different from that of</u> | 4 | suspension cultures of two different | 3 |
| 6 | the three different MWs | 4 | <u>different rCHO cell lines producing</u> | 3 |
| 7 | <u>three different MWs of</u> | 4 | two different rCHO cell lines | 3 |
| 8 | <u>different rCHO cell lines</u> | 4 | unstressed cells at different temperatures | 3 |
| 9 | not significantly different from | 4 | different temperatures and cell concentrations | 3 |
| 10 | <u>different MWs of DS</u> | 4 | at different temperatures and cell | 3 |

Table 42. The most frequent 4- and 5-word lexical bundles of *different* in *BIOTECHNOLOGY*

Different in *BIOTECHNOLOGY* does not enter comparative constructions. It occurs in the predicative structures and collocates with adverbs, and, therefore, is used as a partially gradable adjective.

5.2.1.3. *Low* in *BIOTECHNOLOGY*

| modifiers of "low" | nouns modified by "low" | "low" and/or ... | prepositional phrases |
|---|---|---|----------------------------|
| very very low 23 11.13 | concentration low concentration 59 10.15 | molecular low molecular weight 16 11.87 | "low" than ... 20 3.29% |
| much much lower than 20 11.51 | temperature low temperature 28 10 | high the highest and lowest 9 10.86 | "low" in ... 14 2.31% |
| significantly were significantly lower 17 10.49 | rate lower rate 16 8.56 | erucic the low erucic rapeseed oil 3 10.17 | "low" for ... 5 0.82% |
| relatively relatively low 13 11.12 | activity lower activity 15 8.49 | mw low MW PEG systems 3 10.16 | "low" to ... 3 0.49% |
| slightly was slightly lower than 7 10.3 | level low levels 12 8.87 | relative relative low 3 10.01 | |
| extremely are extremely low 5 10.17 | content low residual phosphorus content 11 8.67 | residual a low residual phosphorus content 3 9.98 | |
| too was too low to 4 9.83 | amount a lower amount of 10 9.09 | aqueous low aqueous solubility 3 9.69 | |
| somewhat somewhat lower than 3 9.57 | efficiency low transfection efficiency 10 9.03 | middle high , middle , and low) to accurately 2 9.58 | |
| rather rather low 3 9.46 | value low value 10 8.32 | nutrient low nutrient 2 9.53 | |
| as as low as 3 7.15 | viscosity low viscosity 8 9.13 | medium low and medium 2 9.48 | |
| even even lower 2 8.58 | solubility low aqueous solubility 7 8.92 | simple simple and low cost 2 9.26 | |
| | weight 7 8.3 | linear 2 9.08 | |

Figure 48. Lexico-grammatical patterns of *low* in *BIOTECHNOLOGY*

The third adjective in *BIOTECHNOLOGY* sub-corpus is *low* (pmw=1,477.10). Overall, of all 607 occurrences, 419 enter the noun phrase (henceforth NP) in which *low* is a modifier (Fig. 48). NPs with *low* comprise nearly 70% of all its structures, which is followed by two other patterns: *modifier of degree* + *low* as well as *and/or*, which account for 19% and 13%, respectively (Fig. 49). As far as nouns are concerned, the most frequent ones are: *concentration* (59 occurrences), followed by *temperature* (28 occurrences) and *rate* (16 occurrences):

- 160 is used as a binder in the layering solution, at **low** drug **concentration** the
 161 film stability was
 161 Conversely, at the **lower** **temperature** (16°C) the low cell concentration,
 N-replete treatment reached the
 162 At the **lowest** shear **rates** tested, a 25-fold difference was found between the
 flow curves of the PIM samples with the highest and

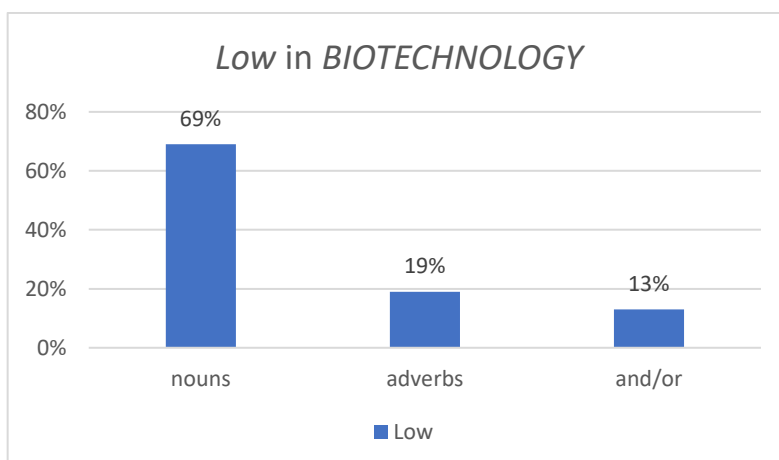


Figure 49. The distribution of lexicogrammatical patterns of *low* in *BIOTECHNOLOGY*

In the case of modifiers of degree, *very* (23 occurrences), *much* (20), and *significantly* (17) are the most frequent markers:

- 163 Also the decrease of Mw would be very **low and linear**.
 164 The sialidase activity of PmST was **much lower** than its trans-sialidase activities with maximum release of sialic acid of 0.92
 165 However, final conversions obtained were **significantly lower** than conversions obtained with equivalent quantities of free lipase, indicating significant loss of specific

With regard to the *verbs before low* pattern, we can see that their total number is at the level of 112, which accounts for 18% of all structures. The most significant verb is *to be* (103 occurrences), followed by *become* and *show* (Fig. 50). The two verbs (*become* and *show*) are of marginal importance, since they occur 4 and 2 times, respectively. The comparison of the attributive and predicative function of *low* is presented in Fig. 51:

| verbs before "low" | | | subjects of "be low" | | |
|------------------------|-----|-----------|--------------------------------|---|-----------|
| be | 103 | 10.48 ... | concentration | 6 | 10.54 ... |
| was lower | | | concentrations much lower | | |
| become | 4 | 9.64 ... | value | 5 | 10.32 ... |
| becomes lower | | | values were lower | | |
| show | 2 | 9.12 ... | rate | 5 | 10.24 ... |
| showed low to moderate | | | rate was lower | | |
| | | | level | 4 | 10.18 ... |
| | | | level was much lower | | |
| | | | activity | 4 | 10.1 ... |
| | | | activity was much lower than | | |
| | | | j301 | 2 | 9.34 ... |
| | | | J301 were much lower | | |
| | | | absorption | 2 | 9.34 ... |
| | | | absorption is usually very low | | |
| | | | ghost | 2 | 9.32 ... |
| | | | ghosts was much lower | | |
| | | | number | 2 | 9.32 ... |
| | | | number lower | | |
| | | | yield | 2 | 9.32 ... |
| | | | yields are typically low | | |
| | | | lipase | 2 | 9.31 ... |
| | | | lipase is significantly lower | | |
| | | | case | 2 | 9.31 ... |

Figure 50. Verb + low pattern in BIOTECHNOLOGY

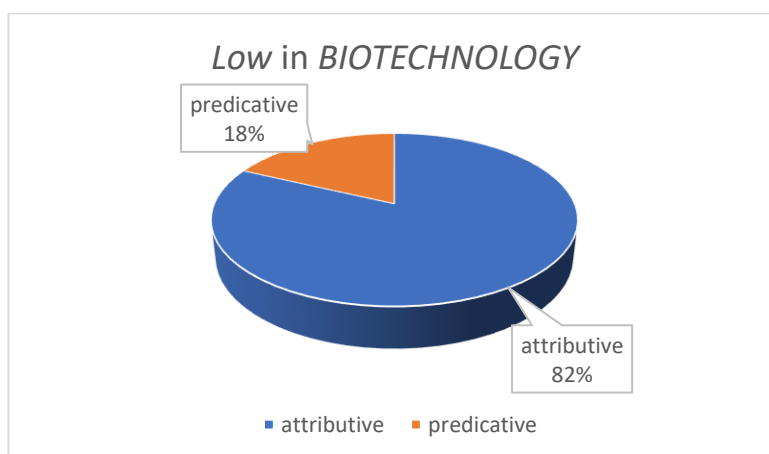


Figure 51. The attributive vs. predicative structure of *low* in BIOTECHNOLOGY

Table 43 provides statistics of the ten most common collocates of *low* (Table 16). Its most productive collocate is the preposition *than*, which in the majority of cases creates a comparative construction *lower than*, e.g., *concentrations lower than 0.25%*, *a lower amount of water than those obtained by a traditional system*. The four nominal collocates of *low* are research process words, e.g., *concentration*, *efficiency*. The third most frequent collocate is the adverb *very*, e.g., *very low coating losses*.

| Lemma | Cooccurrence count | Candidate count | T-score | logDice |
|---------------|--------------------|-----------------|---------|---------|
| than | 78 | 611 | 8.75 | 11.04 |
| concentration | 82 | 1,336 | 8.89 | 10.43 |
| very | 27 | 214 | 5.15 | 10.07 |
| temperature | 38 | 660 | 6.04 | 9.94 |
| much | 20 | 122 | 4.44 | 9.81 |
| molecular | 22 | 197 | 4.64 | 9.81 |
| efficiency | 19 | 169 | 4.31 | 9.65 |
| significantly | 20 | 233 | 4.41 | 9.61 |
| activity | 38 | 1,010 | 5.98 | 9.59 |
| at | 84 | 2,973 | 8.79 | 9.59 |

Table 43. 10 most common collocates of *low* in *BIOTECHNOLOGY*

The last aspect that remains to analyse concerns the lexical bundles that contain adjective *low* (Table 44). The most common structural type of 4-word lexical bundles is *prepositional phrase* (type 3D, pmw=36.50). Among the 5-word bundles the most frequent is *other noun phrase* (type 3C, pmw=29.20).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|----------------------------|--------------|--|--------------|
| 1 | <u>due to its low</u> | 5 | low molecular weight component profile | 3 |
| 2 | low concentration of SNP | 4 | <u>its low supply as well</u> | 3 |
| 3 | due to the low | 4 | <u>low supply as well as</u> | 3 |
| 4 | <u>low supply as well</u> | 3 | <u>to its low supply as</u> | 3 |
| 5 | of low molecular weight | 3 | <u>low yields and slow growth</u> | 3 |
| 6 | <u>its low supply as</u> | 3 | the low molecular weight component | 3 |
| 7 | <u>low yields and slow</u> | 3 | limited due to its low | 3 |
| 8 | the low molecular weight | 3 | <u>due to its low supply</u> | 3 |
| 9 | <u>to its low supply</u> | 3 | | |
| 10 | when low MW PEG | 3 | | |

Table 44. The most frequent 4- and 5-word lexical bundles of *low* in *BIOTECHNOLOGY*

5.2.1.4. *Fatty* in *BIOTECHNOLOGY*

Fatty is the fourth in the list of the most frequently used adjectives in *BIOTECHNOLOGY* sub-corpus. Fig. 52 shows that the total number of *fatty* is 378, which is

almost twice less than *different* (675 occurrences) or *low* (607). *Fatty* seems to be specific of this discipline, since in other sub-corpora its frequency is much lower, e.g., in *ECOLOGY* it amounts to 15 pmw, or it does not occur at all, e.g., in *MATHEMATICS* and *POLITICAL SCIENCE* sub-corpora. Of 378 tokens in *Biotechnology*, all of them perform the function of premodifying adjectives of nouns. The three most common nouns are: *acid* (199 occurrences), *composition* (25) and *ester* (17):

- 166 double-bond hydratase. Hydroxylation of **fatty acids**, abundant feedstock in nature, is an
- 167 Tab. 1 shows that the dewaxing time had no significant effect on the **fatty acid composition** of rice bran oil.
- 168 The lipid content and composition were determined as **fatty acid methyl esters** (FAMES) through the direct transesterification method

fatty as adjective 378x Sorted by frequency x

| nouns modified by "fatty" | | | "fatty" and/or ... | | |
|---|-----|-----------|--|----|-----------|
| acid | 199 | 11.99 ... | acid | 78 | 12.6 ... |
| fatty acids | | | fatty acid | | |
| composition | 25 | 10.56 ... | unsaturated | 20 | 11.32 ... |
| fatty acid compositions of | | | unsaturated fatty acid | | |
| ester | 17 | 10.18 ... | polyunsaturated | 12 | 10.65 ... |
| fatty acid methyl esters | | | polyunsaturated fatty acids | | |
| acyl-coa | 10 | 9.72 ... | hydroxy | 11 | 10.51 ... |
| fatty acids / fatty acyl-CoAs | | | hydroxy fatty acids | | |
| derivative | 10 | 9.47 ... | free | 10 | 10.23 ... |
| of fatty acid derivatives | | | free fatty acids | | |
| system | 8 | 7.68 ... | total | 9 | 10.11 ... |
| fatty acid regulation system | | | total fatty acid | | |
| profile | 7 | 8.33 ... | 16-carbon | 8 | 10.1 ... |
| to obtain a fatty acid composition profile in accordance with | | | fatty acids | | |
| biosensor | 6 | 8.83 ... | modular | 6 | 9.7 ... |
| fatty acids / fatty acyl-CoA biosensors in S | | | a modular fatty acid regulation system | | |
| distribution | 5 | 8.32 ... | saturated | 6 | 9.64 ... |
| fatty acid distributions in | | | had the highest saturated fatty acid content among | | |
| enzyme | 5 | 7.86 ... | hepatic | 4 | 9.09 ... |
| fatty acid hydroxylation enzymes | | | hepatic fatty acid b | | |

Figure 52. Lexico-grammatical patterns of *fatty* in *BIOTECHNOLOGY*

The second structure is *and/or*, represented by 230 tokens, which accounts for 61% (Fig. 53). The major examples here are *acid* (78 occurrences), followed by *unsaturated* (20 occurrences) and *polyunsaturated* (12 occurrences):

- 169 Unveiling of novel regio-selective **fatty acid** double bond hydratases from *Lactobacillus acidophilus* involved in the selective oxyfunctionalization of mono
- 170 Acetoxy ester functionalization of **unsaturated fatty acid** methyl esters
Two synthetic approaches to functionalize plant oil derived platform chemicals were
- 171 Thus, LHT-13 is feasible for the specific biotransformation of **polyunsaturated fatty acid** to 13-hydroxy fatty acids.

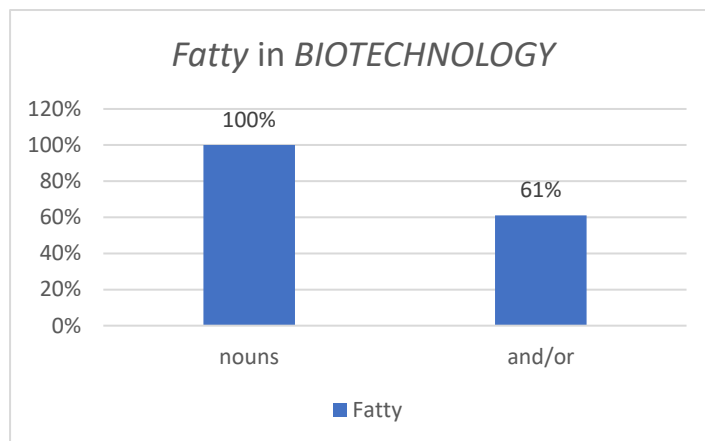


Figure 53. The distribution of lexico-grammatical patterns of *fatty* in BIOTECHNOLOGY

The percentage comparison between the attributive and predicative function of *fatty* is shown in Fig. 54. It follows that the attributive pattern occurs in 100% of cases with *fatty*.

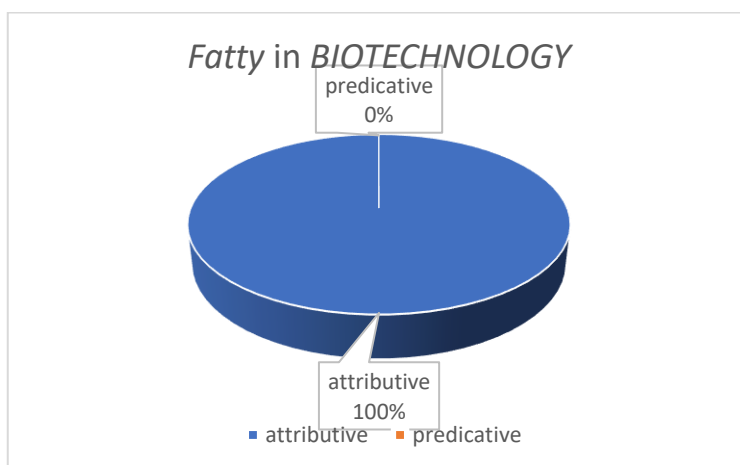


Figure 54. The attributive vs. predicative structure of *fatty* in BIOTECHNOLOGY

The data on the ten most common collocates of *fatty* are contained in Table 45. The most significant lemma is the noun *acid* ($LogDice=12.81$), as in: *fatty acid methyl esters*. It can be seen that the majority of the ten most common collocates are nouns. They refer to research process lexis and objects under analysis, e.g., *composition*, *distribution*, *biosensor*. The second type of collocates is the adjective *fatty*, e.g., *E. coli's native fatty acyl-CoA/fatty acid responsive transcription factor*, and the participial adjectives *unsaturated* and *polyunsaturated*, e.g., *fatty acid derivatives to form unsaturated acetoxy esters*, *n-3 polyunsaturated fatty acids*. The lemmas *ester*, *polyunsaturated*, seem to be significant collocates in this particular discipline, namely BIOTECHNOLOGY, since they are not found among the most common collocates across the six other sub-corpora.

| Lemma | Cooccurrence count | Candidate count | T-score | logDice |
|-----------------|--------------------|-----------------|---------|---------|
| acid | 363 | 1,274 | 19.00 | 12.81 |
| acyl-CoA | 57 | 32 | 7.55 | 12.15 |
| fatty | 74 | 381 | 8.57 | 11.64 |
| composition | 34 | 161 | 5.81 | 11.01 |
| unsaturated | 21 | 33 | 4.58 | 10.71 |
| ester | 20 | 96 | 4.46 | 10.43 |
| biosensor | 18 | 64 | 4.23 | 10.38 |
| polyunsaturated | 15 | 12 | 3.87 | 10.30 |
| positional | 15 | 15 | 3.87 | 10.29 |
| distribution | 19 | 123 | 4.34 | 10.28 |

Table 45. The ten most common collocates of *fatty* in *BIOTECHNOLOGY*

The predominant structural type of lexical bundles with *fatty* is *noun phrase with of-phrase fragment* (type 3A), but it differs in frequency. 4-word bundles containing *fatty* amount to 77.87 pmw as compared to 82.74 pmw of 5-word bundles (Table 46).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|------------------------------------|--------------|---|--------------|
| 1 | <u>distribution of fatty acids</u> | 11 | <u>distribution of fatty acids in</u> | 7 |
| 2 | <u>of fatty acids in</u> | 10 | <u>positional distribution of fatty acids</u> | 7 |
| 3 | <u>fatty acids in the</u> | 9 | <u>fatty acid compositions of the</u> | 5 |
| 4 | fatty acid methyl esters | 7 | Positional distribution of fatty acids | 4 |
| 5 | <u>fatty acid composition of</u> | 7 | <u>of fatty acids in the</u> | 4 |
| 6 | of the fatty acid | 7 | distribution of fatty acids of | 4 |
| 7 | positional distribution of fatty | 7 | fatty acid composition of the | 4 |
| 8 | <u>fatty acid compositions of</u> | 7 | of fatty acids in PE | 3 |
| 9 | the fatty acid composition | 6 | <u>of a modular fatty acid</u> | 3 |
| 10 | <u>a modular fatty acid</u> | 5 | <u>the fatty acid composition of</u> | 3 |

Table 46. The most frequent 4- and 5-word lexical bundles of *fatty* in *BIOTECHNOLOGY*

On the basis of the above-mentioned structures, it can be observed that *fatty* is not modified by adverbs, and it also does not occur in the comparative and superlative degree. *Fatty* is used as a non-gradable adjective in *BIOTECHNOLOGY* sub-corpus.

5.2.1.5. *Total* in BIOTECHNOLOGY

total as adjective 304 × Sorted by frequency ×

| nouns modified by "total" | | | "total" and/or ... | | |
|-------------------------------|----|-------|--|---|-------|
| lipid | 20 | 10.57 | fatty | 9 | 10.11 |
| of total lipids | | | total fatty acid | | |
| amount | 18 | 10.3 | free | 8 | 11.71 |
| total amount of | | | total and free acids | | |
| content | 17 | 9.54 | non-volatile | 3 | 11.3 |
| total phenol content | | | the total non-volatile oxidation compounds | | |
| phenol | 15 | 10.57 | attenuated | 3 | 11.26 |
| total phenols and o-diphenols | | | attenuated total reflectance (ATR) | | |
| volume | 15 | 10.2 | organic | 3 | 10.75 |
| a total volume of | | | total organic carbon (TOC) | | |
| concentration | 14 | 8.19 | model-predicted | 1 | 9.79 |
| total protein concentration | | | model-predicted total | | |
| protein | 13 | 8.94 | volatile | 1 | 9.57 |
| of total protein | | | total volatile | | |
| production | 12 | 8.75 | negative | 1 | 9.5 |
| total lipid production | | | total negative | | |
| acid | 11 | 7.9 | external | 1 | 9.44 |
| total fatty acids | | | external total | | |
| number | 10 | 9.53 | saturated | 1 | 9.3 |
| the total number of cells | | | total saturated | | |
| compound | 8 | 8.85 | available | 1 | 9.3 |

Figure 55. Lexico-grammatical patterns of *total* in BIOTECHNOLOGY

The last adjective to discuss in the *BIOTECHNOLOGY* sub-corpus is *total*, which occurs 304 times (pmw=739.76). As can be seen from Fig. 55, only two lexico-grammatical patterns have been recorded by means of *WordSketch* tool. The main function of *total* is modifying head nouns, which comprises 93% of all patterns in this sub-corpus. The top three nouns which are

modified by *total* are: *lipid* (20 occurrences), *amount* (18 occurrences) and *content* (17 occurrences):

- 172 followed by linolenic and oleic acids), representing 71.4 and 65.9 wt-% for **total lipids** and PL, respectively.
173 The **total amount** of bound immunoglobulin G (IgG) was estimated by the addition of a specific anti-mouse IgGalkaline
174 For the **total content** of acids and alcohols, a 30 m60.32 mm column coated with 0.25 mm 5% phenylmethylpolysiloxane from Agilent

Total enters *and/or* construction, which accounts for 12 % (Fig. 56). The examples of *and/or* with *total* are presented below:

- 175 The 16:29cis,12cis and 16:39cis,12cis,15 comprised 0.8% and 4.0% of the **total fatty** acid content, respectively
176 Tab. 2 shows the proposed guide-value ranges for the content of **total and free** acids, hydroxyacids and acidic monoesters in pure beeswax.
177 The second fraction was eluted with 25 mL of diethyl ether and contains the **total non-volatile** oxidation compounds, lipid hydrolysis products

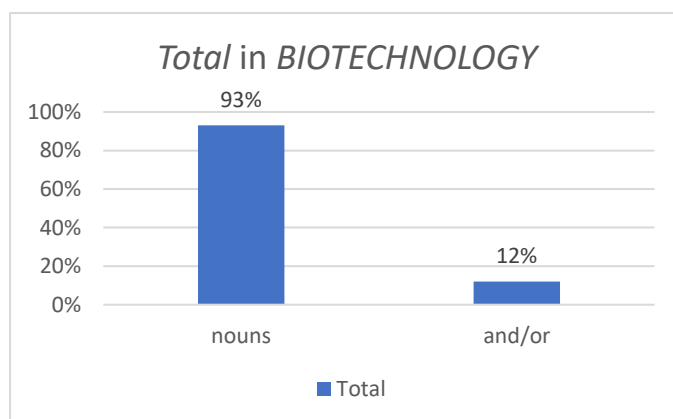


Figure 56. The distribution of lexico-grammatical patterns of *total* in *BIOTECHNOLOGY*

Total is used as a non-gradable adjective in *BIOTECHNOLOGY*. This adjective does not collocate with adverbs. *Total* does not enter the predicative pattern either (Fig. 57).

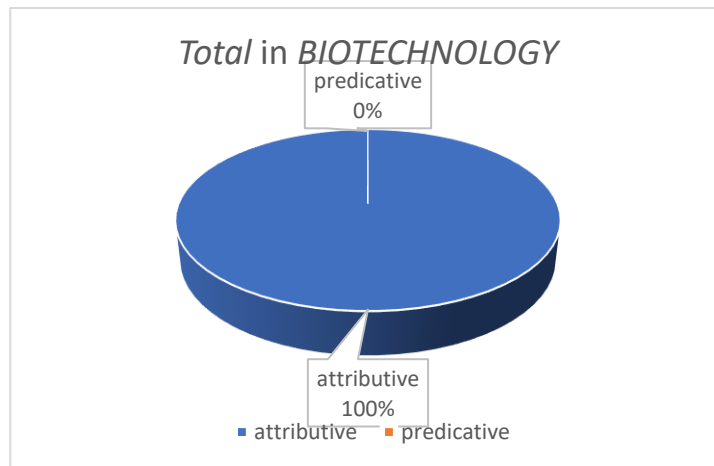


Figure 57. The attributive vs. predicative structure of *total* in *BIOTECHNOLOGY*

The data concerning the ten most common collocates are presented in Table 47, and as can be seen, they are only nouns. In terms of their semantics, they are related to research process, e.g., *amount*, *volume*, and objects under study, e.g., *lipid*, *protein*. 5 of 10 nouns, namely: *phenol*, *lipid*, *o-diphenol*, *hydroxyacid*, *oxidation* seem to be specialized lemmas characteristic of this particular discipline, since we do not find, e.g., *hydroxyacid* or *oxidation*, among collocates in other sub-corpora.

| Word | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| phenol | 24 | 117 | 4.89 | 10.87 |
| lipid | 35 | 486 | 5.87 | 10.50 |
| amount | 23 | 288 | 4.76 | 10.31 |
| volume | 18 | 218 | 4.21 | 10.14 |
| alcohol | 12 | 57 | 3.45 | 10.09 |
| content | 23 | 409 | 4.75 | 10.05 |
| o-diphenol | 8 | 17 | 2.82 | 9.67 |
| hydroxyacid | 7 | 11 | 2.64 | 9.51 |
| protein | 30 | 1,167 | 5.36 | 9.38 |
| oxidation | 9 | 179 | 2.97 | 9.25 |

Table 47. The ten most common collocates of *total* in *BIOTECHNOLOGY*

The most common structural type of lexical bundles that contain *total* is *noun phrase with of-phrase fragment* (type 3A). The frequency differs in the two varieties of lexical bundles, and amounts to 82.74 pmw for 4-word bundles, and 36.50 pmw for 5-word ones (Table 48).

| No | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--------------------------------------|--------------|---|--------------|
| 1 | <u>the total number of</u> | 8 | <u>of total phenols and o-diphenols</u> | 3 |
| 2 | <u>a total volume of</u> | 7 | <u>in a total volume of</u> | 3 |
| 3 | <u>total phenols and o-diphenols</u> | 5 | the total DNA of strain | 3 |

| | | | | |
|----|------------------------------|---|----------------------------------|---|
| 4 | the total amount of | 4 | total DNA of strain TK-6 | 3 |
| 5 | the total volume of | 4 | <u>the total number of cells</u> | 3 |
| 6 | the total amount of | 4 | total variance of the samples | 3 |
| 7 | total volume of the | 4 | <u>the total variance of the</u> | 3 |
| 8 | <u>the total variance of</u> | 3 | <u>of the total variance of</u> | 3 |
| 9 | <u>Of the total variance</u> | 3 | from the total DNA of | 3 |
| 10 | <u>In a total volume</u> | 3 | - | - |

Table 48. The most frequent 4- and 5-word lexical bundles of *total* in *BIOTECHNOLOGY*

5.2.1.6. Concluding remarks

The analysis of five top-frequency adjectives in the *BIOTECHNOLOGY* sub-corpus has revealed that:

- the main function of each adjective is premodifying the head noun in a nominal phrase;
- as many as three adjectives, namely, *high*, *different*, and *low* are modified by adverbs as well as enter the pattern *and/or*;
- *high* and *low* are gradable adjectives. *Different* is used as a partially gradable adjective. The two adjectives, *fatty* and *total*, are used as non-gradable adjectives, since they are not modified by adverbs of degree, do not occur in the comparative and predicative structures;
- the attributive patterns of all the five adjectives are much more common than predicative ones;
- regarding the ten most common collocates of the five adjectives, nouns outnumber other parts of speech. The most significant collocate of *high* and *low* is preposition *than*, with which a comparative structure is created. The most crucial collocate of *different* is *significantly*, which forms *significantly different* collocation. Among *fatty* and *total* collocates there are nouns followed by adjectives;
- all 5 adjectives enter 4-word lexical bundles. *High* does not occur in 5-word bundles. The data in Table 49 summarise the most frequent types of the lexical bundles in *BIOTECHNOLOGY*. As indicated, type 3A, namely, *noun phrase with of-phrase fragment* is most common for both 4-and 5-word bundles. There is a difference in frequency in this type of bundles with the ratio of 231.18 pmw for 4-word bundles to 143.57 pmw for 5-word bundles.

| | 4-word | | 5-word | |
|----|--------------|--------|--------------|--------|
| | Total number | pmw | Total number | pmw |
| 3A | 95 | 231.18 | 59 | 143.57 |
| 3B | 13 | 31.63 | 3 | 7.3 |
| 3C | 54 | 131.40 | 24 | 58.40 |
| 3D | 62 | 150.87 | 31 | 75.44 |
| 3E | 8 | 19.47 | 6 | 14.60 |
| 1D | 5 | 12.17 | 3 | 7.30 |
| 2B | 3 | 7.30 | - | - |

Table 49. Structural types of 4- and 5-word lexical bundles in *BIOTECHNOLOGY*

5.3.1. The five top-frequency adjectives in the *ECOLOGY* sub-corpus

The second sub-corpus to analyse is *ECOLOGY*, which has 456,241 running words. In this respect it is similar in size to *BIOTECHNOLOGY*. Table 50 demonstrates the top five adjectives, of which *high*, *low* and *different*, are present also in *BIOTECHNOLOGY* sub-corpus.

| Adjective | Total number | Pmw |
|-------------|--------------|----------|
| high | 1,270 | 2,783.62 |
| low | 850 | 1,863.05 |
| different | 801 | 1,755.65 |
| large | 755 | 1,654.83 |
| significant | 568 | 1,244.96 |

Table 50. The five top-frequency adjectives in *ECOLOGY* sub-corpus

5.3.1.1. High in ECOLOGY

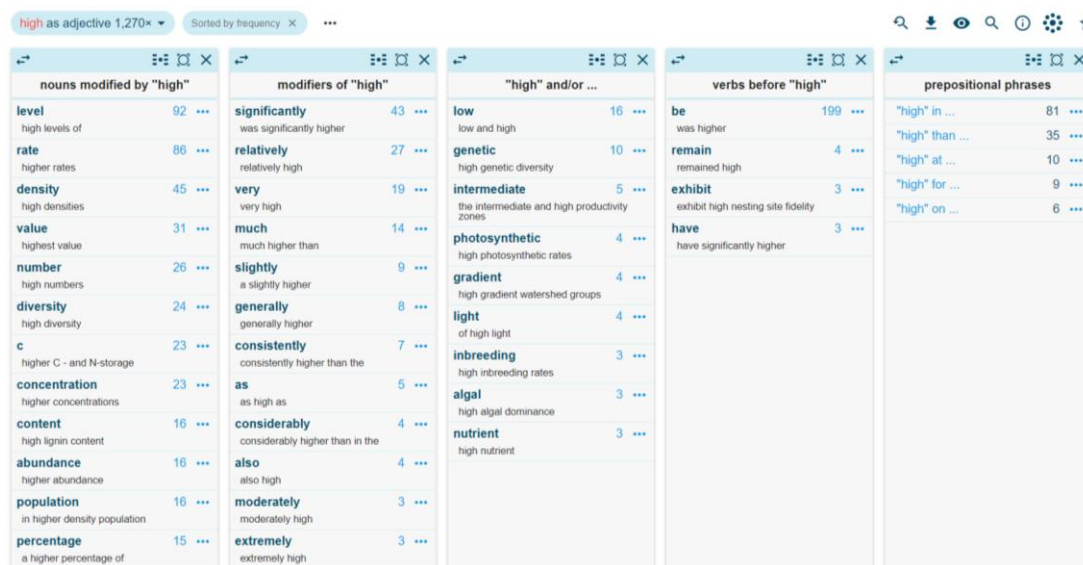


Figure 58. Lexico-grammatical patterns of *high* in *ECOLOGY*

With regard to the top-frequency adjectives in *Ecology*, *high* reaches the frequency of 2,783.62 pmw (Fig. 58). A particularly numerous group which collocates with *high* are nouns. They constitute 72 % of all its lexico-grammatical structures in the sub-corpus (Fig. 59):

- 178 of base cations, it will become an area at the **highest level** of N deposition
of the world in the future.
179 cannot be considered independent because **higher** growth **rates** are
inevitably associated with a greater loss of water and minerals from plant
tissues,
180 but that the effect decreases when fishing on a **higher density** of mussels

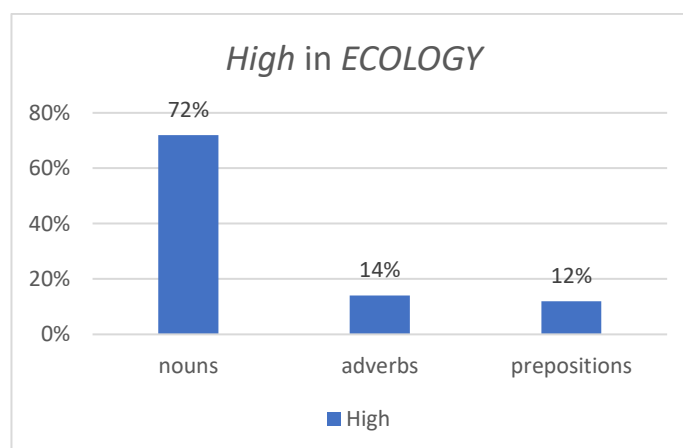


Figure 59. The distribution of lexico-grammatical patterns with *high* in *ECOLOGY*

The second group of words which modify *high* are adverbs. They comprise 14% of all patterns with *high* (Fig. 59). The top three adverbs are: *significantly* (43 occurrences), *relatively* (27) and *very* (19). The examples are as follows:

- 181 the velocity in O6 and O7 was **significantly higher** than in all the other
downstream overflows (O1–
182 for forestry and horticulture. A **relatively high** proportion (around 6%) of
species introduced
183 deposition, soil Fe concentration was also **very high**, and plant would
experience Fe toxicity, a more toxic level than Al toxicity during

The third construction to present is *high + preposition*, which constitutes 12 % of all its constructions:

- 184 whereas soluble sugars were **higher in** *N. pumilio* (Table 1, Fig. 3).
185 is still consistently **higher than** the average values recorded in the whole
distributional range of the species
186 In contrast, the benthos diversity is **higher at** Hallenthan at Bergebukta

High collocates with verbs as well. The top verb is *to be*, which is followed by *remain* and *exhibit*, but they occur rarely in *ECOLOGY* sub-corpus, 4 and 3 occurrences respectively:

- 187 kg to nearly 12,000 kg, **being** exceptionally **high** from 2008 to 2011
(approximately 8000–12,000
188 This ratio **remained high** (45–70) throughout the course of the
decomposition assay.
189 In general, eagles are socially monogamous and **exhibit high** nesting site
fidelity both within and among breeding seasons

As can be seen in Fig. 58, the structure *was higher* occurs 199 times and constitutes 16% of all structures with this adjective, which confirms that *high* functions in the predicative pattern as well. The attributive pattern heavily outnumbers the predicative one, with the ratio of 84% to 16% (Fig. 60).

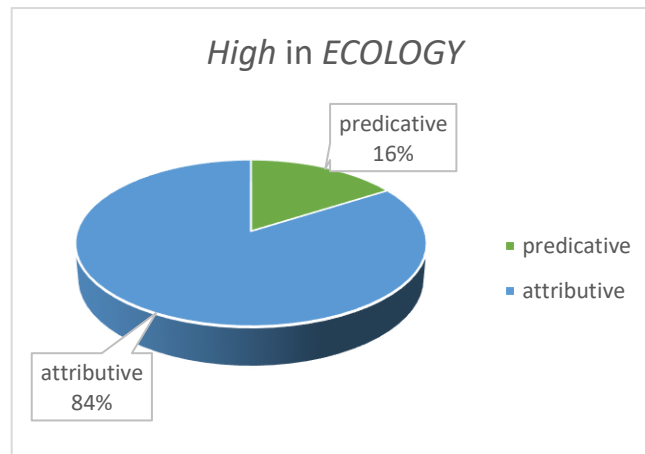


Figure 60. The attributive vs. predicative structure of *high* in *ECOLOGY*

Table 51 lists the ten most common collocates of *high* in *ECOLOGY*, and it can be seen that the most significant collocate is the preposition *than* ($LogDice=11.10$). In the majority of cases it occurs in a comparative structure, *higher than*, as in: *the slow-growing species would be higher than that of the fast-growing species*. Other prepositions that collocate with *high* are *with*, *at*, and *in*. The second part of speech that collocates with *high* in *ECOLOGY* are nouns, and in terms of their semantics they refer to research vocabulary: *level*, *rate*, *density*. Among the top collocates of *high* in *ECOLOGY*, the verb *have* has also been noticed as common, as in: *have a high level*, *had the second highest emissions per tourist*. Other collocates of *high* are: the adjective *low*, e.g., *Species are ranked from lowest to highest*, *a low or high rate*, and the adverb *significantly*, e.g., *The intermediate and high productivity zones were not significantly different*, *the velocity in O6 and O7 was significantly higher*.

| Word | Cooccurrence count | Candidate count | T-score | LogDice |
|---------------|--------------------|-----------------|---------|---------|
| than | 162 | 1,141 | 12.53 | 11.10 |
| level | 115 | 655 | 10.59 | 10.93 |
| rate | 119 | 992 | 10.71 | 10.75 |
| density | 83 | 584 | 8.97 | 10.52 |
| with | 173 | 3,689 | 12.54 | 10.16 |
| have | 115 | 2,241 | 10.26 | 10.07 |
| at | 114 | 2,232 | 10.22 | 10.06 |
| low | 69 | 859 | 8.08 | 10.05 |
| in | 399 | 12,522 | 18.60 | 9.89 |
| significantly | 48 | 403 | 6.80 | 9.88 |

Table 51. The ten most common collocates of *high* in *ECOLOGY*

Table 52 provides lexical bundles with adjective *high* in *ECOLOGY*. The most frequent structural type of 4-word lexical bundles is *noun phrase with of-phrase fragment* (type 3A, pmw=43.87), and *prepositional phrase* (type 3D, pmw=39.45) for 5-word bundles.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|---------------------------------|--------------|--|--------------|
| 1 | <u>at high levels of</u> | 8 | <u>species richness at high levels</u> | 6 |
| 2 | <u>high levels of soil</u> | 6 | <u>richness at high levels of</u> | 6 |
| 3 | <u>richness at high levels</u> | 6 | <u>high levels of soil resources</u> | 6 |
| 4 | <u>species richness at high</u> | 6 | <u>in species richness at high</u> | 5 |
| 5 | a result of high | 5 | <u>at high levels of soil</u> | 4 |
| 6 | in areas of high | 5 | with a high percentage of | 3 |
| 7 | under high levels of | 5 | high levels of the soil | 3 |
| 8 | a high habitat suitability | 5 | intermediate and high productivity zones | 3 |
| 9 | a high level of | 5 | in the high productivity zone | 3 |
| 10 | high levels of productivity | 4 | at the high food level | 3 |

Table 52. The most frequent 4- and 5-word lexical bundles of *high* in *ECOLOGY*

5.3.1.2. *Low* in *ECOLOGY*

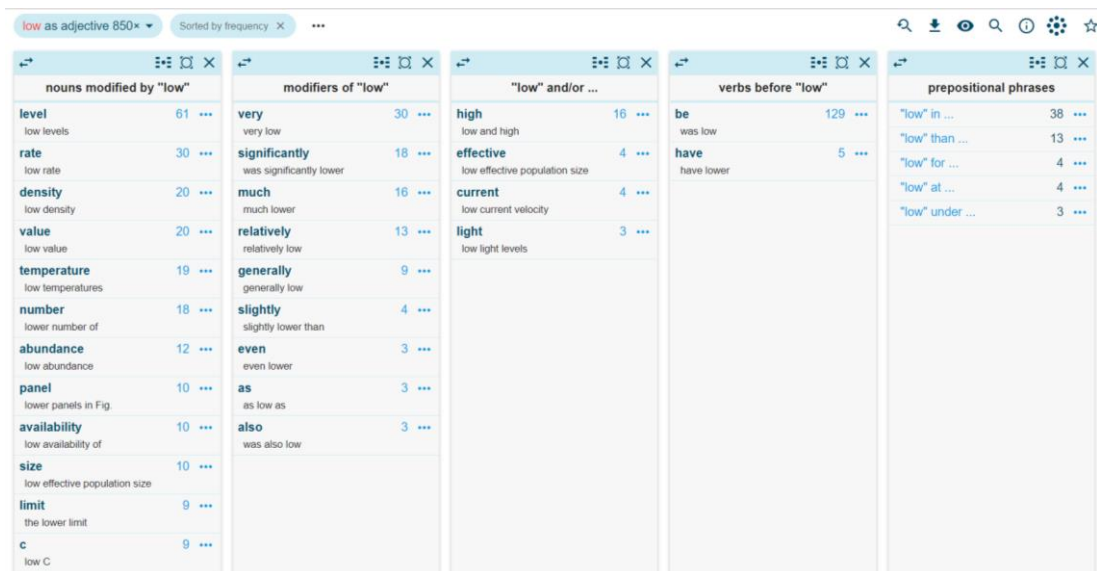


Figure 61. Lexico-grammatical patterns of *low* in *ECOLOGY*

The second adjective to discuss, as shown in Table 50, is *low*, with 850 occurrences. The most common patterns in which *low* occurs are presented in Fig. 61: *low* + *noun* (68 %) and *adverb* + *low* (15%). They are followed by two equally productive constructions: *low* + *preposition* and *and/or* (8%), all illustrated in Fig. 62.

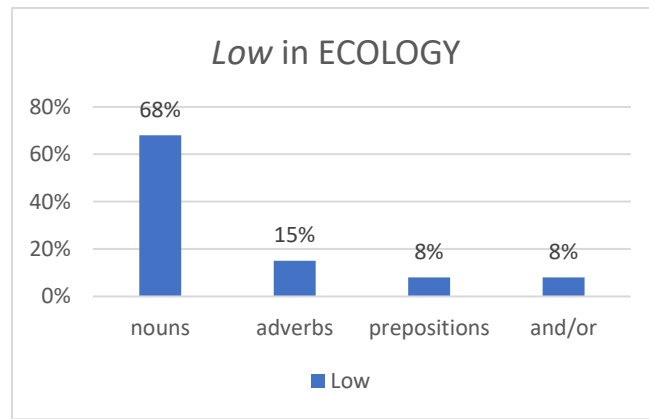


Figure 62. The distribution of lexico-grammatical patterns of *low* in *ECOLOGY*

The first structure to analyse is *low* as a modifier in a nominal phrase. The three top-frequency nouns are *level*, *rate* and *density*, with the total number of 61, 30 and 20. The same nouns, although with different frequency, collocate with the previously discussed adjective *high*, in *ECOLOGY* sub-corpus. This is illustrated with the following concordances:

- 190 Under **low levels** of the soil resource, species composition is limited to
slow-growing species
- 191 we expected that decomposing leaf litter of a single tree species would
support **lower rates** of non-symbiotic N fixation than mixed species litter
taken from
- 192 and probably occurred in very **low densities** at our sampling site.

As far as adverbs are concerned, the most frequently used ones are: *very* (30 occurrences), *significantly* (18) and *much* (16 occurrences), which often collocate with the comparative form of *low*:

- 193 Intent is to manage grazing pressure at a **very low** level and use fire to
control biomass as
- 194 At 5 km porpoise detections were **significantly lower** 2–4 h before seal
scarer activity than 5–7 h before
- 195 also be affected by *O. amphimone*, but to a **much lower** degree than *N.*
pumilio (Veblen et al. 1996;

As many as 69 tokens occurred in *and/or* pattern (85). The examples are:

- 196 there is evidence from field surveys that both **higher and lower** plants
continue to accumulate N in foliage
- 197 The population with **low effective** population size has been exposed to high
inbreeding rates and heterozygosity losses
- 198 Four other species were closely oriented to sand and gravel substrate with
low current velocities

70 tokens are present in *low + preposition* pattern, mainly with prepositions *in* and *than*, with the total number of 38 and 13 occurrences, respectively:

- 199 The damage ratio was **lowest in** GY01 lands cape plot(6.1614%).
 200 one location in each major tributary (e.g., fourth order or one order
lower than the main stem), one location in one third,
 201 deviations of urchin density were small for all surveys combined and
 generally **lower for** weekly surveys than quarterly surveys (Table 1).

As far as verb patterns are concerned, the most common is *to be* (129 tokens). Only 5 instances are found in the pattern *have + low*. The two structures account for 17 % of the predicative function of *low*. The percentage comparison between the attributive and predicative patterns of *low* is presented in Fig. 63, the former outnumbering the latter with the ratio of 83% to 17%. The instances of the predicative pattern are illustrated by the following examples:

- 202 beetles. Although *Ips* populations **were low** in their study, McHugh et al.
 (2003) concluded
 203 band, the reflectance **is obviously lower** under drought stress than that of
 the contrast
 204 Rhodophytes **have generally lower** $\delta^{13}C$ values than other macroalgal
 phyla (Raven et al. 2002b).

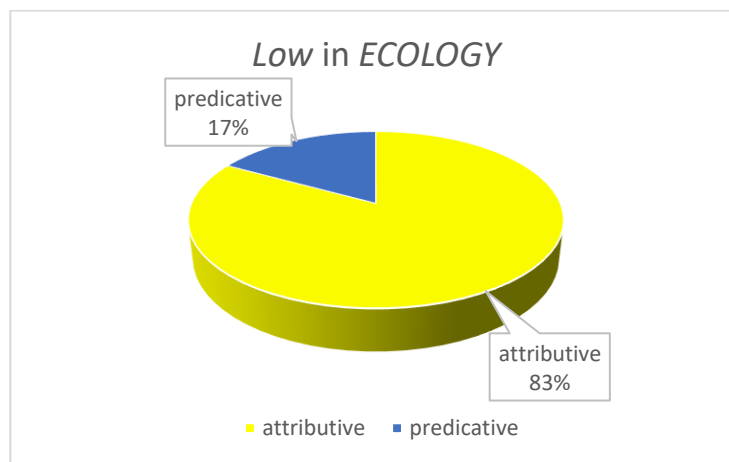


Figure 63. Attributive vs. predicative function of *low* in *ECOLOGY*

Table 53 presents the ten most common collocates of *low*, which are arranged according to *LogDice* index. We can see that nominal collocates outnumber other parts of speech (5 of 10 collocates are nouns). The nouns are related mainly to research lexis, e.g., *level*, *value*, *rate*. The second type of collocates are prepositions, of which *than* (*LogDice*=10.48) is the most significant. In 94% of the records, *low* and *than* create a comparative structure *lower than*, e.g.,

These were much lower than those of the other four areas. The only adjective that collocates with *low* is *high*, e.g., *The SER is highest for low levels of LD*, and the only modifier of degree is *very*, e.g., *very few can tolerate low light levels*.

| Word | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| level | 80 | 655 | 8.84 | 10.77 |
| than | 87 | 1,141 | 9.15 | 10.48 |
| rate | 62 | 992 | 7.69 | 10.11 |
| high | 67 | 1,279 | 7.96 | 10.01 |
| very | 33 | 243 | 5.68 | 9.95 |
| at | 85 | 2,232 | 8.86 | 9.82 |
| with | 119 | 3,689 | 10.41 | 9.75 |
| temperature | 33 | 463 | 5.63 | 9.69 |
| density | 35 | 584 | 5.77 | 9.64 |
| value | 36 | 715 | 5.82 | 9.56 |

Table 53. The ten most common collocates of *low* in *ECOLOGY*

The data concerning the lexical bundles with *low* in *ECOLOGY* are provided in Table 54. The most productive pattern of 4-word lexical bundles is *prepositional phrase* (type 3D, pmw=48.22). With regard to 5-word bundles, the most common type is also prepositional phrase, but its frequency is lower, at the level of 28.49 pmw.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--------------------------------------|--------------|--|--------------|
| 1 | <u>at the low food</u> | 6 | <u>at the low food level</u> | 5 |
| 2 | <u>the low food level</u> | 6 | <u>in the low-gradient watershed groups</u> | 4 |
| 3 | a low level of | 5 | <u>in the low productivity zone</u> | 4 |
| 4 | due to the low | 4 | <u>aggregations in the low-productivity zone</u> | 4 |
| 5 | <u>the low productivity zone</u> | 4 | perch from the low food | 3 |
| 6 | <u>in the low productivity</u> | 4 | <u>perch at the low food</u> | 3 |
| 7 | artificial aggregations in low | 4 | <u>artificial aggregations in the low-productivity</u> | 3 |
| 8 | the low-gradient watershed groups | 4 | - | |
| 9 | <u>in the low-gradient watershed</u> | 4 | - | |
| 10 | <u>in the low-productivity zone</u> | 4 | - | |

Table 54. The most frequent 4- and 5-word lexical bundles of *low* in *ECOLOGY*

5.3.1.3. *Different* in *ECOLOGY*

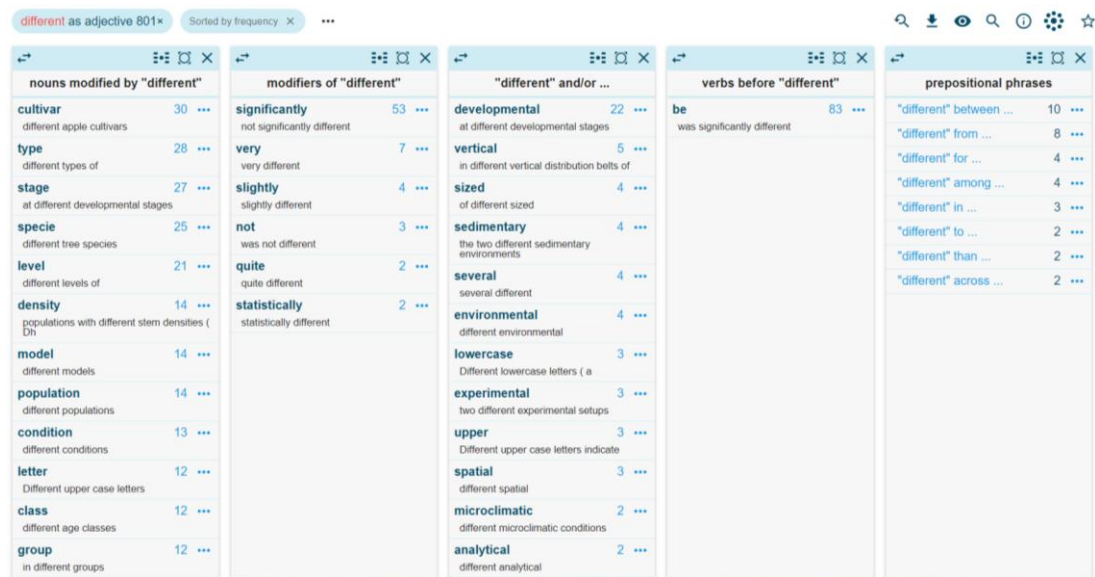


Figure 64. Lexico-grammatical patterns of *different* in *ECOLOGY*

Different is the third of the frequently used adjectives in *ECOLOGY* subcorpus, with the total number of 801 (Fig. 64). Its most frequent collocates are nouns which constitute 86 % of all its lexico-grammatical structures. The two other patterns in which *different* occurs are: *and/or*, 13%, and *adverb + different*, 10% (Fig. 65). As far as nouns are concerned, the most frequently used noun is domain-specific *cultivars* (30 occurrences), followed by *type* (28) and *stage* (27):

205 of infested flowers were not consistent in the **different** apple **cultivars**.
 206 transects, which may be attributed to **different** **types** and intensities of the
 impact of human
 207 green plants, under both drought stress and at **different** developmental
stages.

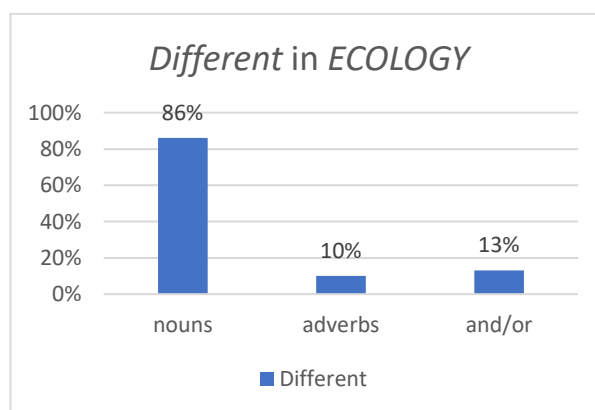


Figure 65. The distribution of lexico-grammatical patterns with *different* in *ECOLOGY*

Of 801 items taken into account in the analysis, 102 (13%) represent *and/or* construction. *Developmental* is the most frequently used adjective in the subcorpus (22 occurrences). This is followed by *vertical* and *sized*, with low total number at the level of 5 and 4 occurrences, respectively:

- 208 The foraging effort devoted to eating in the different **developmental** stages
of *Blighia unijugata*
209 butterfly diversity index varieties H0 and E in different **vertical** distribution
belts of Changbai
210 that consist of different **sized** individuals under the same log have generated
speculation about the social structure and dispersal patterns of

As many as 10% of the records are identified in the pattern *adverb + different*. The most frequently used adverb is *significantly* (53 occurrences). Other adverbs, e.g., *slightly* (4) and *very* (7) do occur in *ECOLOGY* sub-corpus, but they are less commonly used. These patterns can be seen in:

- 211 clusters on NMDS plot indicated **significantly** different soil microbial
community structure between
212 al., 2002), although it may occur at **slightly** different times for different apple
cultivars depending
213 carabid beetles and spiders are known to be very different, no direct
comparison can be made between

As far as the pattern *verb before different* is concerned, we can see that in the majority of cases *different* collocates with *to be*. In as many as 83 occurrences, it occurs only in the predicative form (11%). This means that the attributive form constitutes 89% of all instances (Fig. 66). The less common predicative pattern can be seen in:

- 214 In this study, neither recruitment nor growth rates **were different** for native
versus invasive species
215 the groups of offspring deriving from different populations **was different** from
zero
216 Fig. 2 shows that the E value of the five vertical distribution belts **was different**

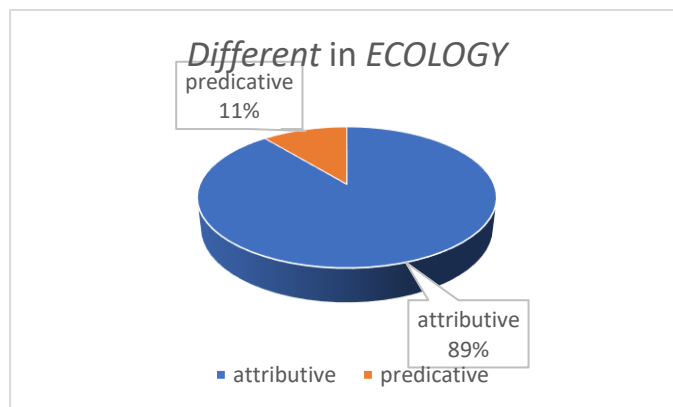


Figure 66. The attributive vs. predicative structure of *different* in *ECOLOGY*

As Table 55 demonstrates, the most crucial lemma which *different* collocates with is the adverb *significantly* ($LogDice=10.57$), e.g., *These proportions were significantly different*. Among other lemmas, we find four nouns, which are related to objects under analysis, e.g., *cultivar*, *apple*, or research lemmas, e.g., *stage*, *type*. We also observe three prepositions: *among*, *at*, *under*, as in the examples: *among approximately 480 different foods*, *different treatments at different developmental stages*, *under very different conditions*. There are two adjectival collocates as well: *different* and *developmental*, e.g., *in a different year and in a different orchard*, *different developmental stages*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|---------------|--------------------|-----------------|---------|---------|
| significantly | 56 | 403 | 7.41 | 10.57 |
| cultivar | 34 | 112 | 5.80 | 10.25 |
| apple | 28 | 98 | 5.27 | 10.00 |
| stage | 33 | 291 | 5.67 | 9.95 |
| different | 48 | 801 | 6.77 | 9.94 |
| among | 40 | 563 | 6.20 | 9.91 |
| type | 34 | 365 | 5.74 | 9.90 |
| developmental | 24 | 49 | 4.89 | 9.85 |
| at | 82 | 2,232 | 8.71 | 9.79 |
| under | 32 | 397 | 5.56 | 9.77 |

Table 55. The ten most common collocates of *different* in *ECOLOGY*

Table 56 indicates the lexical bundles with *different* in *Ecology*. With regard to 4-word lexical bundles, the most common structure is *prepositional phrase* (3D, $pmw=94.25$), and among 5-word ones is *noun phrase with other post-modifier fragment* (3B, $pmw=48.22$).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|---|-----------------------------------|--------------|--|--------------|
| 1 | at different developmental stages | 12 | <u>populations with different stem densities</u> | 8 |
| 2 | with different stem densities | 9 | <u>at different distances along a</u> | 5 |

| | | | | |
|----|--|---|--|---|
| 3 | <u>populations with different stem</u> | 8 | bamboo populations with different stem | 4 |
| 4 | was not significantly different | 7 | stands in different developmental stages | 4 |
| 5 | were not significantly different | 7 | dispersed at different distances along | 3 |
| 6 | <u>at different distances along</u> | 6 | the contributions of different N | 3 |
| 7 | from different apple cultivars | 6 | different months of the year | 3 |
| 8 | under different levels of | 5 | during the different sampling periods | 3 |
| 9 | different distances along a | 5 | fish pass during the different | 3 |
| 10 | of different N components | 5 | different age classes in July | 3 |

Table 56. The most frequent 4- and 5-word lexical bundles of *different* in *ECOLOGY*

In the analysis of the patterns with *different* in *ECOLOGY* no comparative and superlative structures with this adjective have been observed. *Different* in *ECOLOGY* sub-corpus does not have a full set of properties.

5.3.1.4. *Large* in *ECOLOGY*

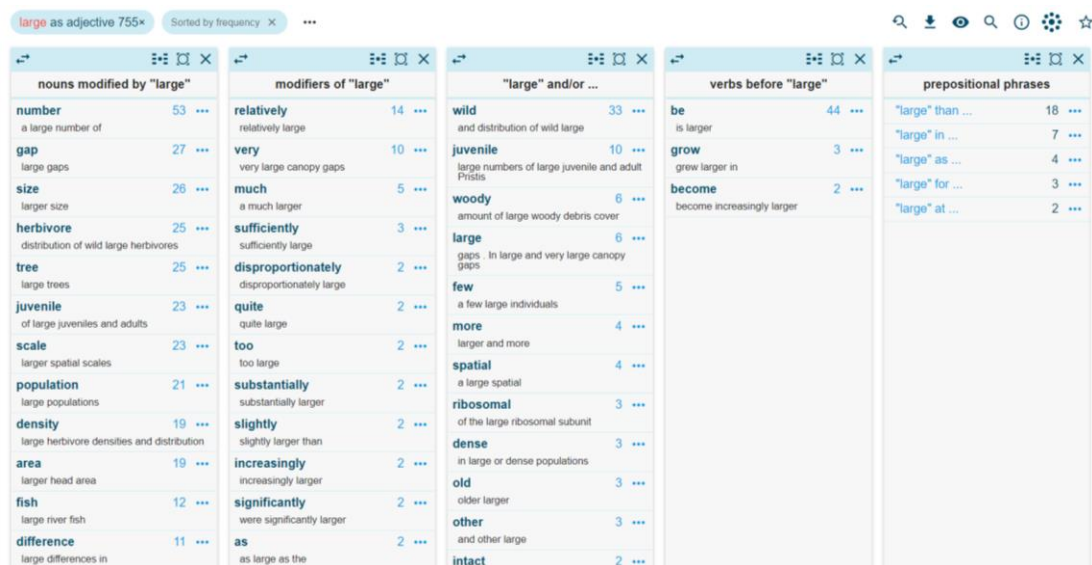


Figure 67. Lexico-grammatical patterns of *large* in *ECOLOGY*

As can be seen in Fig. 67, the fourth adjective is *large*, with the total number of 755 (pmw=1,654.83). The most significant function which *large* takes is a modifier in a nominal phrase, which comprises 82 % of all its patterns. The three top-frequency nouns are: *number*, *gap* and *size* with as many as 53, 27, and 26 occurrences:

- 217 Some species have been shown to germinate in **large numbers** following disturbance from intense storms
- 218 However, in the **largest gaps** situated in the 22- and 33-year-old sites, there was a greater differentiation
- 219 light is not correlated with maximal growth rate, fast-growing species attain **larger sizes** than slow-growing species,

The second construction in which *large* occurs is *and/or*. It is found in as many as 140 instances, which accounts for 18% of all patterns with *large*. *Large* collocates also with other adjectives: *wild* (33 occurrences), *juveline* (10) and *woody* (6).

- 220 However, studies of mammal communities across **large** spatial scales
 continue to be rare in ecological research
 221 This discrepancy, including the presence of the **large** juvenile and adult
 hotspot near St. Lucie, may be due to the presence of a mosaic of habitats
 such as coastal reefs, a
 222 affect stream width and depth, and may influence the levels of boulder,
 cobble and **large** woody debris cover.

Large is modified by adverbs as well which comprise only 8% of all its patterns (Fig. 68). The top three modifiers of degree are *relatively* (14 occurrences), *very* (10) and *much* (5). This is illustrated with the following concordances below:

- 223 The proportion of canopy under gap and the mean gap area was both
 relatively **large** when compared with other forests with the exception of
 boreal forests
 224 Althoughvery **large** expansions were observed, the majority of gap
 expansions and formation of random new gaps in our study area resulted
 225 However, these juveniles weremuch larger than the tautog larvae that we
 investigated (2.3–7.7 mm SL).

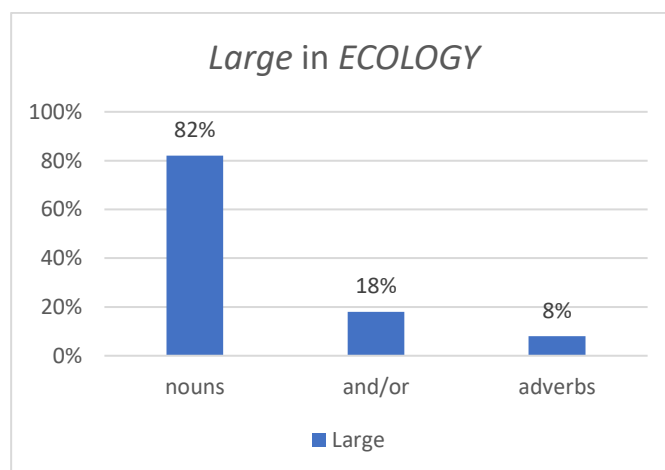


Figure 68. The distribution of lexico-grammatical patterns of *large* in *ECOLOGY*

Fig. 69 shows the percentage distribution of the attributive and predicative construction of *large* in *Ecology*. In the substantial majority of cases, the attributive form prevails (91%) over the predicative one (9%).

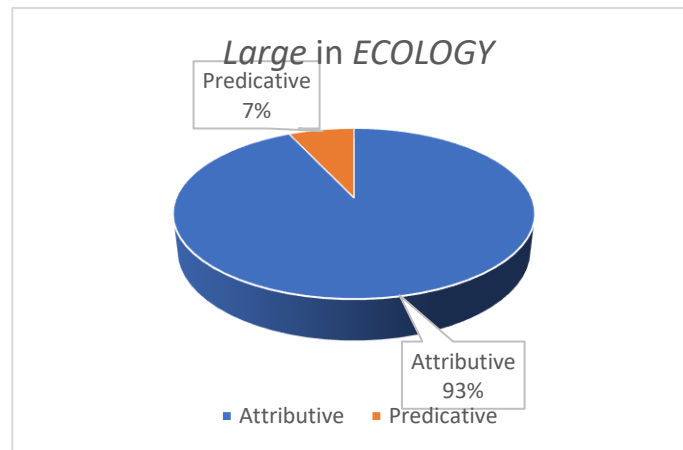


Figure 69. The attributive vs. predicative structure of *large* in *ECOLOGY*

Table 57 summarises the statistics of the ten most common collocates of *large*. As can be seen, 8 of 10 collocates are nouns, e.g., *herbivore*, *juvenile*, and *density*. As far as their semantics is concerned, they refer to objects under investigation, e.g., *herbivore*, *adult*, *river*, or research process, e.g., *number*, *gap*, *distribution*. The only adjective in the table is *wild*, which collocates with *large* and the noun *herbivore*, e.g., *distribution of wild large herbivores*, and the only preposition is *than*, which enters the comparative constructions with *large*: *however not more than the large C. arquatrix*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|--------------|--------------------|-----------------|---------|---------|
| herbivore | 56 | 144 | 7.46 | 11.00 |
| juvenile | 40 | 233 | 6.28 | 10.37 |
| wild | 34 | 98 | 5.81 | 10.35 |
| number | 63 | 863 | 7.80 | 10.32 |
| gap | 44 | 481 | 6.54 | 10.19 |
| adult | 35 | 338 | 5.84 | 10.04 |
| density | 41 | 584 | 6.28 | 9.97 |
| than | 57 | 1,141 | 7.35 | 9.94 |
| distribution | 40 | 593 | 6.20 | 9.93 |
| river | 31 | 355 | 5.48 | 9.84 |

Table 57. The ten most common collocates of *large* in *ECOLOGY*

The data on the lexical bundles with *large* in *ECOLOGY* are presented in Table 58. The most common structural type of the 4-word lexical bundles is *other noun phrase* (type 3C, pmw=89.86). Among the 5-word bundles very well marked is the same type, but it is less frequent, pmw=63.56.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|---|----------------|--------------|----------------|--------------|
|---|----------------|--------------|----------------|--------------|

| | | | | |
|----|--------------------------------------|----|---|----|
| 1 | <u>large juveniles and adults</u> | 18 | and distribution of wild large | 10 |
| 2 | a large number of | 15 | <u>of large juveniles and adults</u> | 9 |
| 3 | <u>of wild large herbivores</u> | 11 | <u>distribution of wild large herbivores</u> | 9 |
| 4 | <u>distribution of wild large</u> | 11 | <u>large herbivore densities and distribution</u> | 6 |
| 5 | <u>large juvenile and adult</u> | 9 | <u>of large juvenile and adult</u> | 5 |
| 6 | <u>of large juveniles and</u> | 9 | <u>large juvenile and adult Pristis</u> | 5 |
| 7 | <u>large herbivore densities and</u> | 8 | large herbivore density and distribution | 4 |
| 8 | of large juvenile and | 6 | large juveniles and adults were | 4 |
| 9 | the large number of | 6 | sand on large sand bars | 4 |
| 10 | wild large herbivore densities | 6 | <u>of wild large herbivores in</u> | 4 |

Table 58. The most frequent 4- and 5-word lexical bundles of *large* in *ECOLOGY*

5.3.1.5. Significant in *ECOLOGY*

As shown by Figure 70, *significant* (pmw=1,244.96) is the fifth top adjective in the *ECOLOGY* sub-corpus. The most dominant pattern that *significant* enters is a modifier in a nominal phrase, which comprises 76 % of all its structures (Fig. 71). The three nouns are: *difference* (130 occurrences), *effect* (40) and *interaction* (31), which are presented in the concordances below:

- 226 Some studies have found **significant differences** in soil mineral N under different tree species and this
- 227 Overall, chronic exposure to neonicotinoids had a **significant negative effect** on the number of offspring that emerged
- 228 For litter phenol-oxidase activity, the **significant interaction** with temperature in the current study suggests

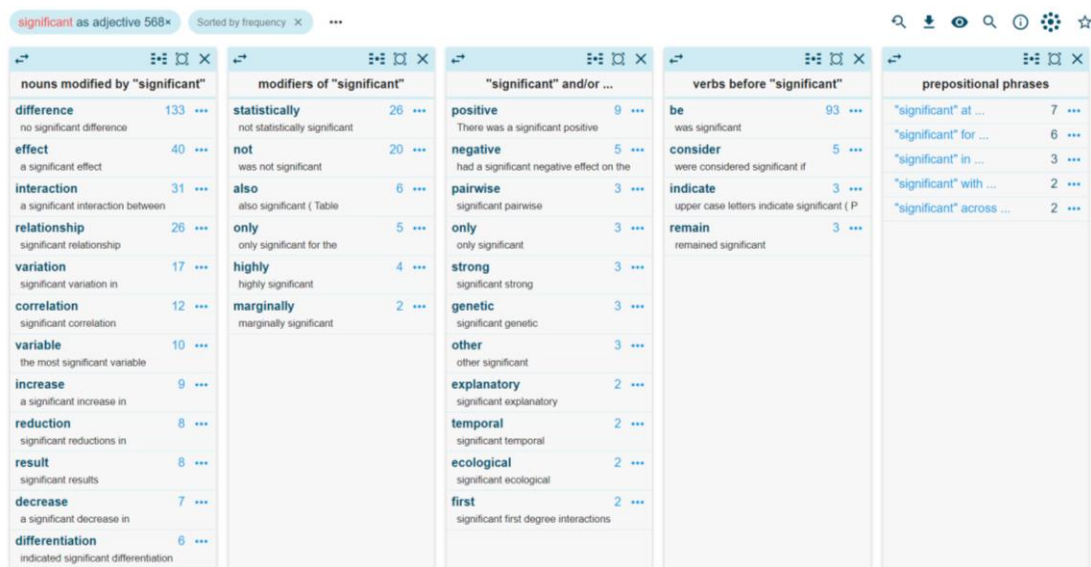


Figure 70. Lexico-grammatical patterns of *significant* in *ECOLOGY*

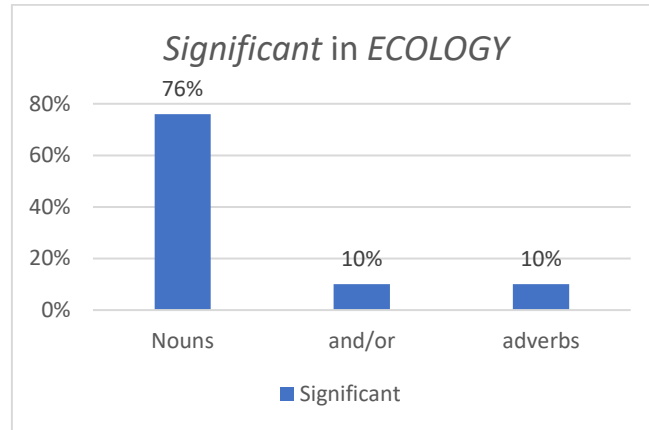


Figure 71. The distribution of the lexico-grammatical patterns of *significant* in *ECOLOGY*

This is followed by two more patterns, the first of which is the adjective phrase (henceforth AP), in which *significant* is modified by adverbs. AP is found in 10% of all patterns with *significant*. As can be seen in Fig. 70, *statistically* is a crucial adverb that collocates with *significant*, mainly when the RAs authors used statistics. *Also significant* and *only significant* are the two next instances in this category, but their importance is marginal, since they occur 6 and 5 times respectively. The examples are presented as follow:

- 229 The RDA revealed **statistically significant** compositional differences in
vascular plant communities
- 230 there are **also significant** differences on the anthropogenic activities and
intensities in reef flat
- 231 The individual anovas were **only significant** for coffee and grasses

As far as the *and/or* construction is concerned, it is as productive as the adjective phrase, since it accounts for 10% as well.

- 232 There was a **significant positive** correlation between MBN and litter C: N
ratio.
- 233 chemical to organic fertilizer may be performed without a **significant
negative** effect on the overall ground-dwelling predators.
- 234 Most of the **significant pairwise differentiation** involved populations at the
extreme eastern

Figure 72 presents a comparison between the attributive and predicative use of *significant*. The former comprises 81% of patterns, while the latter 19%. *To be* collocates with *significant* most frequently (Fig. 70). It is followed by *consider* and *indicate*, but the total number is low with only 5 and 3 occurrences, respectively:

235 the rotenone dosing compared with 1 year after in the treatment streams **was**
significant
 236 Variables were **considered significant** if they were within the 0.90
 confidence level using a Monte Carlo permutation test with 1000
 permutations
 237 Different upper case letters **indicate significant** ($P < 0.05$) differences in
 concentrations between species, and different lower case letters

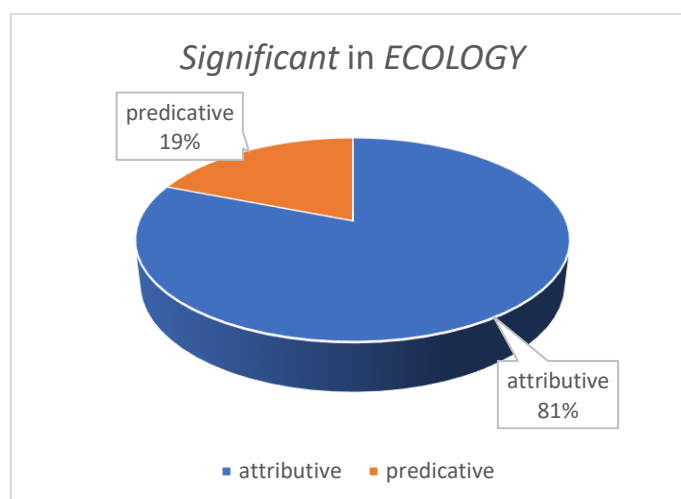


Figure 72. The attributive vs. predicative structure of *significant* in *ECOLOGY*

Table 59 presents the ten most common collocates of *significant* according to *LogDice* index. The collocates are varied in terms of the category of parts of speech they represent. The most significant collocate is *difference* (*LogDice*=11.92), e.g., *a significant difference between observed and predicted values*. Nominal collocates are the most numerous category of parts of speech (4 of 10), and they refer to research process, e.g., *difference, interaction, effect*. Among the significant collocates, we also observe the negation *no* (*LogDice*=11.50) and the pronoun *there* (*LogDice*=11.28) which create frequently used collocation: *There was no significant difference*. With a view to adverbs, the only instance is *statistically*, e.g., *statistically significant regression relationships*. The one preposition that enters collocations with *significant* is *between*, e.g., *significant differences between collection dates*. Among the ten collocates we also find verbs: *indicate* and *show*, e.g., *the twin haul experiment indicate no significant difference, polynomials showed significant fit*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|---------------|--------------------|-----------------|---------|---------|
| difference | 156 | 751 | 12.43 | 11.92 |
| no | 100 | 566 | 9.94 | 11.50 |
| there | 88 | 589 | 9.32 | 11.28 |
| interaction | 42 | 231 | 6.45 | 10.75 |
| statistically | 27 | 52 | 5.19 | 10.48 |
| between | 90 | 1,547 | 9.33 | 10.45 |

| | | | | |
|--------------|----|-----|------|-------|
| effect | 52 | 930 | 7.08 | 10.15 |
| relationship | 34 | 414 | 5.76 | 10.15 |
| indicate | 35 | 504 | 5.83 | 10.06 |
| show | 41 | 824 | 6.28 | 9.91 |

Table 59. The ten most common collocates of *significant* in *ECOLOGY*

As regards the lexical bundles with *significant* in *Ecology*, they are shown in Table 60. *Noun phrase with other post-modifier fragment* (3B, pmw=142.47) is the most frequent type of 4-word lexical bundles. As far as 5-word bundles are concerned, the most common is *verb phrase* (1B, pmw=59.18).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|---|--------------|--|--------------|
| 1 | <u>was no significant difference</u> | 15 | <u>there was no significant difference</u> | 10 |
| 2 | <u>there was no significant</u> | 15 | <u>there was a significant effect</u> | 7 |
| 3 | <u>no significant difference in</u> | 14 | <u>was no significant difference in</u> | 7 |
| 4 | <u>there was a significant</u> | 14 | was a significant effect of | 7 |
| 5 | <u>no significant difference between</u> | 12 | <u>no significant difference between the</u> | 6 |
| 6 | <u>significant difference in the</u> | 11 | <u>a significant difference in the</u> | 6 |
| 7 | <u>There was a significant</u> | 10 | was no significant difference between | 6 |
| 8 | <u>a significant difference in</u> | 10 | There were no significant differences | 5 |
| 9 | a significant interaction between | 9 | were no significant differences in | 5 |
| 10 | <u>significant difference between the</u> | 9 | There was no significant difference | 5 |

Table 60. The most frequent 4- and 5-word lexical bundles of *significant* in *ECOLOGY*

As compared to *significant* in the *ELC*, *significant* in *ECOLOGY* is also used as a gradable adjective. It tends to be used in comparative constructions, but not frequently, e.g., *a greater number of (generally more significant) relationships*.

5.3.1.6. Concluding remarks

The following conclusions can be drawn from the analysis of the five top-frequency adjectives in *Ecology* sub-corpus:

- the most crucial pattern that each of the five adjectives enters is a premodifier in a nominal phrase;
- the four adjectives: *high*, *low*, *large* and *significant* have a full set of properties, which means they enter both the attributive and predicative patterns, are used in the comparative and superlative constructions and are modified by adverbs; *different* does not occur in comparative structures, and, therefore, is not a full value adjective;
- the attributive pattern is much more frequently used than the predicative one;

- the most common category of parts of speech of the ten collocates are nouns (24 of 50), which are followed by prepositions (12 of 50). Some of the collocates directly precede or follow the adjectives as in: *higher than, significantly different*;
- all adjectives form 4- and 5-word bundles. The most common structural types of the lexical bundles for the entire *ECOLOGY* sub-corpus are summarized in Table 61. The *prepositional phrase* (type 3D, pmw=219.18) prevails over noun phrases (3B and 3C) among 4-word bundles. The pattern 3B (*noun phrase with other post modifier*, pmw=138.08) is most frequent one among 5-word bundles.

| | 4-word | | 5-word | |
|----|--------------|--------|--------------|--------|
| | Total number | pmw | Total number | pmw |
| 3A | 57 | 124.93 | 24 | 52.60 |
| 3B | 82 | 179.73 | 63 | 138.08 |
| 3C | 60 | 131.51 | 32 | 70.14 |
| 3D | 100 | 219.18 | 57 | 124.93 |
| 1B | 39 | 85.48 | 27 | 59.18 |
| 1D | 29 | 63.56 | 28 | 61.37 |

Table 61. Structural types of 4- and 5-word lexical bundles in *ECOLOGY*

5.4.1. The five top-frequency adjectives in *LINGUISTICS* sub-corpus

5.4.1.1. *Academic* in *LINGUISTICS*

As regards *LINGUISTICS* sub-corpus, its five top-frequency adjectives are shown in Table 62. In contrast to *BIOTECHNOLOGY* and *ECOLOGY* sub-corpora, *LINGUISTICS* does not share *high* and *low* with them. The only common adjective among the top-frequency ones for the three sub-corpora is *different*. The adjectives: *academic, linguistic, social* and *particular* do not occur among most frequently used adjectives in the previous sub-corpora.

| Adjective | Total number | Pmw |
|------------|--------------|----------|
| academic | 893 | 1,429.96 |
| linguistic | 860 | 1,377.12 |
| different | 831 | 1,330.68 |
| social | 504 | 807.06 |
| particular | 495 | 792.64 |

Table 62. The five top-frequency adjectives in *LINGUISTICS*

Academic is the first adjective in the list. Among its collocates are nouns, which constitute 95 % of all its patterns (Fig. 73 and 74).

academic as adjective 893x Sorted by frequency

| nouns modified by "academic" | | | "academic" and/or ... | | |
|-------------------------------|-----|------|---|----|------|
| writing | 137 | 11.6 | professional | 23 | 11.5 |
| of academic writing | | | academic and professional | | |
| literacy | 53 | 10.8 | english | 18 | 10.6 |
| academic literacy in | | | English academic literacy | | |
| biliteracy | 38 | 10.4 | other | 13 | 10.0 |
| of academic biliteracy | | | in other academic courses | | |
| word | 36 | 9.8 | general | 7 | 10.0 |
| academic words in | | | general academic | | |
| discourse | 29 | 9.8 | medical | 6 | 10.0 |
| academic discourse | | | medical academic writing | | |
| fs | 27 | 9.9 | personal | 4 | 9.3 |
| of academic FS | | | academic and personal | | |
| vocabulary | 25 | 9.8 | established | 3 | 9.2 |
| of academic vocabulary | | | of established academic terms in Korean | | |
| text | 22 | 9.0 | formulaic | 3 | 9.2 |
| in academic texts | | | use of academic formulaic sequences | | |
| context | 19 | 8.7 | technical | 3 | 9.1 |
| in academic contexts | | | technical and academic | | |
| reading | 17 | 9.2 | authentic | 3 | 9.1 |
| of academic reading | | | authentic academic | | |
| discipline | 17 | 9.2 | written | 3 | 8.8 |
| academic disciplines | | | written academic | | |
| purpose | 16 | 9.0 | different | 3 | 8.5 |
| English for academic purposes | | | different academic | | |

Figure 73. Lexico-grammatical patterns of *academic* in *LINGUISTICS*

The most frequently used nouns that collocate with *linguistic* are *writing* (137 occurrences), *literacy* (53), and *biliteracy* (38):

- 238 or students to write in English as they were familiar with English **academic**
 239 writing, an opinion which was shared by the students interviewed
 239 but interestingly, this struggle is not only true of her English **academic**
 239 literacy, but it is also true of writing in Korean
 240 Others advocate **academic** biliteracy as a way of helping to deter English
 240 from monopolizing academia by making professional knowledge

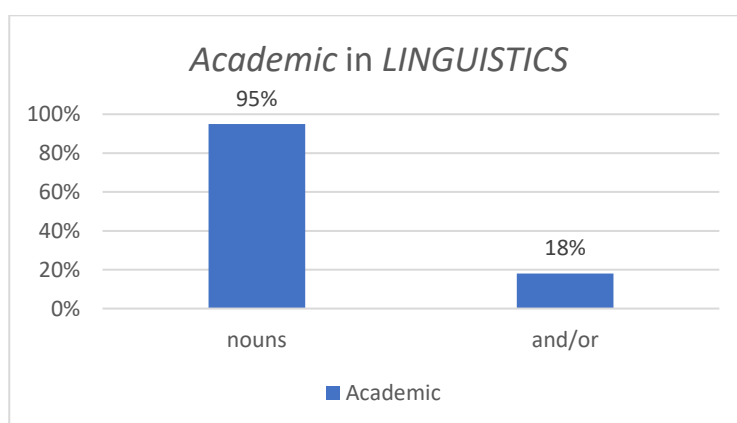


Figure 74. The distribution of lexico-grammatical structures of *academic* in *LINGUISTICS*

Out of 893 tokens, as many as 160 represent *and/or* construction. It is less common than the first pattern, since it comprises 18% of all patterns with *academic*.

- 241 Critical reflections on genre analysis Genre Analysis of **academic and professional** texts has traditionally been the focus of much of ESP (English for Specific Purposes) inspired
- 242 Regarding the teaching of **English academic** writing/research publication skills in peripheral countries, the problem is even more acute because of a lack of
- 243 However, it remains to be seen whether these differences are valid for **other academic** genres

Interestingly, in 100 % of cases, *academic* occurs in the attributive position (Fig. 75).

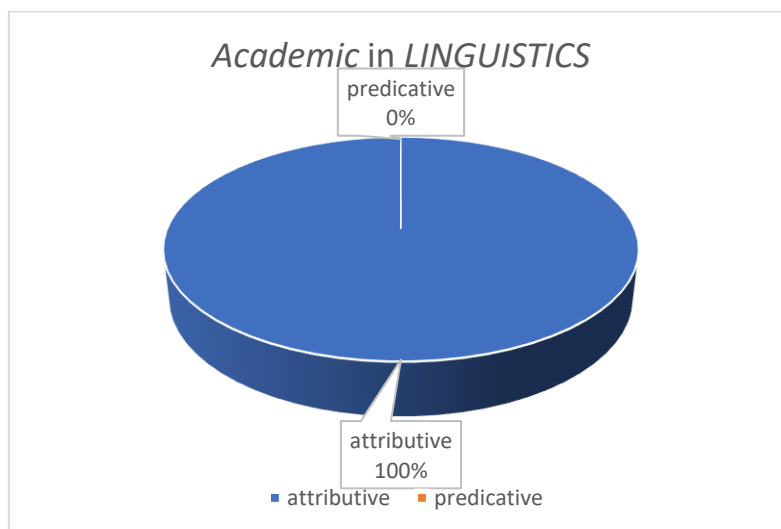


Figure 75. The attributive vs. predicative structure of *academic* in LINGUISTICS

Table 63 summarises the ten most common collocates of *academic* presented according to *LogDice* index. The most significant collocate is *writing* (*LogDice*=11.34), which in the overwhelming majority of cases creates a cluster *academic writing*. As can be observed, the majority of collocates are nouns (6 of 10). As regards their semantics, they seem to be lemmas characteristic of a particular discipline, e.g., *literacy*, *biliteracy*, *reading*. Among the collocates, we also find three adjectives: *English*, *Korean* and *professional*, e.g., *improving their academic English*, *use of Korean for academic purposes*, *This emphasis on academic and professional practice*. The only verbal collocate is *develop*, e.g., *developing the digital and academic literacies*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|------------|--------------------|-----------------|---------|---------|
| writing | 167 | 1,213 | 12.81 | 11.34 |
| literacy | 68 | 196 | 8.22 | 11.00 |
| biliteracy | 41 | 44 | 6.39 | 10.49 |
| English | 94 | 1,680 | 9.49 | 10.23 |
| vocabulary | 31 | 136 | 5.54 | 9.95 |

| | | | | |
|--------------|----|-------|------|------|
| word | 32 | 175 | 5.62 | 9.94 |
| reading | 59 | 1,159 | 7.50 | 9.88 |
| Korean | 30 | 218 | 5.43 | 9.79 |
| develop | 27 | 146 | 5.16 | 9.73 |
| professional | 36 | 506 | 5.90 | 9.72 |

Table 63. Ten ten most common collocates of *academic* in *LINGUISTICS*

Lexical bundles of *academic* are listed in Table 64. The most common structural types are *prepositional phrase* (type 3D, pmw=33.63) for 4-word bundles, and *noun phrase with of-phrase* for 5-word bundles (type 3A, pmw=25.62).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--|--------------|--|--------------|
| 1 | <u>academic literacy in English</u> | 11 | <u>to develop academic literacy in</u> | 5 |
| 2 | of academic writing in | 9 | <u>developing academic literacy in English</u> | 4 |
| 3 | <u>English for academic purposes</u> | 8 | expectations of the academic community | 4 |
| 4 | of the academic community | 7 | <u>the development of academic literacy</u> | 3 |
| 5 | <u>to develop academic literacy</u> | 6 | the important role of academic | 3 |
| 6 | <u>the development of academic</u> | 5 | and spontaneous use of academic | 3 |
| 7 | <u>developing academic literacy in</u> | 5 | the expectations of the academic | 3 |
| 8 | use of academic FS | 5 | <u>of English for academic purposes</u> | 3 |
| 9 | of academic and professional | 5 | used academic words in medical | 3 |
| 10 | <u>develop academic literacy in</u> | 5 | the academic words used in | 3 |

Table 64. The most frequent 4- and 5-word lexical bundles of *academic* in *LINGUISTICS*

On the basis of the analysis of *academic*, we may conclude that it is used as a non-gradable adjective in *LINGUISTICS* sub-corpus. It does not collocate with adverbs, and does not occur in the predicative and comparative structures.

5.4.1.2. Linguistic in *LINGUISTICS*

The second most frequently used adjective in *LINGUISTICS* sub-corpus is *linguistic*, whose lexico-grammatical behaviour is similar to *academic*. There have been 860 tokens of *linguistic* observed in the sub-corpus. It collocates with nouns (90%) and creates *and/or* pattern (24%). As can be seen in Fig. 76, *linguistic* is modified by only one adverb, *specifically*, but its total number is merely 6 occurrences. The distribution of the syntactic patterns with *linguistic* is presented in Fig. 77.

linguistic as adjective 860* Sorted by frequency X ...

| modifiers of "linguistic" | nouns modified by "linguistic" | "linguistic" and/or ... |
|--|---|---|
| specifically 6 11.3 *** a level of specifically linguistic semantics | resource 51 10.6 *** of linguistic resources | cultural 19 10.9 *** the linguistic and cultural |
| | meaning 36 10.1 *** between linguistic meaning and truth-conditions | different 15 10.4 *** different linguistic |
| | semantics 32 10.3 *** of linguistic semantics | certain 8 9.7 *** use of certain linguistic |
| | feature 32 9.7 *** linguistic features | non-linguistic 7 9.8 *** linguistic and non-linguistic signs across the |
| | form 22 9.2 *** linguistic forms | primary 7 9.8 *** and the primary linguistic data problem interfaces |
| | sign 21 9.7 *** linguistic signs | particular 7 9.6 *** share particular linguistic resources |
| | expression 20 9.5 *** linguistic expressions | semantic 7 9.5 *** the linguistic semantic level |
| | competence 20 9.5 *** linguistic competence | rhetorical 6 9.2 *** the linguistic and rhetorical features of |
| | diversity 17 9.4 *** linguistic diversity | individual 5 9.2 *** individual linguistic act in its |
| | analysis 16 8.4 *** of linguistic analysis | specific 5 9.0 *** specific linguistic |
| | system 15 8.7 *** of a linguistic system | many 5 8.9 *** many linguistic |
| | knowledge 15 8.6 *** of linguistic knowledge | other 5 8.3 *** and other linguistic |

Figure 76. Lexico-grammatical patterns of *linguistic* in LINGUISTICS

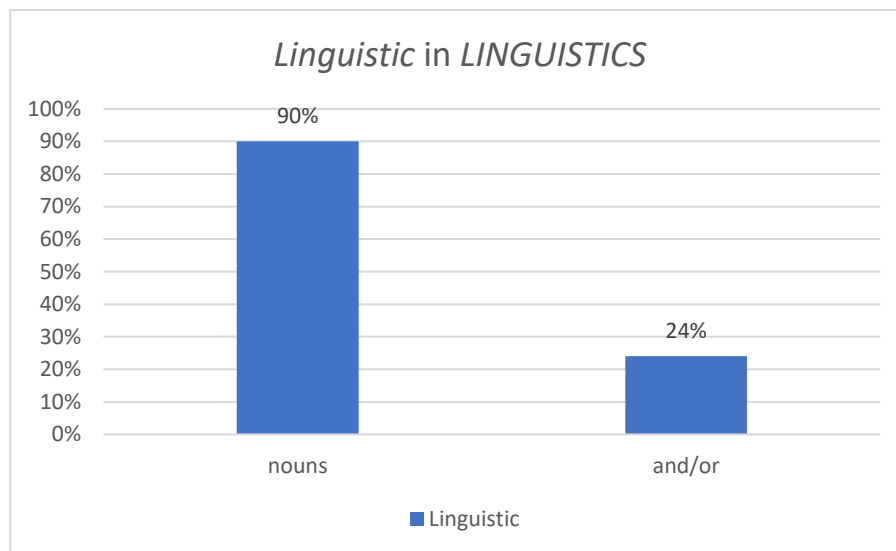


Figure 77. The distribution of lexico-grammatical patterns of *linguistic* in LINGUISTICS

As far as the nominal phrase with *linguistic* is concerned, the following three nouns: *resource* (51 occurrences), *meaning* (36) and *semantics* (32) collocate with this adjective most frequently:

- 244 context and at the same time deploying their available **linguistic resources** to serve that function appropriate
- 245 Without this close, constitutive link between **linguistic meaning** and truth-conditions, this objection goes, we cannot explain linguistic expressions' constant
- 246 his suggests that a specifically **linguistic semantics** i.e., a semantics other than that of thought

Cultural, *different* and *certain* are the three most frequent collocates in *and/or* pattern. Their total number is 19, 15, and 8 occurrences, respectively, as in:

247 then, raises several important questions: how does the **linguistic and**
 248 **cultural** diversity observable in Singapore, which includes the
 paradigmatic relations in that they exist between **different linguistic**
 expressions, for example between a noun and an adjective
 249 In other words, what motivates the use of **certain linguistic** forms in ELF
 discourse (Jenkins, Cogo & Dewey, 2011).

Interestingly, in 100 % of cases, *linguistic* performs the attributive function (Fig. 78).

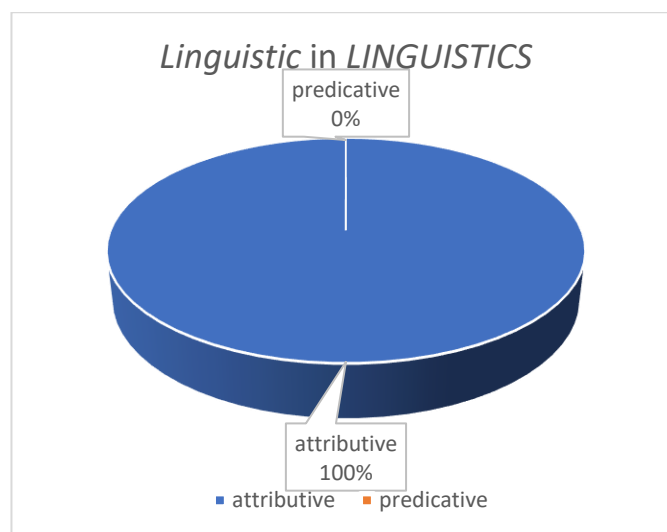


Figure 78. The attributive vs. predicative structure of *linguistic* in *LINGUISTICS*

Table 65 illustrates the ten most common lemmas of the word *linguistic* ordered according to *LogDice* parameter. The most significant collocate of *linguistic* is *resource* (*LogDice*=10.57). Further, *linguistic* collocates with nine nouns and only one adjective, *cultural*. The nouns are related to research process, e.g., *resource*, *diversity*, *feature*, as well as objects under investigation, e.g., *semantics*, *expression*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-----------------|--------------------|-----------------|---------|---------|
| resource | 56 | 348 | 7.43 | 10.57 |
| semantics | 37 | 130 | 6.06 | 10.26 |
| meaning | 46 | 544 | 6.69 | 10.07 |
| feature | 41 | 565 | 6.30 | 9.88 |
| sign | 28 | 151 | 5.26 | 9.83 |
| competence | 28 | 170 | 5.25 | 9.80 |
| cultural | 26 | 186 | 5.06 | 9.67 |
| diversity | 24 | 129 | 4.87 | 9.64 |
| expression | 24 | 243 | 4.48 | 9.48 |
| truth-condition | 18 | 37 | 4.23 | 9.36 |

Table 65. The ten most common collocates of *linguistic* in *LINGUISTICS*

It emerges clearly from the data in Table 66 that *linguistic* is found in 4- and 5-word lexical bundles. The most common structural types are: *other noun phrase* (3C) for 4-word bundles (pmw=78.46), and *prepositional phrase* (3D) for 5-word bundles (pmw=33.63).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--|--------------|---|--------------|
| 1 | <u>between linguistic meaning and</u> | 12 | <u>between linguistic meaning and truth-conditions</u> | 11 |
| 2 | <u>linguistic meaning and truth-conditions</u> | 11 | <u>written and oral meta-linguistic explanation</u> | 9 |
| 3 | <u>written and oral meta-linguistic</u> | 10 | <u>as written and oral meta-linguistic</u> | 6 |
| 4 | <u>and oral meta-linguistic explanation</u> | 9 | <u>cross-disciplinary and cross-linguistic differences in</u> | 5 |
| 5 | the linguistic and cultural | 7 | <u>and cross-linguistic differences in citation</u> | 4 |
| 6 | <u>cross-disciplinary and cross-linguistic differences</u> | 7 | linguistic resources to multilingual students | 4 |
| 7 | attribution of linguistic resources | 6 | the meaning of linguistic expressions | 4 |
| 8 | <u>of linguistic resources to</u> | 6 | <u>of linguistic resources to multilingual</u> | 4 |
| 9 | <u>and cross-linguistic differences in</u> | 6 | relation between linguistic meaning and | 3 |
| 10 | linguistic and non-linguistic signs | 5 | the contrastiveness of the linguistic | 3 |

Table 66. The most frequent 4- and 5-word lexical bundles of *linguistic* in *LINGUISTICS*

Linguistic in *LINGUISTICS* sub-corpus is used as a non-gradable adjective, since it is modified by adverbs very rarely (less than 1% of all patterns with *linguistic*). *Linguistic* occurs neither in the comparative nor predicative structures.

5.4.1.3. Different in *LINGUISTICS*

| modifiers of "different" | nouns modified by "different" | "different" and/or ... | prepositional phrases |
|---|--|--|-------------------------------|
| very 30 11.3 ... very different from | type 54 10.8 ... different types of | linguistic 15 10.4 ... different linguistic | "different" from ... 4.1% ... |
| significantly 9 10.3 ... significantly different from the | way 32 10.0 ... in different ways | many 6 9.8 ... to many different | "different" in ... 0.8% ... |
| quite 8 10.1 ... quite different from | context 30 9.5 ... in different contexts | communicative 5 9.9 ... to different communicative contexts | "different" for ... 0.5% ... |
| qualitatively 5 10.6 ... is qualitatively different from | kind 28 10.2 ... different kinds of | native 4 9.3 ... different native languages | "different" on ... 0.2% ... |
| slightly 4 9.9 ... a slightly different | level 19 9.1 ... different levels of | geographical 3 9.6 ... different geographical locations | |
| somewhat 3 9.3 ... somewhat different | aspect 15 9.1 ... different aspects of the | national 3 9.4 ... different national | |
| markedly 2 9.3 ... markedly different | language 14 8.3 ... different languages | corrective 3 9.2 ... on accuracy for different corrective feedback options | |
| fundamentally 2 9.3 ... fundamentally different from | discipline 13 9.0 ... in different disciplines | first 3 9.0 ... different first | |
| radically 2 9.2 ... radically different | prompt 13 9.0 ... different prompts | cultural 3 8.9 ... different cultural | |
| statistically 2 8.8 ... statistically different | stage 12 8.9 ... the different stages of | academic 3 8.5 ... different academic | |
| rather 2 8.2 ... rather different | genre 12 8.8 ... different genres | ditransitive 2 9.0 ... different ditransitive verbs | |
| | group 12 8.5 ... different groups | sequential 2 9.0 ... in different sequential | |

Figure 79. Lexico-grammatical patterns of *different* in *LINGUISTICS*

Different is the third top-frequency adjective in *LINGUISTICS* sub-corpus and occurs as many as 831 times. As can be seen in Fig. 79, its most common collocates are nouns (84%), which are followed by less frequently observed parts of speech, e.g., adverbs (11%). The pattern *and/or* comprises 14 % of all structures. The *structure different + preposition* is less frequent, since it comprises 6% of all occurrences with this adjective. The proportion of the patterns is presented in Fig. 80.

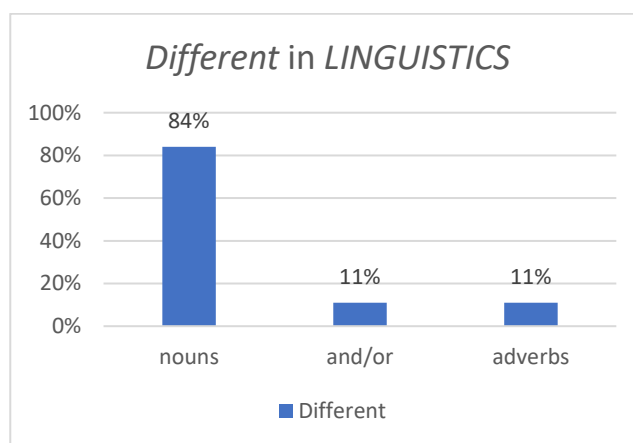


Figure 80. The distribution of lexico-grammatical patterns of *different* in *LINGUISTICS*

The three most common nouns that create a nominal phrase with *different* are *type* (54 occurrences), *way* (32) and *context* (30). The instances of concordances are as follow:

- 250 According to Ralli (1988), Greek presents three **different types** of active perfective past-T formations:
- 251 Sequences involving the expression of empathy can be initiated in a range of **different ways**; for instance, such sequences may start with the patient revealing some
- 252 These **different contexts** may help to explain why He and Dai (2006) found little evidence of communication skills elicited by the group

The pattern *and/or* is represented by 119 tokens, among which the top parts of speech are adjectives, e.g., *linguistic* and *communicative* as well as a determiner *many*, as in the instances:

- 253 She tailors **different linguistic** approaches to confront misunderstandings, and at some point arbitrarily wraps it up.
- 254 and the term 'pragmatics' has subsequently been used to denote **many different** areas of linguistics.
- 255 Narrative and argumentative texts are two distinct discourse genres defined by **different communicative** functions

The third structure worth mentioning is adjective phrase, in which *different* is modified by adverbs; the most frequently used ones are: *very*, *significantly* and *quite*, with the total number of 30, 9 and 8:

- 256 These differences would likely result in **very different** outcomes for both students.
- 257 This second embodiment of place is **significantly different** from the practice of keeping an eye on what goes on inside the cabin which we came across in the previous section.
- 258 This, because standard and dialect actually carry some **quite different** 'baggage' of social meanings in Austria: dialect is commonly associated with lower education and less intelligence

In the majority of cases in *LINGUISTICS*, *different* is used in the attributive function, which comprises 90 %, as compared to 10 % in the predicative function (Fig. 81). Among *verbs before different* patterns, it can be observed that copula *be* heavily outnumbers *appear* (Fig. 82).

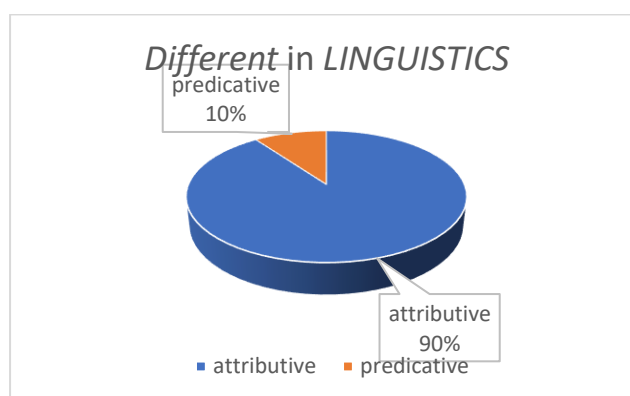


Figure 81. The attributive vs. predicative structure of *different* in *LINGUISTICS*

| verbs before "different" | | | | subjects of "be different" | | | |
|--------------------------|----|-----|-----|---|---|------|-----|
| be | 69 | 9.0 | ... | task | 2 | 10.0 | ... |
| is different | | | | task was no different | | | |
| appear | 2 | 9.3 | ... | fact | 2 | 10.0 | ... |
| appear different | | | | of study in fact is different from the notion | | | |

Figure 82. *Verb + different* pattern in *LINGUISTICS*

Table 67 presents the ten most common collocates of *different* in *LINGUISTICS*. As can be seen, its noun collocates outnumber other parts of speech (5 of 10). From a semantic perspective, nominal collocates refer to research process, e.g., *type*, *kind*, *way*, as well as objects under study, e.g., *genre*, *context*. Among other collocation candidates, *different* co-occurs with the adjective *different* in *and/or* pattern: *They may prioritize different rating criteria and assign different weights*. The preposition *from* collocates with *different* as in the example: *editors from the different peripheral regions*. The only instance of the adverbial collocate is *very*, which is a

direct modifier of *different*, e.g., *very different needs and profiles*. We also find two cardinal numerals that collocate with *different*, e.g., *two radically different uses, three different institution types*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-----------|--------------------|-----------------|---------|---------|
| type | 60 | 551 | 7.67 | 10.47 |
| different | 68 | 831 | 8.14 | 10.39 |
| kind | 33 | 256 | 5.70 | 9.96 |
| from | 103 | 2,760 | 9.85 | 9.88 |
| very | 32 | 343 | 5.59 | 9.80 |
| context | 41 | 852 | 6.26 | 9.64 |
| way | 39 | 802 | 6.10 | 9.61 |
| two | 44 | 1,049 | 6.46 | 9.58 |
| genre | 26 | 530 | 4.98 | 9.29 |
| three | 25 | 550 | 4.88 | 9.21 |

Table 67. The ten most common collocates of *different* in *LINGUISTICS*

The data in Table 68 indicate that *different* is found mainly in 4-word lexical bundles and in a few 5-word grams. The most common structural type for both lexical bundles is *noun phrase with of-phrase fragment* (type 3A). 4-word bundles that incorporate noun phrase differ in their frequency from 5-word ones. The former amounts to 38.42 pmw and the latter to 25.62 pmw.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|----------------------------------|--------------|--------------------------------------|--------------|
| 1 | of different types of | 10 | effectiveness of different types of | 4 |
| 2 | effectiveness of different types | 4 | the different stages of the | 3 |
| 3 | different from that of | 4 | in a range of different | 3 |
| 4 | is different from the | 4 | different types of learners and | 3 |
| 5 | the effectiveness of different | 4 | the effectiveness of different types | 3 |
| 6 | the different stages of | 4 | different senses of the term | |
| 7 | different aspects of the | 4 | | |
| 8 | a number of different | 4 | | |
| 9 | a range of different | 4 | | |
| 10 | very different from the | 4 | | |

Table 68. The most frequent 4- and 5-word lexical bundles of *different* in *LINGUISTICS*

On the basis of the analysis of lexico-grammatical patterns with *different* in *LINGUISTICS* we observe that it is not a full value adjective, since it does not occur in any comparative and superlative structures.

5.4.1.4. *Social* in LINGUISTICS

The fourth top-frequency adjective in *LINGUISTICS* is *social*, whose total number is 504. Its most important function is a modifier in a nominal phrase, which stands for 88 % of all patterns with *social* in *LINGUISTICS*. Well-represented is also the structure *and/or*, which accounts for 32%. As presented by Fig. 83, only one adverb collocates with *social*, but the frequency of this construction accounts for less than 1%.



Figure 83. Lexico-grammatical patterns of *social* in *LINGUISTICS*

Fig. 84 presents the share of lexico-grammatical structures with *social*.

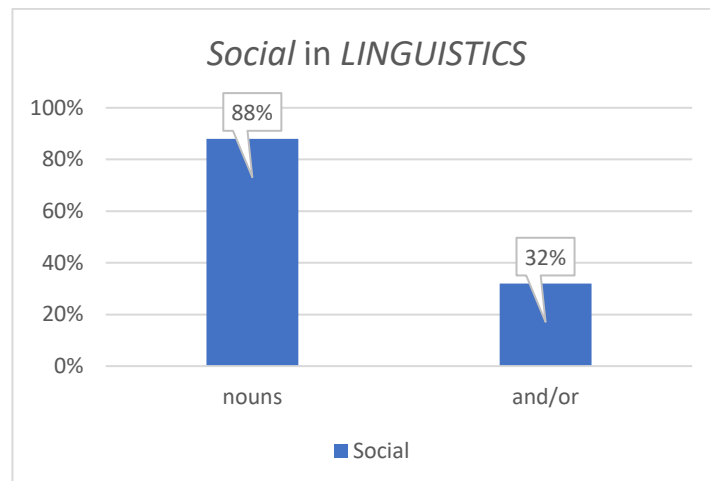


Figure 84. The distribution of lexico-grammatical patterns of *social* in *LINGUISTICS*

The most commonly used nouns which are modified by *social* are *interaction*, *context* and *meaning* with the total number of 35, 31 and 22:

- 259 Harklau's (1994) description of L2 high school students' noted their limited **social interactions** beyond those with teachers

- 260 The developing individual too is dynamic, adapting to new **social contexts**,
 constructing new "knowledge, identities, [and] ways of knowing"
 261 This is not the case with noka: it is used much less than toka, and its **social**
meanings are much more ambiguous.

In terms of *and/or* pattern, adjectives that collocate with *social* most frequently are: *cultural* (10 occurrences), *everyday* (7) and *constructivist* (6):

- 262 immediate environments in which people function and the broader **cultural**
 and **social** systems that impact their immediate environment
 263 it is the occurrences within **everyday social** interactions which should be
 researched in order to reveal finely detailed information about these
 exchanges
 264 Crabbe's framework fits well with the **social constructivist** view of EAP
 adopted in this paper, which sees students as novices

The attributive function of *social* is represented by 99.5 % of instances in *LINGUISTICS* sub-corpus. There are only 2 examples of the predicative constructions with this adjective, which account for merely 0.5 % (Fig. 85).

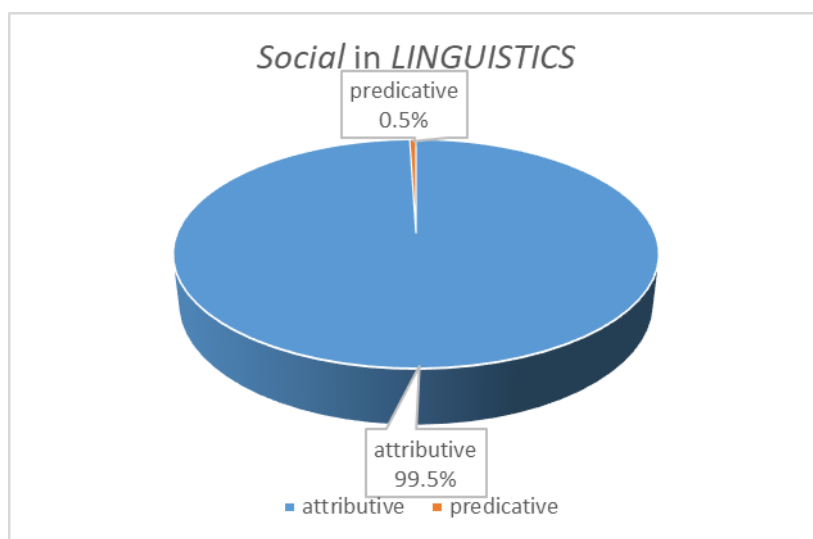


Figure 85. The attributive vs. predicative structure of *social* in *LINGUISTICS*

The ten most common collocates of *social* are shown in Table 69, in which it can be seen that nine of the ten collocates are nouns. The nouns refer to research process, e.g., *interaction*, *relation*, *science*, as well as objects under investigation, e.g., *context*, *meaning*. Of these, *interaction* is the most significant noun (*LogDice*=10.61). The only preposition in the list is *within*, e.g., *a research topic within the appropriate social and disciplinary context*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| interaction | 46 | 462 | 6.74 | 10.61 |

| | | | | |
|--------------|----|-----|------|------|
| context | 38 | 852 | 6.07 | 9.84 |
| organisation | 15 | 46 | 3.87 | 9.80 |
| space | 17 | 180 | 4.09 | 9.67 |
| within | 25 | 581 | 4.92 | 9.56 |
| meaning | 24 | 544 | 4.82 | 9.55 |
| identity | 17 | 270 | 4.08 | 9.49 |
| child | 20 | 409 | 4.41 | 9.49 |
| science | 14 | 172 | 3.71 | 9.41 |
| relation | 15 | 286 | 3.82 | 9.28 |

Table 69. The ten most common collocates of *social* in *LINGUISTICS*

The findings in Table 70 present only few instances of 4-word lexical bundles with *social*, and the most frequent patterns are *noun phrase with other post-modifier* (type 3B, pmw=9.60) and *other noun phrase* (type 3C, pmw=9.60). 5-word grams with this adjective were not found in *LINGUISTICS*.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|---|---------------------------------|--------------|----------------|--------------|
| 1 | social constructivist view of | 3 | - | - |
| 2 | and the social contexts | 3 | | |
| 3 | social context in which | 3 | | |
| 4 | research into children's social | 3 | | |
| 5 | and the social and | 3 | | |

Table 70. The most frequent 4- and 5-word lexical bundles of *social* in *LINGUISTICS*

Social in *LINGUISTICS* is used as a non-gradable adjective. It collocates with only one adverb, its predicative structure is very rarely used (0.5% of all patterns), and it has not been found in any comparative patterns.

5.4.1.5. *Particular* in *LINGUISTICS*

Particular (pmw=792.64) is the last of the five top-frequency adjectives in *LINGUISTICS*. It is a restrictive non-gradable adjective, which means that it is not modified by adverbs and does not occur in comparative and superlative constructions. As Fig. 86 and 87 show, the most frequent pattern with *particular* is a nominal phrase, in which it is a modifier of the head noun, and it accounts for 78 % of all its patterns. The second construction is *and/or* which comprises 13 %. One more pattern, *particular + preposition*, is far less frequent than the two previous ones (2 %).

particular as adjective 495* Sorted by frequency

| nouns modified by "particular" | "particular" and/or ... | prepositional phrases | verbs before "particular" |
|---|---|------------------------------|---|
| context particular context 18 9.2 *** | linguistic share particular linguistic resources 7 9.6 *** | "particular" to ... 0.8% *** | favour to favour particular linking adverbials 2 13.4 *** |
| language a particular language 13 8.6 *** | disciplinary the particular disciplinary 4 10.1 *** | "particular" on ... 0.4% *** | be are particular 2 4.0 *** |
| type a particular type of 11 9.1 *** | communicative in a particular communicative situation 3 9.7 *** | | |
| way particular ways of speaking 9 8.7 *** | social particular social 3 8.8 *** | | |
| kind this particular kind of chronotope 8 9.2 *** | evaluative particular evaluative meaning 2 9.5 *** | | |
| community a particular community 8 8.5 *** | pedagogical a particular pedagogical 2 9.2 *** | | |
| attention particular attention to the 7 8.9 *** | institutional particular institutional 2 9.1 *** | | |
| group to a particular group 7 8.2 *** | cultural particular cultural 2 8.8 *** | | |
| form a particular form 7 8.1 *** | lexical particular lexical 2 8.7 *** | | |
| interest Of particular interest 6 8.7 *** | professional particular professional 2 8.6 *** | | |
| situation in a particular communicative situation 6 8.5 *** | academic particular academic 2 8.2 *** | | |
| case In the particular case of 6 8.4 *** | | | |

Figure 86. Lexico-grammatical patterns of *particular* in *LINGUISTICS*

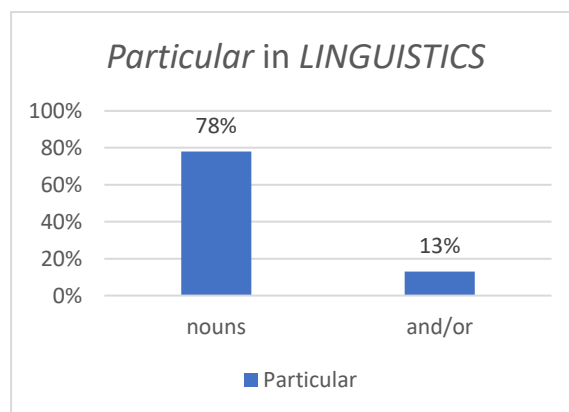


Figure 87. The distribution of lexico-grammatical patterns of *particular* in *LINGUISTICS*

With regard to *particular* + *noun* pattern, the three most frequently used nouns are *context*, *language* and *type*, which occur as many as 18, 13 and 11 times, respectively. The instances of concordances are:

- 265 inherently dynamic nature of ELF and the rationale for using particular forms in **a particular context**
- 266 whereas the second approach refers to a property or quality of **a particular language** in a historically specific language contact situation, for example, the use of Latin as the language of
- 267 The SLM verb exhibits greater morphological complexity of **a particular type**, to be defined below, than verbs in MJ, its lexical source language.

Concerning the *and/or* structure, it is represented with *particular* and another adjective. The three most common instances include: *linguistic*, *disciplinary*, and *communicative*, with the total number of 7, 4 and 3.

268 for instance, is likely to be based on the presupposition that they share **particular**
linguistic resources
 269 It has been observed that as topic progression becomes more specific within
 the **particular disciplinary** context,
 270 dependent and closely associated with the goals of the speaker/writer in a
particular communicative situation

As regards the attributive and predicative constructions with *social*, the former greatly outnumbers the latter, with the ratio of 99 % to 1 % (Fig. 88).

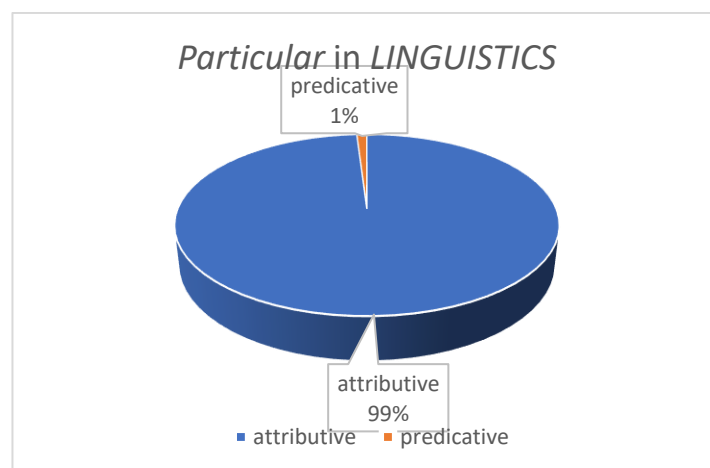


Figure 88. The attributive vs. predicative structure of *particular* in LINGUISTICS

Table 71 presents the ten most common collocates of *particular* presented according to *LogDice* parameter. As can be seen, nouns outnumber other parts of speech (7 of 10 collocates are nouns). Of these the most significant collocate of *particular* is *context* (*LogDice*=9.60). As with previous adjectives in the corpus, nominal collocates refer to research process, e.g., *way*, *type*, and objects under analysis, e.g., *language*, *interlocutor*, *context*. The two adjectives that collocate with *particular* are *adverbial*, e.g., *the high use of particular linking adverbials*, and *particular*, e.g., *particular forms in a particular context*. The only preposition that collocates with *particular* is *within*, e.g., *within a particular discourse community*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|--------------|--------------------|-----------------|---------|---------|
| context | 32 | 852 | 5.56 | 9.60 |
| link | 14 | 308 | 3.69 | 9.16 |
| adverbial | 10 | 105 | 3.14 | 9.09 |
| attention | 11 | 198 | 3.28 | 9.02 |
| language | 40 | 2,502 | 6.06 | 8.77 |
| way | 17 | 802 | 4.00 | 8.75 |
| interlocutor | 7 | 42 | 2.64 | 8.74 |
| within | 14 | 581 | 3.64 | 8.74 |
| particular | 13 | 509 | 3.51 | 8.73 |

| | | | | |
|------|----|-----|------|------|
| type | 13 | 551 | 3.51 | 8.67 |
|------|----|-----|------|------|

Table 71. The ten most common collocates of *particular* in *LINGUISTICS*

As compared to *different*, *particular* enters a similar number of lexical bundles, (Table 72). Only 5 instances of 5-word grams were found in the analysis. The most common structural type of both 4- and 5-word bundles is *noun phrase with of-phrase fragment* (3A), but it differs in frequency, since 4-word grams of this type amount to 44.83 pmw, and 5-word bundles comprise 25.62 pmw.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|---|--------------|---|--------------|
| 1 | a particular type of | 6 | <u>use of particular linking adverbials</u> | 6 |
| 2 | <u>of particular linking adverbials</u> | 6 | <u>the high use of particular</u> | 4 |
| 3 | <u>use of particular linking</u> | 6 | <u>high use of particular linking</u> | 4 |
| 4 | <u>high use of particular</u> | 5 | with a particular focus on | 3 |
| 5 | <u>particular kind of chronotope</u> | 4 | <u>this particular kind of chronotope</u> | 3 |
| 6 | a particular kind of | 4 | | |
| 7 | of a particular type | 3 | | |
| 8 | of a particular language | 3 | | |
| 9 | a particular focus on | 3 | | |
| 10 | <u>this particular kind of</u> | 3 | | |

Table 72. The most frequent 4- and 5-word lexical bundles of *particular* in *LINGUISTICS*

Particular in *LINGUISTICS* is used as a non-gradable adjective, since it does not occur in comparative constructions. Its predicative pattern accounts for 1% of all patterns. *Particular* has not been found to be premodified by adverbs.

5.4.1.6. Concluding remarks

To sum up the research results so far, the following conclusions can be drawn:

- the most productive structure that each of the five adjectives in *LINGUISTICS* sub-corpus enters is a nominal phrase in which adjectives modify the head noun;
- with regard to gradability, *academic*, *linguistic*, *social* and *particular* are used as non-gradable adjectives in *LINGUISTICS*. *Different* is used as a partially gradable adjective in this sub-corpus;
- the attributive pattern is much more frequently used than the predicative one;
- the majority of the ten most common collocation candidates of the five adjectives are nouns. Less frequent collocates are adjectives and prepositions;
- all the five adjectives are found in 4-word bundles. Four adjectives, namely, *academic*, *linguistic*, *different* and *particular* are also found in 5-word bundles. Table 73 summarises the most productive structural types of the lexical bundles in

LINGUISTICS, which are marked in yellow. For 4- and 5-word lexical bundles the most common pattern is *noun phrase with of phrase fragment (3A)*.

| | 4-word | | 5-word | |
|----|--------------|--------|--------------|-------|
| | Total number | pmw | Total number | pmw |
| 3A | 71 | 113.69 | 56 | 89.67 |
| 3B | 38 | 60.85 | 12 | 19.21 |
| 3C | 55 | 88.07 | 13 | 20.82 |
| 3D | 61 | 97.68 | 30 | 48.04 |
| 3E | 4 | 6.40 | - | - |
| 1D | 20 | 32.03 | 12 | 19.21 |
| 1E | - | - | 3 | 4.80 |

Table 73. Structural types of 4- and 5-word lexical bundles in *LINGUISTICS*

5.5.1. The five top-frequency adjectives in *MATERIAL SCIENCE* sub-corpus

| Adjective | Total number | Pmw |
|--------------|--------------|----------|
| high | 885 | 2,290.04 |
| different | 826 | 2,137.38 |
| low | 549 | 1,420.60 |
| large | 370 | 957.42 |
| experimental | 350 | 905.67 |

Table 74. The five top-frequency adjectives in *MATERIAL SCIENCE*

5.5.1.1. High in MATERIAL SCIENCE

| modifiers of "high" | nouns modified by "high" | "high" and/or ... | prepositional phrases | verbs before "high" |
|---|--|---|---|---|
| much is much higher than 22 ... | temperature high temperatures 79 ... | normal at high normal stress 11 ... | "high" than ... "high" in ... "high" for ... "high" as ... | be is higher 103 ... |
| very very high 16 ... | value higher values 39 ... | low low and high 8 ... | | become the arch rise becomes higher . The axial 5 ... |
| significantly resulted in significantly higher percentages of gap-free 14 ... | strength high strength 34 ... | molecular of high molecular weight 7 ... | | |
| relatively relatively high 11 ... | concentration high intracellular nanoparticle concentration 20 ... | intracellular Effects of high intracellular nanoparticle concentration on 6 ... | | |
| slightly slightly higher porosity in the 7 ... | stress high normal stress 16 ... | thermal high thermal insulation performance 6 ... | | |
| considerably considerably higher 4 ... | pressure high pressure 15 ... | magnetic the high magnetic field region 5 ... | | |
| also also higher 3 ... | level high levels of 14 ... | specific to their high specific strength 4 ... | | |
| | rate high cooling rates 14 ... | still a high still 3 ... | | |
| | amount higher amount of 12 ... | initial high initial strength 3 ... | | |
| | density high densities 12 ... | | | |
| | number high number of 12 ... | | | |
| | percentage resulted in significantly higher 11 ... | | | |

Figure 89. Lexico-grammatical patterns of high in MATERIAL SCIENCE

Fig. 89 presents lexico-grammatical constructions with *high* in MATERIAL SCIENCE. The three most common patterns are: *high* as a modifier of the head noun, which is most frequently used (77%), followed by adverbs that modify *high* (12%) and *and/or* pattern (10%). Fig. 89 shows *high* + *preposition* construction, but it accounts for 6% of all constructions, and due to its low score, it is omitted in the analysis. The distribution of the patterns is presented in Fig. 90.

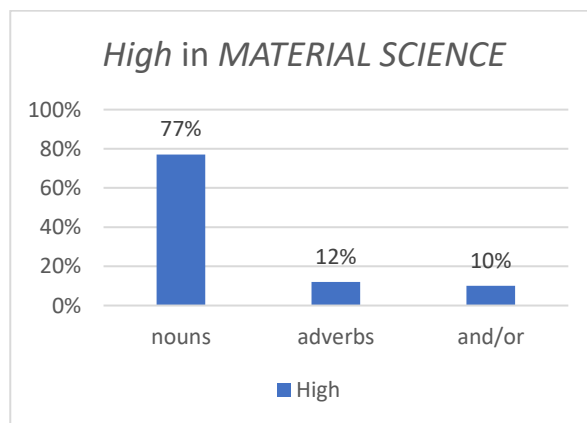


Figure 90. The distribution of lexico-grammatical patterns of high in MATERIAL SCIENCE

High + *noun* is the most productive pattern, and the three most common nouns are *temperature* (79 occurrences), *value* (39) and *strength* (34) as in the following concordances:

- 271 The S-Al₂CuMg precipitates at the **highest temperatures** during relatively slow cooling
- 272 The trend is that, the bottom specimens have **higher** unit weight **values** than the top specimens
- 273 Structural lightweight concrete has its obvious advantages of **higher strength**/weight ratio, better tensile strain capacity, lower coefficient of thermal

The second pattern, namely, *adverb + high*, is represented with the following top-frequency modifiers of degree: *much* (22 occurrences), and *very* (16) and *significantly* (14). The instances from the concordances are:

- 274 Another way is to produce pressed pellets in a molding press, which gives a much **higher** compaction.
- 275 Cases with relatively **high** errors could possibly have resulted from the difficulty in estimating stripping in fine aggregates.
- 276 This indicates a very **high** amount of cell-associated nanoparticles when compared to other iron oxides

And/or construction consists of *high* and another adjective which modifies the head noun. The most common adjectives here are: *normal*, *low* and *molecular*, with the total number of 11, 8, and 7 tokens, respectively. The adjectives can also enter a pattern with a linking word *and*:

- 277 At **high normal** stress, the average peak friction angle is about 21 and the average adhesion is about 46 kPa, as shown in Fig. 2a.
- 278 **High and low** temperatures were chosen to respectively accelerate and prevent binder creep.
- 279 Adsorption of **high molecular** weight PEG/polylysine copolymers onto endovascular stents reduces restenosis after implantation [8],

As far as the attributive and predicative construction with *high* in *MATERIAL SCIENCE* is concerned, the former occurs at the level of 88% and the latter at 12 % (Fig. 91).

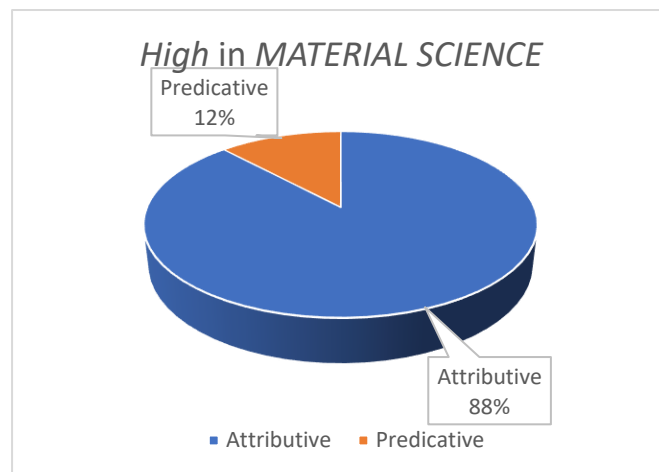


Figure 91. The attributive vs. predicative structure of *high* in MATERIAL SCIENCE

With regard to the verb pattern, *to be* occurs 103 times before *high*, which can be illustrated with the following instances:

- 280 it will extend through the crack if the temperature of asphalt concrete **is high** enough for bitumen to behave as a Newtonian fluid
- 281 The results show that the dry NP GCL peak envelope **is higher** than the envelope of the dry bentonite.
- 282 However, the experimental value of the critical heat load **was higher** at about 0.2–0.24 mW.

Table 75 demonstrates the ten most common collocates of *high*, among which the most significant is the preposition *than* (*LogDice*=11.11). In the majority of cases *than* creates a comparative pattern *higher than*, e.g., *concrete filling is 9% higher than that of the basic CFT arch girder case*. This pattern has also been noticed as the most important with the adjective *high* in *BIOTECHNOLOGY* and *ECOLOGY*. Another preposition that collocates with *high* is *at*, which in most cases directly precedes *high*, e.g., *at high normal stress*. There are five nominal collocates of *high* and they are related to research lexis and object under study, e.g., *temperature, pressure, value*. As regards adjectival collocates, *high* co-occurs with *high* or collocates with *low*, e.g., *The higher the heterogeneity, the higher is the difference between samples, high and low temperatures were chosen*. *Much* is the only adverb among the ten collocates of *high* in *MATERIAL SCIENCE* sub-corpus, and it occurs in the comparative structure, as in the example: *Since the stiffness of clays is much higher than the epoxy*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| than | 108 | 713 | 10.26 | 11.11 |
| temperature | 119 | 1230 | 10.69 | 10.84 |
| strength | 81 | 838 | 8.82 | 10.58 |
| pressure | 52 | 533 | 7.07 | 10.23 |

| | | | | |
|--------|-----|------|-------|-------|
| at | 126 | 2595 | 10.79 | 10.21 |
| high | 50 | 893 | 6.83 | 9.84 |
| low | 40 | 555 | 6.16 | 9.83 |
| value | 44 | 767 | 6.41 | 9.76 |
| stress | 38 | 688 | 5.95 | 9.62 |
| much | 24 | 146 | 4.84 | 9.57 |

Table 75. The ten most common collocates of *high* in *MATERIAL SCIENCE*

Lexical bundles which contain *high* are presented in Table 76. 4-word bundles which are also a part of 5-word ones are underlined. The most frequent structural types of lexical bundles is *other noun phrase* (3C), but the frequency of 4-word bundles differs from 5-word ones with the ratio of 72.45 pmw to 49.16 pmw.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--|--------------|---|--------------|
| 1 | high temperature and pressure | 5 | <u>high frequency cascade thermoacoustic engine</u> | 4 |
| 2 | due to the high | 5 | high intracellular nanoparticle concentration on | 3 |
| 3 | at high normal stress | 4 | intermediate-G alginate and a high-G | 3 |
| 4 | <u>a high degree of</u> | 4 | finest and high Cu values | 3 |
| 5 | the high pressure refrigerant | 4 | <u>with a high degree of</u> | 3 |
| 6 | <u>high magnetic field region</u> | 4 | <u>mobile fines and high Cu</u> | 3 |
| 7 | <u>high frequency cascade thermoacoustic</u> | 4 | of high intracellular nanoparticle concentration | 3 |
| 8 | at high temperature and | 4 | of the high frequency cascade | 3 |
| 9 | <u>mobile fines and high</u> | 3 | <u>the high magnetic field region</u> | 3 |
| 10 | of high strength woven | 3 | <u>the high frequency cascade thermoacoustic</u> | 3 |

Table 76. The most frequent 4- and 5-word lexical bundles of *high* in *MATERIAL SCIENCE*

5.5.1.2. *Different* in *MATERIAL SCIENCE*

The second adjective to analyse in *MATERIAL SCIENCE* sub-corpus is *different* with the total number of 826 occurrences, as observed in Fig. 92.

| modifiers of "different" | nouns modified by "different" | "different" and/or ... | prepositional phrases | verbs before "different" |
|---|---|--|-----------------------|----------------------------------|
| very 9 ... very different from the | type 35 ... different types of | electric 6 ... laminated plate under different electric loads | "different" from ... | be 56 ... is different |
| quite 8 ... it. A quite different conclusion with respect | temperature 29 ... at different temperatures | crank 4 ... the regenerator under different crank angles. Fig. | "different" in ... | |
| slightly 7 ... slightly different | depth 18 ... different depth of placement | minimum 4 ... evaporator outlet and different minimum temperature approaches | "different" with ... | |
| significantly 7 ... per material are not significantly different (P | size 17 ... with different particle sizes | many 4 ... there are many different | "different" among ... | |
| distinctly 3 ... distinctly different | rate 15 ... different cooling rates | residual 3 ... different residual gases | | |
| substantially 2 ... substantially different | method 15 ... different methods | experimental 3 ... different experimental | | |
| chemically 2 ... of chemically different | value 15 ... for different values of | particulate 2 ... different particulate matters | | |
| dramatically 2 ... dramatically different | exchanger 14 ... with different cascade heat exchangers | still 2 ... different still pressures | | |
| considerably 2 ... considerably different | ratio 14 ... different ratios | observed 2 ... illustrate that the different observed immune responses are | | |
| completely 2 ... completely different | modulus 12 ... different moduli | solid 2 ... different solid | | |
| | material 12 ... the different materials | bacterial 2 ... different bacterial species | | |
| | condition 11 ... under different conditions | | | |

Figure 92. Lexico-grammatical patterns of *different* in *MATERIAL SCIENCE*

The most important role of *different* is the role of a modifier of the head noun, which accounts for 88% of all its patterns (Fig. 93).

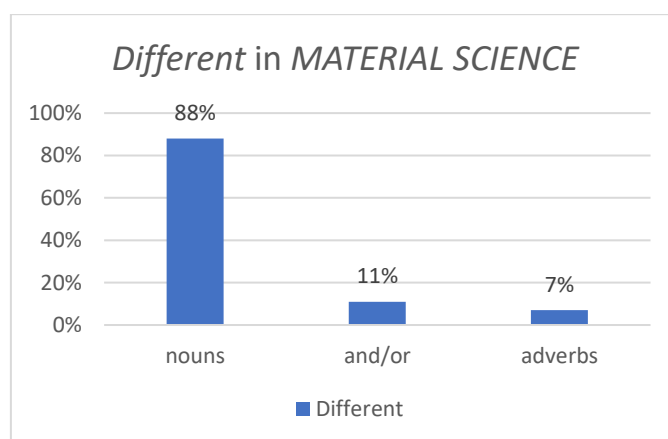


Figure 93. The distribution of lexico-grammatical patterns of *different* in *MATERIAL SCIENCE*

Type, *temperature* and *depth* are nouns with the highest total number (35, 29 and 18 occurrences, respectively). The following instances illustrate the use of *different* + *noun*:

- 283 Data collected from **different types** of sensors are often based on diverse physical phenomena,
- 284 Relationship between time of flow and time at **different conditioning temperatures**
- 285 Variations of q with S/B for model slope with **different depths** of replaced sand

The second top-frequency construction is *and/or*, but it is far less productive than the previous one, since it comprises 11% of all patterns with *different*. As reported in Fig. 92, *electric*, *crank* and *minimum* are the top-frequency adjectives which enter this pattern:

- 286 on the nonlinear dynamic response of the piezoelectric laminated plate under
different electric loads,
 287 The local Reynolds number distribution along the length of the regenerator
 under **different crank** angles
 288 1a–c with different cascade heat exchangers with refrigerating temperature
 and **different minimum** temperature approaches (DT_{min})

The least common construction is adjective phrase in which *different* is modified by adverbs. This accounts merely for 7% of all its patterns.

- 289 However, at high normal stress (Fig. 3a) the failure envelopes are **very different**
 290 The distributions for damaged samples are **quite different**: the intrusion volume in pores with 0.1 μm diameter decreases with increasing number of shocks whereas it increases
 291 The concentration of the mixture is only **slightly different** at lower minimum temperature approaches in the heat exchanger

With regard to the attributive and predicative function of *different*, the former one heavily outnumbered the latter, with the ratio of 93% to 7% (Fig. 94).

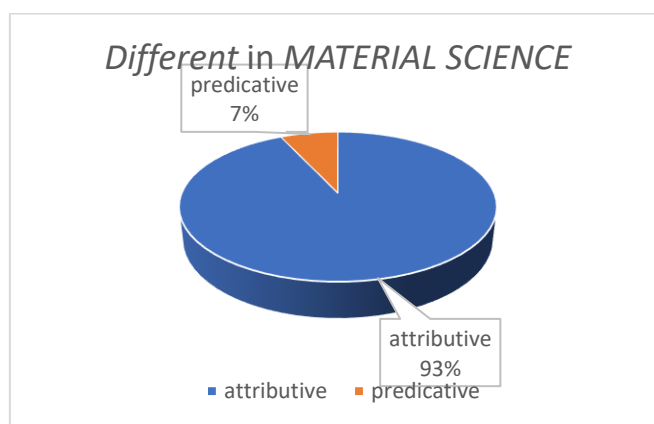


Figure 94. The attributive vs. predicative structure of *different* in MATERIAL SCIENCE

The following concordances illustrate *different* used in the predicative form:

- 292 As discussed previously, the mobilized resistance mechanisms appear to **be**
 different for low and **high** normal stresses
 293 The surfaces of cement and silica fume **are** distinctly **different** with respect
 to the position of calcium atoms/ions.
 294 The results **were** quite **different** when polycations were applied as
 crosslinking agent.

Regarding the ten most common collocates of *different* according to *LogDice* order, (Table 77), only three nouns collocate with this adjective, and they refer to research lexis: *type*, *ratio* and *temperature*. Of them, the most significant is *type* (*LogDice* 10.29). Interestingly, two cardinal numerals that collocate with *different* are: *two*, and *three*, e.g., *these two system scaffolds are different with the adjustment of the joint positions*, *three different GCL water*

contents. Well represented are also prepositional collocates: *with, at, for, under*, which are used as in the examples: *with different moisture potentials, at different interruption temperatures, Repeating this for different cooling rates, good forming properties under different conditions*. There is only one adjectival collocate, namely, *different*, e.g., *Different storage moduli promote different wound healing genetic programs*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| type | 42 | 269 | 6.41 | 10.29 |
| two | 52 | 557 | 7.08 | 10.15 |
| with | 170 | 4,076 | 12.50 | 10.15 |
| three | 37 | 307 | 6.00 | 10.06 |
| at | 109 | 2,595 | 10.01 | 10.03 |
| temperature | 55 | 1,230 | 7.13 | 9.78 |
| different | 44 | 826 | 6.42 | 9.77 |
| for | 127 | 4,157 | 10.63 | 9.71 |
| under | 30 | 410 | 5.35 | 9.64 |
| ratio | 32 | 533 | 5.49 | 9.59 |

Table 77. The ten most common collocates of *different* in *MATERIAL SCIENCE*

The lexical bundles in which *different* can be found are summarised in Table 78. Lexical bundles that incorporate *prepositional phrase* are most frequent among 4-word bundles (type 3D, pmw=90.57). The most frequent structural type of 5-word bundles is *noun phrase with other post modifier* (pmw=69.86).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--|--------------|---|--------------|
| 1 | <u>different cascade heat exchangers</u> | 14 | <u>with different cascade heat exchangers</u> | 10 |
| 2 | with different cascade heat | 10 | samples at different temperatures such | 5 |
| 3 | with different particle sizes | 7 | <u>CP Ti samples at different</u> | 5 |
| 4 | for different values of | 6 | <u>of the pipe for different</u> | 5 |
| 5 | <u>under different electric loads</u> | 6 | <u>Ti samples at different temperatures</u> | 5 |
| 6 | with different types of | 6 | at different temperatures such as | 5 |
| 7 | <u>samples at different temperatures</u> | 6 | of the regenerator under different | 4 |
| 8 | the effect of different | 5 | laminated plate under different electric | 4 |
| 9 | <u>Ti samples at different</u> | 5 | piezoelectric laminated plate under different | 4 |
| 10 | <u>the pipe for different</u> | 5 | <u>plate under different electric loads</u> | 4 |

Table 78. The most frequent 4- and 5-word lexical bundles of *different* in *MATERIAL SCIENCE*

As the analysis of *different* in *MATERIAL SCIENCE* demonstrates, this adjective is classified as partially gradable, since it does not occur in any comparative construction. This is similar to *different* in *BIOTECHNOLOGY, ECOLOGY* and *LINGUISTICS*.

5.5.1.3. *Low* in MATERIAL SCIENCE

The third top-frequency adjective in *MATERIAL SCIENCE* is *low* with 549 occurrences (pmw=1,420.60). As provided in Fig. 95 and 96, its three most important collocates are nouns, adverbs, and other adjectives used in *and/or* pattern.

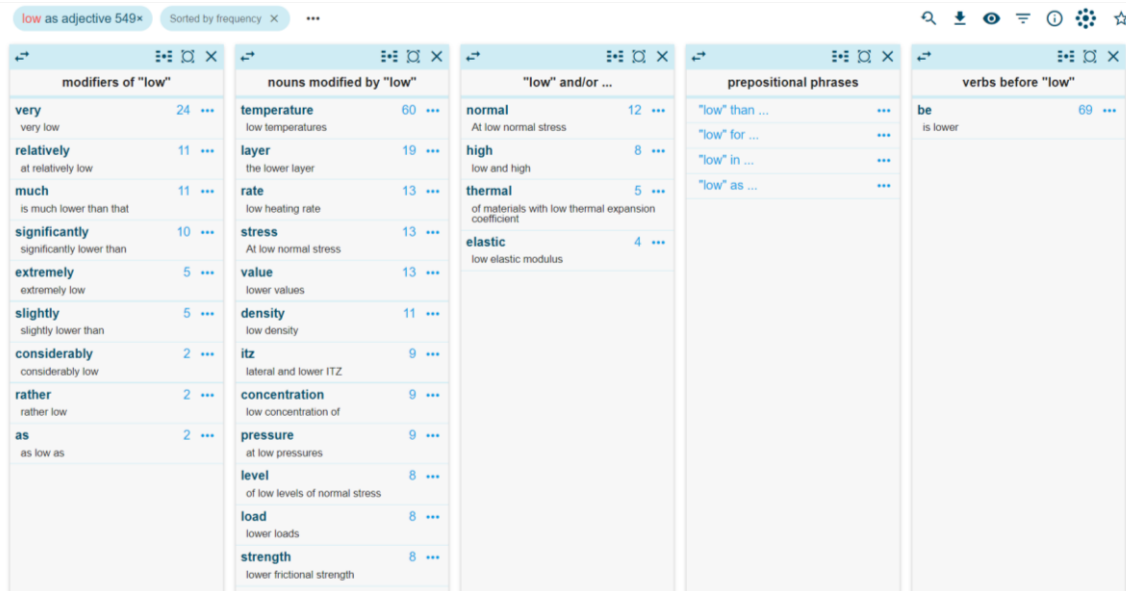


Figure 95. Lexico-grammatical patterns of *low* in *MATERIAL SCIENCE*

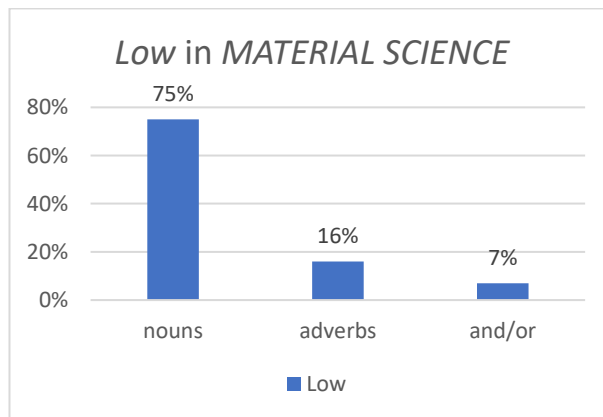


Figure 96. The distribution of lexico-grammatical patterns of *low* in *MATERIAL SCIENCE*

The main function of *low* is a modifier in a nominal phrase, and it accounts for 75% of all patterns with this adjective. Its three most common noun collocates are *temperature*, *layer* and *rate*, which occur 60, 19 and 13 times respectively. The selected instances of concordances are presented below:

- 295 At **lower temperatures** (~250 °C down to ~140 °C), the precipitation of thin
 Y-phase platelets rich in Zn and Cu occurs at
 296 As cells could adhere and proliferate on the surface of the **lower layer**,

297 For the testing length of 20 mm **lower rate** was chosen, 5 mm/min, to achieve a better visual inspection during the test.

As far as the second pattern is concerned, it is an adjective phrase, in which *low* is modified by adverbs and determiners. The most frequently used adverbs are *very*, with as many as 24 occurrences, *relatively* (11) and *much* (11). This construction comprises 16% of all constructions with this adjective in *MATERIAL SCIENCE* sub-corpus.

298 The goal of these trials was to operate the system under **very low** flow rates, representing the seepage of water through a WSP berm.
299 cores from BWT locations showed higher values of air voids and **relatively lower** values of saturation compared to IWT and OWT locations in both sections.
300 While 30% relative humidity is **much lower** than that found in the mouth, this initial work aimed to study the basic setting prop

The third pattern among most frequent structures is *and/or*, which accounts for merely 7%. In this construction *low* co-occurs with other adjectives, as in:

301 At **low normal** stress, the peak and residual friction angle is about 40 like the dry bentonite tests results (see Fig. 2b).
302 The **high and low** pressures were assumed to be 1.95 MPa and 0.85 MPa, respectively
303 The displacers made of materials with **low thermal** expansion coefficient can improve the labyrinth sealing effect.

Regarding the attributive and predicative function of *low*, the former one constitutes 88% of all its constructions, while the latter 12% (Fig. 97).

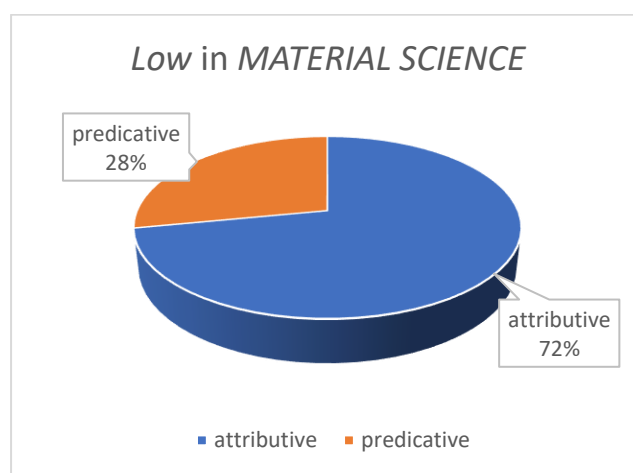


Figure 97. The attributive vs. predicative structure of *low* in *MATERIAL SCIENCE*

The examples in which *low* can freely occur in the predicative function are:

304 The Gibbs energy of Al₃Ti **is** extremely **lower** than other compounds.
305 At 2 C, average removals **were** much **lower**, and not statistically significant.

306 T-load **was** obviously **lowest** when the still pressure was at its lowest value of about 0.4 mbar.

Table 79 lists the ten most common collocates of *low* ordered according to *LogDice* index. The most significant pattern regarding *LogDice* parameter is the preposition *than* (*LogDice*=10.81). The preposition *at* (*LogDice*=10.30) occurs at the fourth position as compared to *than*, which means that it is less significant than *than*, e.g., *at low nanomolar concentrations*. Among noun collocates, only two instances can be seen: *temperature* and *pressure*. There are three representatives of adjectives: *upper*, *high*, and *normal*, e.g., *the upper layer and lower layer*, *the high and low pressures*, *of low normal zone propagation velocity*. With regard to adverbial collocates, two representatives are found: *very* and *much*, e.g., *the Ti content in the filler meter is very low*, *much lower refrigeration temperature*. The last collocate is the acronym ITZ, which stands for a term specific of the discipline, e.g., *the upper ITZ displays the lowest porosity*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| than | 69 | 713 | 8.21 | 10.81 |
| temperature | 83 | 1230 | 8.95 | 10.58 |
| upper | 25 | 70 | 4.98 | 10.37 |
| at | 121 | 2595 | 10.73 | 10.30 |
| very | 26 | 251 | 5.04 | 10.06 |
| high | 41 | 893 | 6.24 | 9.86 |
| ITZ | 18 | 86 | 4.21 | 9.86 |
| normal | 20 | 205 | 4.42 | 9.76 |
| much | 13 | 146 | 3.56 | 9.26 |
| pressure | 20 | 533 | 4.33 | 9.24 |

Table 79. The ten most common collocates of *low* in *MATERIAL SCIENCE*

As far as the lexical bundles of *low* are concerned, they are summarised in Table 80. *Low* is found in fewer instances than previous adjectives (*high* and *different*), since there are only eight 4-word grams and four 5-word grams. The most common structural type of 4-word pattern is *prepositional phrase* (type 3D, pmw=54.34). With regard to 5-word bundles, *prepositional phrase* (type 3D, pmw=15.52) is as productive as *noun phrase with of-phrase fragment* (type 3A, pmw=15.52).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|---|----------------------|--------------|-------------------------|--------------|
| 1 | at low normal stress | 6 | of low levels of normal | 3 |

| | | | | |
|---|---------------------------------|---|---|---|
| 2 | <u>the low frequency region</u> | 4 | <u>low levels of normal stress</u> | 3 |
| 3 | At low normal stress | 4 | <u>low-temperature part of the fridge</u> | 3 |
| 4 | due to the low | 4 | <u>in the low frequency region</u> | 3 |
| 5 | <u>low levels of normal</u> | 3 | | |
| 6 | <u>of low levels of</u> | 3 | | |
| 7 | low-temperature part of the | 3 | | |
| 8 | <u>in the low frequency</u> | 3 | | |

Table 80. The most frequent 4- and 5-word lexical bundles of *low* in *MATERIAL SCIENCE*

5.5.1.4. *Large* in *MATERIAL SCIENCE*

Figure 98 presents lexico-grammatical constructions of *large* in *MATERIAL SCIENCE* sub-corpus.

| modifiers of "large" | nouns modified by "large" | "large" and/or ... | prepositional phrases | verbs before "large" |
|--|---|--|-----------------------|---------------------------------------|
| very 8 ... very large | amount 15 ... larger amount of | direct 7 ... large direct shear test | "large" than ... | be 55 ... is larger |
| too 5 ... regenerator is too large | number 15 ... a large number of | haversian 5 ... propagated from a large haversian canal with a | "large" with ... | become 4 ... becomes larger |
| much 5 ... much larger than the | value 9 ... for large values of w | small 3 ... small and large | "large" in ... | |
| relatively 4 ... a relatively large | aggregate 8 ... large aggregates | thermal 3 ... the large thermal | | |
| significantly 4 ... significantly larger | strain 8 ... larger local strains | enough 2 ... a large enough | | |
| not 4 ... is not large enough to | area 7 ... mesh regenerator with large cross-sectional area | cross-sectional 2 ... mesh regenerator with large cross-sectional area | | |
| generally 2 ... generally larger | test 7 ... large direct shear test | second 2 ... large second stage | | |
| | hole 6 ... in medium and larger holes of the | plastic 2 ... plastic large deformation analysis | | |
| | deformation 6 ... and concrete. Large deformation elastic | specific 2 ... large specific surface | | |
| | canal 5 ... propagated from a large haversian canal with a length | compressive 2 ... large compressive forces | | |
| | variation 5 ... the large variation in | | | |
| | diameter 5 ... | | | |

Figure 98. Lexico-grammatical patterns of *large* in *MATERIAL SCIENCE*

The most frequent pattern (70%) that *large* enters is a nominal phrase in which this adjective is a modifier of the head noun. The three most common nouns are *amount*, *number* and *value*, with the total number of 15, 15, and 9, respectively. The instances of concordances are the following:

- 307 The 6 wt.% Sn sample shows **a large amount** of ? phase at room temperature.
- 308 The influence of **a large number** of loading cycles was beyond the scope of this investigation
- 309 **The large values** of coefficient of variation are indicative of large variability in the data.

The second pattern, namely, *and/or*, is far less productive than the nominal phrase, since it accounts for 13% of all patterns with *large* (Fig. 99). *Direct*, *haversian* and *small* are the adjectives which collocate most frequently with *large* in this pattern:

- 310 The **large direct** shear test and the shear tensile test were used for this
purposed.
- 311 Fig. 4(a) demonstrates a microcrack propagated from a **large haversian**
canal with a length of approximately 10 ?m
- 312 ML sizes will not lead to a difference in uptake efficiency of either the
smaller or larger particles, it can be calculated (see Supplementary
information) that the value found, corresponds to a total of 1.31

Almost equally productive, i.e., 12%, is an adjective phrase in which *large* is modified by adverbs and determiners. *Very*, *too* and *much* collocate with *large* most frequently:

- 313 On the other hand, for the specimens with **very large** holes such as the
specimens QWE.1 and QWE.2, the influence of the cutout
- 314 When the temperature gradient of the regenerator was **too large**, the
difference of the remaining gas mass between the hot end and the cold end
was too large and the average remaining gas
- 315 Since the size of the water tank is **much larger** than the size of the specimen

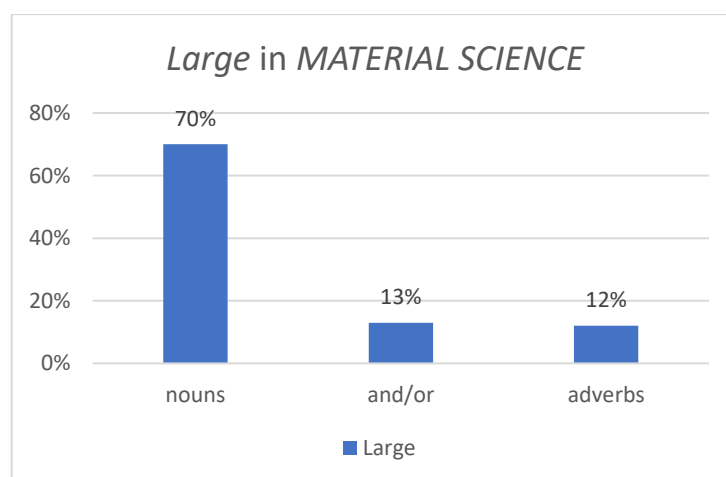


Figure 99. The distribution of lexico-grammatical patterns of *large* in *MATERIAL SCIENCE*

With regard to the attributive pattern with *large*, it accounts for 83% of all constructions. The predicative pattern constitutes 17% (Fig. 100). The predicative function of *large* can be illustrated with the following concordances:

- 316 The values are the mean SD (n ? 5), the length of the epithelial tongue **was**
larger than all the others at both day 3 and day 7.
- 317 Since the diameter of the second stage regenerator **is** rather **large** (about 77
mm
- 318 while the magnitude of the bending strains **are largest** at the deepest point
and near the top

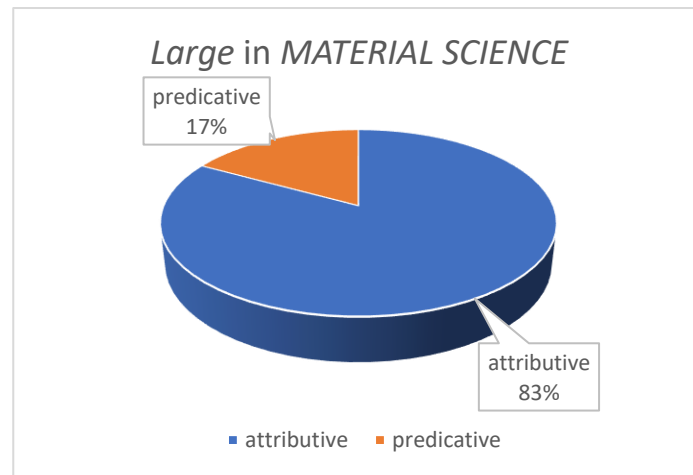


Figure 100. The attributive vs. predicative structure of *large* in MATERIAL SCIENCE

Table 81 presents the ten most common collocates of *large* ordered according to *LogDice* parameter. The most crucial lemma is the preposition *than* (*LogDice*=10.53), which enters a comparative construction, e.g., *when the heat power is larger than the MQE*. In the case of nouns, they outnumber other parts of speech, since there are 7 of them. With regard to their semantics, they refer to research process terms, e.g., *amount*, *number*, as well as objects and phenomena under analysis, which seem to be specific of particular discipline, e.g., *deformation*, *pore*. *Enough* is an example of the adverb which collocates with *large*, e.g., *the interface is not large enough*. *Short* is the only adjectival collocate of *large*, e.g., *It is the largest with the shortest arch span*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| than | 49 | 713 | 6.92 | 10.53 |
| number | 21 | 393 | 4.51 | 9.82 |
| amount | 15 | 286 | 3.81 | 9.55 |
| pore | 15 | 335 | 3.80 | 9.44 |
| span | 9 | 75 | 2.98 | 9.37 |
| deformation | 11 | 175 | 3.27 | 9.37 |
| enough | 8 | 42 | 2.81 | 9.31 |
| variation | 10 | 235 | 3.10 | 9.08 |
| short | 7 | 64 | 2.63 | 9.04 |
| size | 13 | 441 | 3.51 | 9.04 |

Table 81. The ten most common collocates of *large* in MATERIAL SCIENCE

As can be seen in Table 82, we find ten instances of 4-word bundles, but only four of 5-word grams. *Noun phrase with of-phrase fragment* (3A, pmw=36.22) is most frequent structural

type of 4-word bundles, and *prepositional phrase* (type 3D, pmw=28.46) is the most common among 5-word bundles.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|------------------------------------|--------------|--|--------------|
| 1 | <u>A large number of</u> | 10 | <u>propagated from a large haversian</u> | 4 |
| 2 | <u>for large values of</u> | 4 | <u>from a large haversian canal</u> | 4 |
| 3 | <u>from a large haversian</u> | 4 | <u>for large values of w</u> | 4 |
| 4 | <u>propagated from a large</u> | 4 | <u>of a large number of</u> | 3 |
| 5 | <u>a large haversian canal</u> | 4 | | |
| 6 | <u>large values of w</u> | 4 | | |
| 7 | <u>of a large number</u> | 3 | | |
| 8 | plastic large deformation analysis | 3 | | |
| 9 | not large enough to | 3 | | |
| 10 | large direct shear test | 3 | | |

Table 82. The most frequent 4- and 5-word lexical bundles of *large* in *MATERIAL SCIENCE*

5.5.1.5. *Experimental* in *MATERIAL SCIENCE*

Figure 101 presents lexico-grammatical structures of *experimental*, which is the fifth top-frequency adjective in *MATERIAL SCIENCE* sub-corpus. The total number of *experimental* is 350. As compared to the previous adjectives in this sub-corpus, *experimental* enters fewer constructions, namely a nominal phrase and *and/or* pattern.



Figure 101. Lexico-grammatical patterns of *experimental* in *MATERIAL SCIENCE*

With regard to a nominal phrase, *experimental* is a modifier of the noun, and this pattern comprises 90% of all its constructions (Fig. 102). The three nouns that collocate with

experimental are *result*, *datum* and *study*, with the total number of 72, 45 and 16 occurrences.

They are illustrated with the following concordances:

- 319 The usefulness of the method is confirmed by **experimental results** of
location tests for the normal transitions in a Bi2223 HTS coil.
- 320 However, in the present work, the ANN material model based on
experimental data [8] is assumed to contain elastic, plastic and creep strains
- 321 From these numerical and **experimental studies**, the following
conclusions are reached

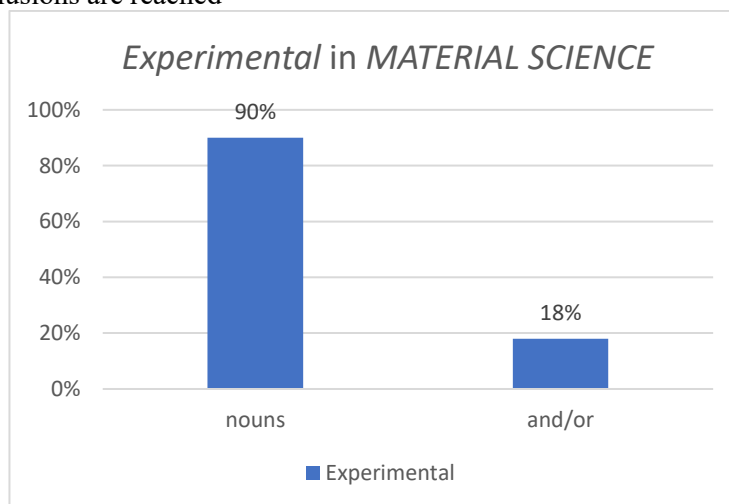


Figure 102. The distribution of lexico-grammatical patterns of *experimental* in *MATERIAL SCIENCE*

In *and/or* pattern *experimental* collocates with another adjective or determiner, and accounts for 18% of all patterns with *experimental* in *MATERIAL SCIENCE*. The three adjectives are *numerical*, *theoretical* and *analytical* with as many as 24, 5 and 4 occurrences, respectively.

- 322 In this study, the **experimental and numerical** investigation of clay/epoxy
nanocomposites were performed.
- 323 Based on the **theoretical and experimental** results, critical values of the
geogrid parameters for maximum reinforcing effects are established.
- 324 Comparisons of **experimental and analytical** results are presented in Table
4.

On the basis of the data gathered in this section, we may conclude that *experimental* is present only in the attributive structures (Fig. 103).

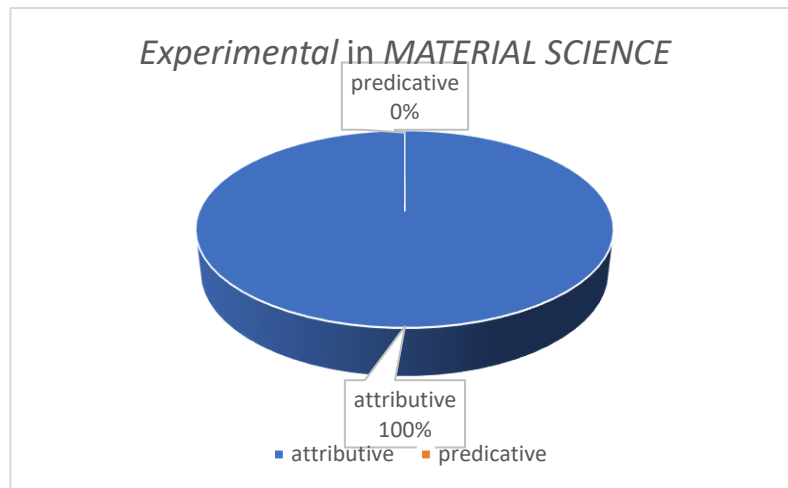


Figure 103. The attributive vs. predicative structure of *experimental* in MATERIAL SCIENCE

Table 83 lists the ten most frequent collocates of *experimental* ordered in accordance with *LogDice* parameter. As can be seen, 8 of 10 lemmas are nouns, which outnumber other parts of speech. They refer to research process, e.g., *datum*, *investigation*, *parameter*, *result*. With regard to adjectival collocates, *experimental* collocates with *numerical*, e.g., *From these numerical and experimental studies, the following conclusions are reached*. *Compare* is the only verbal collocate of *experimental*, e.g., *The numerical results were compared with the experimental ones*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|---------------|--------------------|-----------------|---------|---------|
| result | 104 | 1273 | 10.11 | 11.04 |
| datum | 47 | 422 | 6.81 | 10.96 |
| numerical | 25 | 147 | 4.98 | 10.69 |
| setup | 14 | 61 | 3.73 | 10.12 |
| investigation | 14 | 131 | 3.72 | 9.90 |
| procedure | 15 | 167 | 3.84 | 9.89 |
| apparatus | 11 | 35 | 3.31 | 9.87 |
| compare | 22 | 437 | 4.62 | 9.84 |
| study | 36 | 954 | 5.88 | 9.82 |
| parameter | 15 | 304 | 3.81 | 9.55 |

Table 83. The ten most common collocates of *experimental* in MATERIAL SCIENCE

Table 84 presents the ten most frequent lexical bundles of *experimental*. *Prepositional phrase* (type 3D, pmw=67.28) is the most common type of 4-word lexical bundles, while *verb phrase with passive verb* (type 1E, pmw=38.81) is the most productive type of 5-word grams.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|---|---------------------------------------|--------------|--|--------------|
| 1 | <u>the experimental and numerical</u> | 11 | <u>compared with the experimental data</u> | 6 |
| 2 | <u>with the experimental data</u> | 9 | <u>were compared with the experimental</u> | 5 |

| | | | | |
|----|---|---|---|---|
| 3 | <u>compared with the experimental</u> | 9 | <u>between the experimental and numerical</u> | 5 |
| 4 | <u>between the experimental and</u> | 5 | <u>the experimental and numerical results</u> | 4 |
| 5 | <u>experimental and numerical results</u> | 5 | are compared with the experimental | 4 |
| 6 | of the experimental apparatus | 4 | the basis of experimental data | 3 |
| 7 | of the experimental parameters | 4 | results and the experimental data | 3 |
| 8 | <u>experimental and numerical studies</u> | 4 | <u>the experimental and numerical studies</u> | 3 |
| 9 | <u>effect of experimental parameters</u> | 4 | <u>effect of experimental parameters on</u> | 3 |
| 10 | in the experimental chamber | 4 | on the basis of experimental | 3 |

Table 84. The most frequent 4- and 5-word lexical bundles of *experimental* in *MATERIAL SCIENCE*

Experimental is used as a non-gradable adjective in *MATERIAL SCIENCE*. It is not modified by adverbs and does not function in the predicative and comparative constructions.

5.5.1.6. Concluding remarks

The discussion on the top-frequency adjectives in *MATERIAL SCIENCE* can be concluded with the following observations:

- the most productive pattern that each of the five adjectives in *MATERIAL SCIENCE* sub-corpus enters is a nominal phrase, in which adjectives premodify the head nouns;
- with a view to gradability, 3 of 5 adjectives, namely, *high*, *low* and *large* have a full set of properties, and are used as gradable adjectives. *Different* is a partially gradable adjective, since it has not been found in comparative patterns. *Experimental* is the instance of a non-gradable adjective in *MATERIAL SCIENCE*;
- the attributive pattern is much more frequently used than predicative one;
- the most significant collocates of *high*, *low*, *different* and *large* are nouns which are followed by prepositions and adjectives. *Experimental* collocates mainly with nouns.
- all the five top-frequency adjectives in *MATERIAL SCIENCE* are found in 4- and 5-word lexical bundles. The most frequent structural types of the lexical bundles in *MATERIAL SCIENCE* sub-corpus are highlighted in yellow in Table 85. As can be seen, the type which prevails over others is *prepositional phrase* (3D) both for 4- and 5-word bundles, but it has different frequency: 271.70 pmw for 4-word and 150.08 for 5-word ones.

| | 4-word | | 5-word | |
|----|--------------|--------|--------------|-------|
| | Total number | pmw | Total number | pmw |
| 3A | 32 | 82.80 | 12 | 31.05 |
| 3B | 16 | 41.40 | 30 | 77.63 |
| 3C | 80 | 207.01 | 29 | 75.04 |

| | | | | |
|----|-----|--------|----|--------|
| 3D | 105 | 271.70 | 58 | 150.08 |
| 1D | 4 | 10.35 | 4 | 10.35 |
| 1E | 9 | 23.29 | 15 | 38.81 |
| 2D | 3 | 7.76 | - | - |

Table 85. Structural types of 4- and 5-word lexical bundles in *MATERIAL SCIENCE*

5.6.1. The five top-frequency adjectives in *MEDICINE* sub-corpus

| Adjective | Total number | Pmw |
|-------------|--------------|----------|
| high | 664 | 2.286,20 |
| clinical | 493 | 1,697.43 |
| significant | 475 | 1,635.46 |
| low | 446 | 1,535.61 |
| different | 237 | 816.011, |

Table 86. The five top-frequency adjectives in *MEDICINE* sub-corpus

5.6.1.1. *High* in *MEDICINE*

As presented in Table 86, *high* (664 occurrences) is at the top of the list of most common adjectives in *MEDICINE* sub-corpus. Figure 104 demonstrates lexico-grammatical patterns of this adjective.

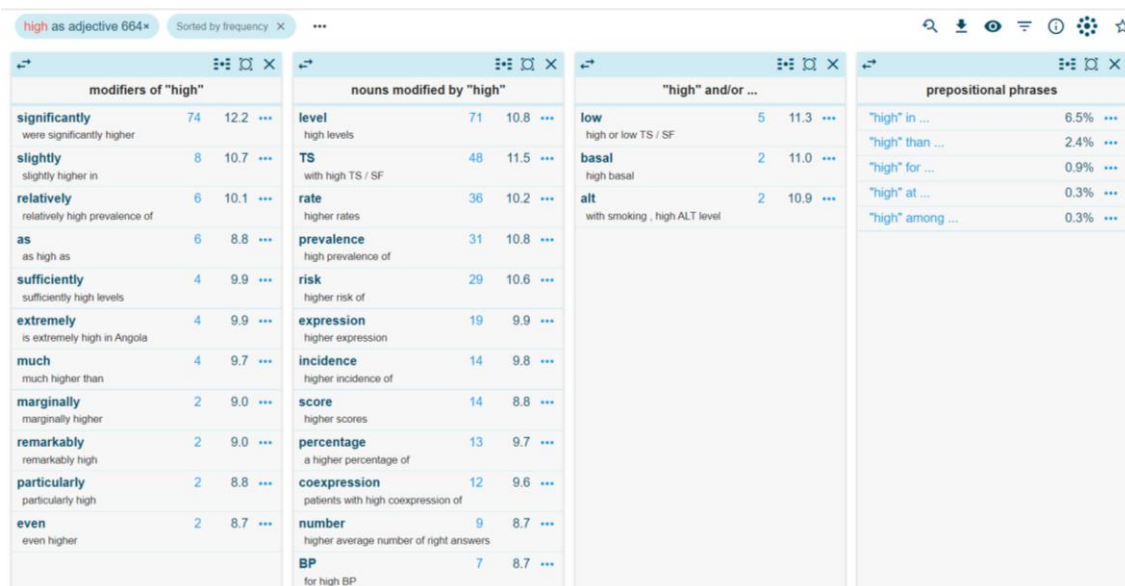


Figure 104. Lexico-grammatical patterns of *high* in *MEDICINE*

The most productive function of *high* is a premodifier of nouns, which comprises 73% of all its patterns (Fig. 105). The word with the highest total number, 71 occurrences, which collocates with *high* is a noun *level* (71 occurrences), followed by an acronym *TS* (48) and another noun, *rate*, (36). They can be illustrated with the concordances below:

- 325 In addition, Bernhardt et al recorded **the highest level** of activity that occurred during the 1-minute observation.
- 326 Among Asians, 2.8% with **high TS/SF** were HFE V295A heterozygotes.
- 327 Patients with CKD Stage 3 or higher had **a higher rate** of MAU or macroalbuminuria (36.3%; 62 out of 171) compared with patients with CKD

From the examples 325-327 it can be also observed that *high* occurs in the three forms: plain, comparative and superlative.

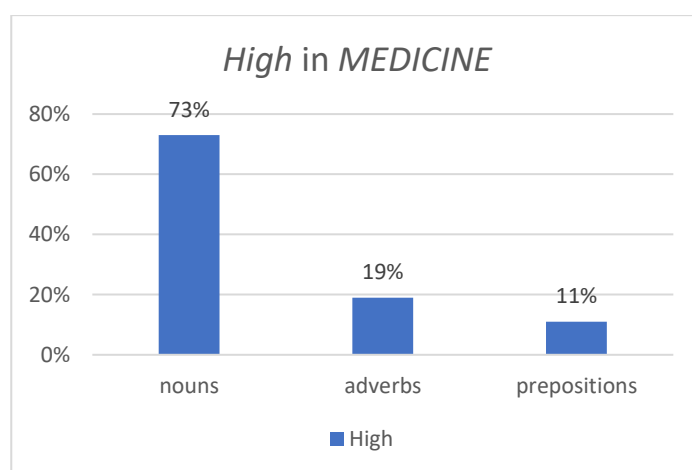


Figure 105. The distribution of lexico-grammatical patterns of *high* in *MEDICINE*

The second, yet a far less frequent construction is *adverb/determiner + high*, which accounts for 19%. The three most common adverbs are: *significantly*, *slightly* and *relatively* which occur as many as 74, 8 and 6 times in *MEDICINE* sub-corpus:

- 328 The incidence of stable responses was also **significantly higher** in patients with splenic uptake (85% vs. 50%, P50.0083).
- 329 The phaeochromocytoma group had **a slightly higher** complication rate of 21% compared to 12%
- 330 The **relatively high** prevalence of food allergy has led to increased diagnostic testing.

The third pattern, namely, *high + preposition*, constitutes 11% of all patterns with *high*. The following three patterns are most frequent ones: *high in*, a comparative construction *higher than*, and *high for*:

- 331 The SCA burden is extremely **high in** Angola, but NBS is feasible.
 332 The frequency scores were significantly **higher than** the independence scores in most settings except the home and in most chapters except d1
 333 In univariate analysis, 4-year LFS and 4-year OS were significantly **higher for** NPM11/FLT3-ITD2 patients compared with patients presenting another

As examples 331-333 show, *high* is used in the predicative function, and as compared to the attributive function it is used with the ratio of 16% to 84% (Fig. 106).

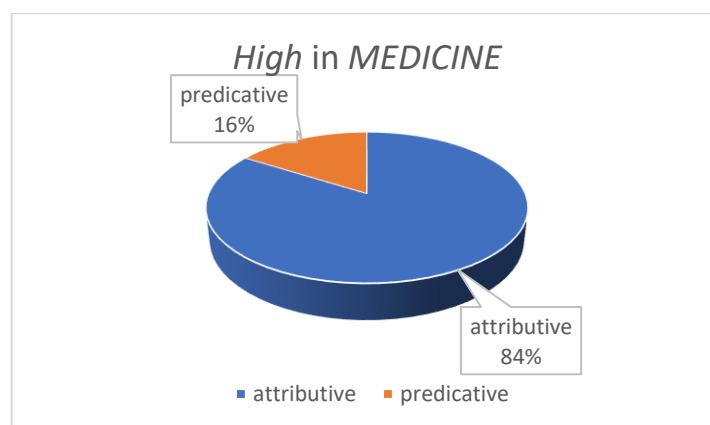


Figure 106. The attributive vs. predicative structure of *high* in *MEDICINE*

Figure 107 presents two verbs which are used before *high*: *to be* and *to remain*, in which the former outnumbers the latter with the ratio of 103 to 3 occurrences. The three most frequent subjects of *be high* are *group*, *patient* and *rate*, with the total number of 9, 7 and 5 occurrences:

- 334 Bilirubin levels of the BDL, GL1BDL, and GL2BDL **groups** were significantly higher than those of the sham group ($p < 0.001$).
 335 Serum IMA levels of COPD **patients** were significantly higher than those of the control participants ($p ? 0.001$).
 336 The non-attendance **rate** was higher if the physician had more shifts per week

| verbs before "high" | | subjects of "be high" | | verbs complemented by "high" | |
|---------------------------|--------------|---|------------|------------------------------|------------|
| be | 103 10.7 ... | group | 9 11.0 ... | be | 2 11.4 ... |
| were significantly higher | | of the BDL group were significantly higher than those of | | were almost 5-fold higher | |
| remain | 3 9.2 ... | rate | 5 10.5 ... | | |
| remained high | | rate was higher | | | |
| | | patient | 7 10.2 ... | | |
| | | levels of COPD patients were significantly higher than those of | | | |
| | | level | 4 10.2 ... | | |
| | | levels were significantly higher in | | | |
| | | verge | 3 10.0 ... | | |
| | | from the anal verge was significantly higher in the TEM | | | |
| | | study | 4 9.9 ... | | |
| | | study were higher | | | |
| | | visit | 2 9.4 ... | | |
| | | or emergent care visits were higher for patients | | | |
| | | load | 2 9.4 ... | | |
| | | viral loads higher than | | | |
| | | 5-fold | 2 9.4 ... | | |
| | | higher | | | |
| | | Elisa | 2 9.4 ... | | |
| | | ELISA is remarkably high | | | |
| | | cm | 2 9.4 ... | | |
| | | cm high | | | |
| | | event | 2 9.4 ... | | |
| | | events were significantly higher | | | |

Figure 107. Verb +high pattern in MEDICINE

The ten most common collocates of *high* ordered according to *LogDice* parameter are presented in Table 87. The most significant adverb which directly precedes *high* is *significantly* (*LogDice*=11.42), e.g., *a significantly higher percentage of patients*. As regards acronyms, there are two collocate candidates, namely, *TS* and *SF*, which belong to expressions specific of this particular discipline, e.g., *We used high TS/SF phenotypes as surrogates*. *Than* is the only representative of prepositional collocate of *high*, e.g., *higher than those from wild-type mice*. The last type of collocate is the verb *have*, which is used as in the examples: *specific IgE had the highest frequency of positive reaction; It has a high affinity for the ER*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|---------------|--------------------|-----------------|---------|---------|
| significantly | 85 | 351 | 9.15 | 11.42 |
| TS | 52 | 71 | 7.19 | 11.18 |
| than | 91 | 632 | 9.42 | 11.17 |
| SF | 50 | 77 | 7.05 | 11.11 |
| level | 87 | 684 | 9.19 | 11.05 |
| rate | 50 | 416 | 6.96 | 10.57 |
| prevalence | 38 | 220 | 6.10 | 10.46 |
| have | 117 | 2,308 | 10.43 | 10.33 |
| risk | 39 | 335 | 6.15 | 10.32 |
| expression | 26 | 156 | 5.04 | 10.02 |

Table 87. The ten most common collocates of *high* in MEDICINE

Table 88 demonstrates the ten most frequent 4- and 5-word lexical bundles of *high*. *Prepositional phrase* (type 3D) is the most productive structural type of both 4- and 5-word grams, but its frequency is different and amounts to 55.09 pmw for 4-word grams and 61.97 pmw to 5-word grams.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|----------------------------------|--------------|---|--------------|
| 1 | <u>high coexpression of both</u> | 7 | <u>in blacks with high TS</u> | 5 |
| 2 | <u>whites with high TS</u> | 7 | <u>greater in whites with high</u> | 5 |
| 3 | <u>with high coexpression of</u> | 6 | <u>in whites with high TS</u> | 5 |
| 4 | <u>that high levels of</u> | 5 | <u>significantly in blacks with high</u> | 4 |
| 5 | <u>blacks with high TS</u> | 5 | <u>with high coexpression of both</u> | 4 |
| 6 | <u>in blacks with high</u> | 5 | <u>patients with high coexpression of</u> | 4 |
| 7 | <u>in whites with high</u> | 5 | <u>that high levels of IgE</u> | 3 |
| 8 | <u>a high risk of</u> | 4 | <u>high coexpression of both EGFR</u> | 3 |
| 9 | <u>the high prevalence of</u> | 4 | <u>exposed to high levels of</u> | 3 |
| 10 | <u>exposed to high levels</u> | 4 | <u>are at high risk for</u> | 3 |

Table 88. The most frequent 4- and 5-word lexical bundles of *high* in *MEDICINE*

5.6.1.2. *Clinical* in *MEDICINE*

The second adjective to discuss is *clinical* with 493 occurrences. As presented in Figure 108, *clinical* fulfils two functions: it is a premodifier in a nominal phrase which comprises 93% of all its patterns, and it enters *and/or* pattern with other adjectives or determiner *other*. The second construction accounts for 24%. The distribution is demonstrated in Figure 109.



Figure 108. Lexico-grammatical patterns of *clinical* in *MEDICINE*

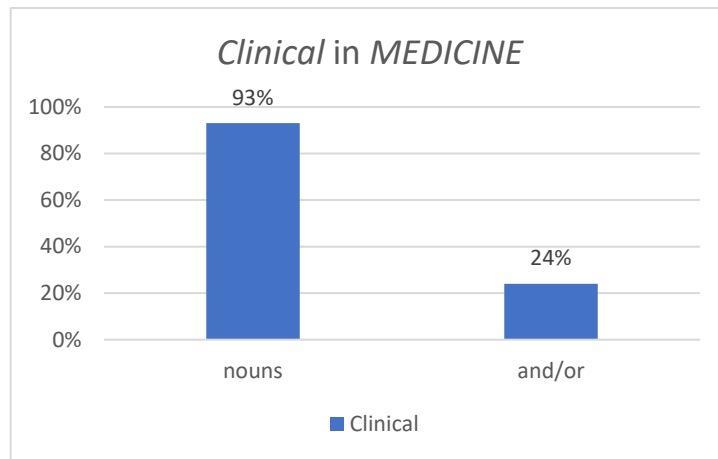


Figure 109. The distribution of lexico-grammatical patterns of *clinical* in *MEDICINE*

The three top-frequency nouns that form a nominal phrase with *clinical* are *trial*, *practice* and *outcome*, and their total number is 47, 35 and 23 occurrences, respectively.

- 337 This was the first **clinical trial** to treat Japanese SAR patients with omalizumab.
- 338 Human biocompatibility has been proven in **clinical practice**.
- 339 We have examined **the clinical outcome** of such sequential treatment in a retrospective analysis of patients with ALK-rearranged NSCLC.

As far as the second construction is concerned, namely, *and/or*, *demographic*, *routine* and *major* are the three most common adjectives, with the total number at the level of 15, 4 and 4. The pattern is illustrated with the following concordances:

- 340 The **demographic and clinical** characteristics of the patients at the analysis of the gefitinib plasma concentration are listed in Table 1.
- 341 **Routine clinical** care occurred every 2 months for the first 6 months (aligned with PCV-13 schedule) and every 3 months thereafter.
- 342 Data from this community sample were generally in agreement with the **major clinical** trial of erlotinib.

All structures with *clinical* in *MEDICINE* occur in the attributive form (Fig. 110).

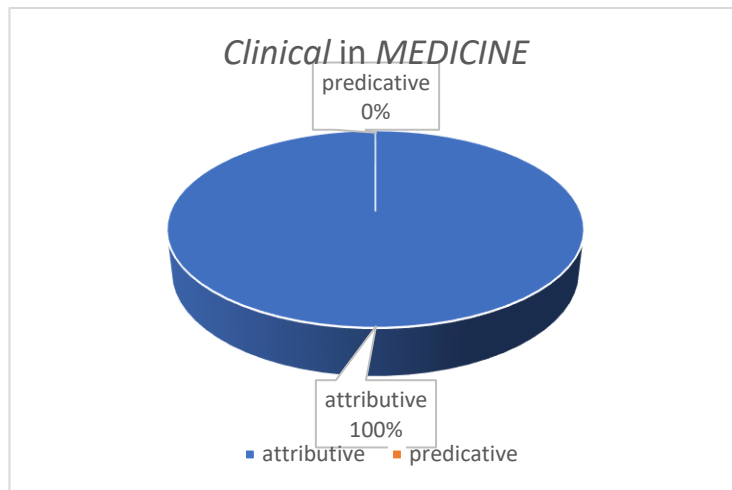


Figure 110. The attributive vs. predicative structure of *clinical* in *MEDICINE*

Table 89 demonstrates the ten most common collocates of *clinical* according to the *LogDice* index. It can be seen that nouns outnumber other parts of speech, since they are 8 of 10 collocates of *clinical*. The nouns are related to research process, e.g., *outcome*, *feature*, or refer to the problems characteristic of a particular discipline, e.g., *diagnosis*, *symptom*. As far as other parts of speech are concerned, we find: the adjective *demographic*, e.g., *demographic and clinical characteristics associated with LOS 10 days*, and the participial adjective *randomized*, e.g., *This randomized clinical trial*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|----------------|--------------------|-----------------|---------|---------|
| practice | 43 | 103 | 6.54 | 11.21 |
| trial | 50 | 244 | 7.02 | 11.12 |
| outcome | 31 | 272 | 5.50 | 10.37 |
| characteristic | 28 | 221 | 5.23 | 10.33 |
| demographic | 19 | 74 | 4.34 | 10.10 |
| experience | 18 | 138 | 4.20 | 9.87 |
| diagnosis | 19 | 327 | 4.26 | 9.57 |
| symptom | 16 | 234 | 3.92 | 9.49 |
| feature | 12 | 67 | 3.44 | 9.46 |
| randomize | 12 | 114 | 3.42 | 9.34 |

Table 89. The ten most common collocates of *clinical* in *MEDICINE*

Lexical bundles which contain *clinical* are presented in Table 90. The most frequent structural type of 4-word lexical bundles is 3A – *noun phrase with of-phrase* (pmw=58.53). *Prepositional phrase* (type 3D, pmw=34.43) prevails among 5-word lexical bundles.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|---|-------------------------------------|--------------|--|--------------|
| 1 | <u>years of clinical experience</u> | 7 | <u>years of clinical experience in</u> | 6 |
| 2 | <u>of clinical experience in</u> | 6 | <u>clinical experience in stroke</u> | 4 |

| | | | | |
|----|--|---|---|---|
| 3 | <u>clinical characteristics of the</u> | 6 | <u>of clinical experience in stroke</u> | 4 |
| 4 | <u>used in clinical practice</u> | 5 | <u>in the major clinical trial</u> | 3 |
| 5 | <u>clinical experience in stroke</u> | 4 | <u>in the MSH clinical trial</u> | 3 |
| 6 | <u>the demographic and clinical</u> | 4 | <u>the clinical features and renal</u> | 3 |
| 7 | <u>accuracy of clinical diagnosis</u> | 4 | <u>clinical features and renal pathology</u> | 3 |
| 8 | <u>the major clinical trial</u> | 4 | <u>clinical characteristics of the patients</u> | 3 |
| 9 | <u>in the major clinical</u> | 3 | - | |
| 10 | <u>the MSH clinical trial</u> | 3 | | |

Table 90. The most frequent lexical bundles of *clinical* in *MEDICINE*

Clinical is not modified by any modifiers of degree, and does not occur in the predicative structure. *Clinical* has not been found in any comparative constructions. It is classified as a non-gradable adjective in *MEDICINE*.

5.6.1.3. Significant in *MEDICINE*

The third top-frequency adjective in *MEDICINE* is *significant*, whose total number is 475 occurrences. Lexico-grammatical constructions of *significant* are demonstrated in Fig. 111. The main function of *significant* is modifying nouns in a nominal phrase. This structure accounts for 76% of all patterns with *significant* (Fig. 112).

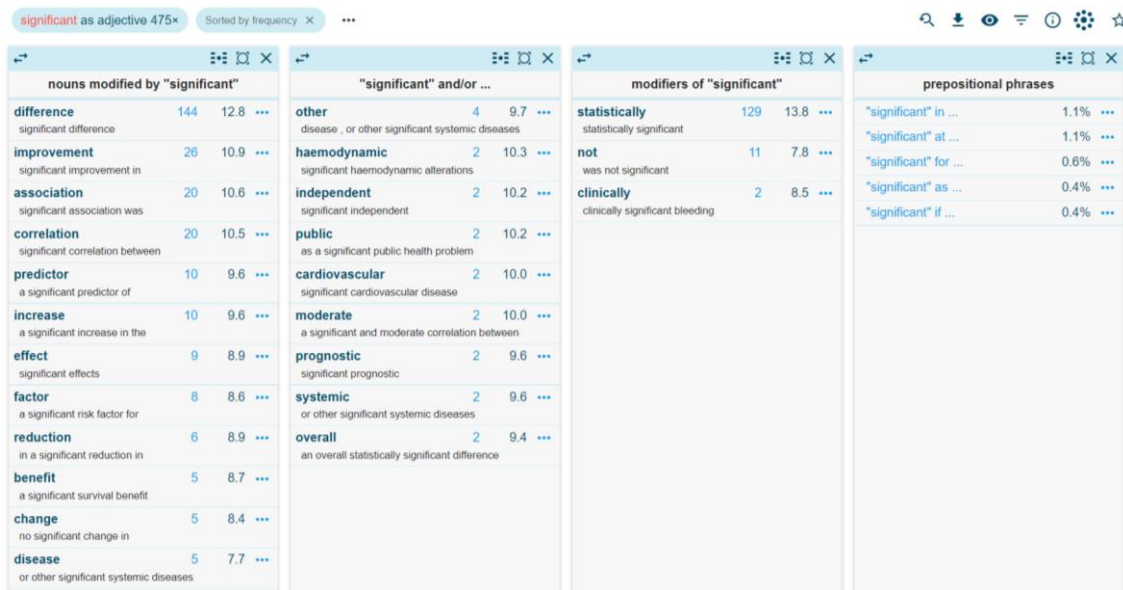


Figure 111. Lexico-grammatical patterns of *significant* in *MEDICINE*

The three most frequently used nouns that enter the pattern *significant* + *noun* are: *difference* (144 occurrences), *improvement* (26) and *association* (20). They are illustrated with the following concordances:

- 343 A statistically **significant difference** was found in those diagnoses related to speech/language/fluency areas, with a prevalence of 63.9% in boys
- 344 Group A and Group C participants had statistically **significant improvements** in their Modified Rivermead Mobility Index ($p < 0.017$).

345 Among the various obesity measures, WHtR revealed the greatest odds and **significant associations** with musculoskeletal symptoms in identified body regions.

The second most frequent construction which *significant* enters is *modifiers of significant*, which accounts for 30% of all patterns with this adjective. *Statistically* is most common (129 occurrences), followed by negation *not* (11) and adverb *clinically* (2):

346 There was a **statistically significant** difference in the mean age of the radical cystectomy group (51.1 years) compared with the radiotherapy group (62.9

347 VAS Reduction in pain score during maximum hand gripping was found in both groups, although the between group difference was **not significant**.

348 This report describes three individuals with underlying hypercoagulable states, who developed **clinically significant** bleeding complications while receiving therapeutic anticoagulation with enoxaparin.

The third pattern is *and/or*, which comprises 10% of all constructions with *significant*. Determiner *other* occurs four times, followed by adjectives *haemodynamic* and *independent*, each of which occurs twice. The following instances illustrate *and/or* pattern:

349 No **othersignificant** effects were identified.

350 Pneumoperitoneum per se did not result in **significant haemodynamic** alterations in the other 11 patients.

351 However, these two factors were not found to be **significant independent** factors when a multivariate analysis was carried out (Table 3).

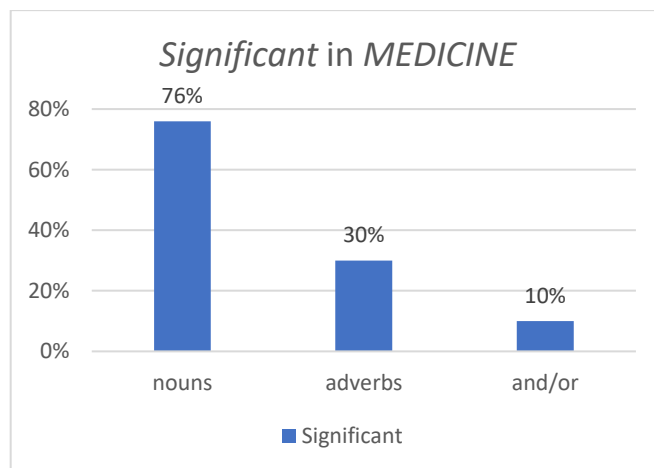


Figure 112. The distribution of lexico-grammatical patterns of significant in MEDICINE

The proportion between the attributive and predicative forms of *significant* is tilted towards the former, with the ratio of 82% to 18% (Fig. 113).

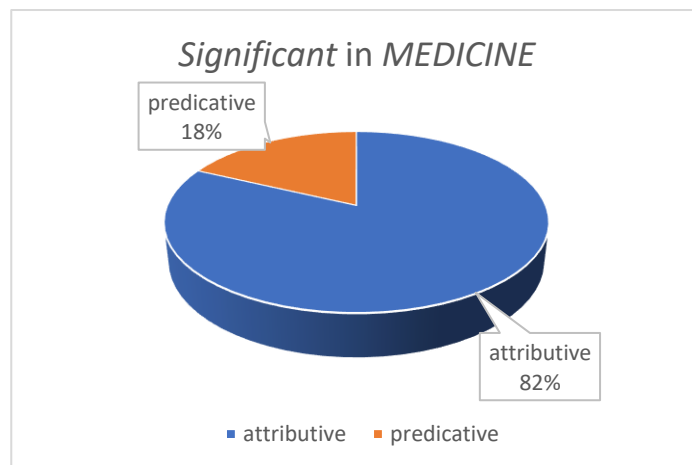


Figure 113. The attributive vs. predicative structure of *significant* in *MEDICINE*

The two verbs that represent *verb + significant* pattern are *to be* (55 occurrences) and *to consider* (28 occurrences, Fig. 114):

- 352 Again, the trend over time for both groups **was significant** (P .01), but the effect of the intervention was not (P.65).
 353 A p value < 0.05 was taken to **be significant**
 354 Results were **considered** to be statistically **significant** at a 2-tailed p value of less than 0.05.

Data on *subjects of be significant* are presented in Fig. 114. Among most frequent subjects are *difference*, *group* and *association*, with the total number of 16, 4 and 2:

- 355 Although the **difference** was not statistically **significant**, controls had marginally higher odds of receiving FDA-approved pharmacologic prophylaxis than cases (P ? 0.07);
 356 Again, the trend over time for both **groups** was **significant** (P .01), but the effect of the intervention was not (P.65).
 357 for lower extremity symptoms and the **association** was **significant**, whereas (OR Z 1.51; 95% CI, 0.94e2.40) for back pain the association was not significant (Table 4).

| verbs before "significant" | | | subjects of "be significant" | | |
|--------------------------------------|----|----------|--|----|----------|
| be | 55 | 9.8 *** | difference | 16 | 13.1 *** |
| was significant | | | the difference was not statistically significant | | |
| consider | 28 | 12.7 *** | group | 4 | 10.6 *** |
| considered statistically significant | | | time for both groups was significant (P | | |
| | | | association | 2 | 10.7 *** |
| | | | association was significant | | |
| | | | intervention | 2 | 10.6 *** |
| | | | effect of the intervention was not significant (P | | |
| | | | patient | 2 | 8.9 *** |
| | | | patients is not significant | | |

Figure 114. *Verb + significant* pattern in *MEDICINE*

An overview of the ten most frequent collocates of *significant* presented according to *LogDice* index is demonstrated in Table 91. The collocation representatives are more varied than of the previous adjectives, *high* and *clinical*, as four of them are nouns (*difference*,

improvement, association, correlation), one is an adverb (*statistically*), one expresses negation (*no*), one serves as a pronoun (*there*), one is a preposition (*between*), and two are verbs (*find, consider*). The most significant collocate is *statistically* ($LogDice=12.73$). The first three collocates: *statistically, difference, and no* create the structure: *no statistically significant difference*, as in the example: *There were no statistically significant differences between the groups in these variables.*

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|---------------|--------------------|-----------------|---------|---------|
| statistically | 129 | 146 | 11.34 | 12.73 |
| difference | 166 | 427 | 12.84 | 12.56 |
| no | 108 | 549 | 10.32 | 11.75 |
| there | 91 | 537 | 9.47 | 11.52 |
| between | 82 | 762 | 8.95 | 11.08 |
| find | 53 | 433 | 7.20 | 10.90 |
| consider | 35 | 211 | 5.87 | 10.71 |
| improvement | 27 | 114 | 5.17 | 10.55 |
| association | 24 | 144 | 4.86 | 10.31 |
| correlation | 24 | 185 | 4.85 | 10.22 |

Table 91. The ten most common collocates of *significant* in *MEDICINE*

Regarding the lexical bundles with *significant*, *noun phrase with other post-modifier* (type 3B, pmw=103.29) is the most productive among 4-word bundles, and *verb phrase with non-passive verb* (type 1D, pmw=37.87) among 5-word grams (Table 92).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--|--------------|---|--------------|
| 1 | <u>was no significant difference</u> | 18 | <u>was no significant difference in</u> | 14 |
| 2 | <u>no significant difference in</u> | 17 | <u>There was no significant difference in</u> | 9 |
| 3 | <u>there was no significant</u> | 15 | <u>there was no significant difference in</u> | 9 |
| 4 | <u>significant difference was found</u> | 14 | <u>statistically significant difference was found</u> | 7 |
| 5 | <u>there was no significant</u> | 12 | <u>There was no statistically significant</u> | 7 |
| 6 | <u>significant difference in the</u> | 12 | <u>no significant difference in the</u> | 7 |
| 7 | <u>a statistically significant difference</u> | 12 | <u>no significant differences between the</u> | 7 |
| 8 | <u>were no significant differences</u> | 11 | <u>was no statistically significant difference</u> | 7 |
| 9 | <u>no significant differences in</u> | 11 | <u>were no significant differences between</u> | 6 |
| 10 | <u>no statistically significant difference</u> | 11 | <u>a statistically significant improvement in</u> | 6 |

Table 92. The most frequent 4- and 5-word lexical bundles of *significant* in *MEDICINE*

Like *significant* in the *ELC* and *ECOLOGY*, *significant* in *MEDICINE* is a gradable adjective.

5.6.1.4. *Low* in *MEDICINE*

Low is the fourth top-frequency adjective in *MEDICINE*, and its total number is 446 occurrences.

| nouns modified by "low" | "low" and/or ... | modifiers of "low" | prepositional phrases |
|---|---|--|--------------------------|
| level low levels 23 9.4 ... | high high or low TS / SF 5 11.3 ... | significantly were significantly lower than 47 11.6 ... | "low" in ... 8.1% ... |
| rate lower rates 18 9.4 ... | back with low back pain 3 11.2 ... | relatively relatively low 17 11.8 ... | "low" than ... 1.4% ... |
| score associated with low ACT scores 16 9.2 ... | Int-1 IPSS low and Int-1 3 11.2 ... | very very low birth weight infants 12 11.0 ... | "low" to ... 0.5% ... |
| extremity and lower extremities 15 10.5 ... | ACT factors associated with low ACT scores 3 11.2 ... | consistently mean DHSMS were consistently lower in the omalizumab 5 10.5 ... | "low" with ... 0.5% ... |
| risk a low risk 15 10.2 ... | socioeconomic low socioeconomic class 2 10.7 ... | much a much lower 3 9.5 ... | "low" among ... 0.5% ... |
| pain lower extremity pain 11 9.7 ... | mid mid and low 2 10.6 ... | only only lower 2 7.9 ... | |
| prevalence lower prevalence of 10 9.7 ... | educational Low educational 2 10.5 ... | as as low as 2 7.3 ... | |
| TS SF, low TS / SF 9 9.6 ... | physical low Physical 2 10.1 ... | also also low 2 6.5 ... | |
| symptom and lower extremity symptoms 9 9.2 ... | early low early mortality 2 9.7 ... | | |
| limb of the lower limbs 7 9.5 ... | | | |
| dose low doses of RfVIIa 7 9.1 ... | | | |
| wall middle, and lower posterior walls of the maxillary 6 9.0 ... | | | |

Figure 115. Lexico-grammatical patterns of *low* in *MEDICINE*

Figure 115 presents lexico-grammatical patterns of this adjective. Its most salient function is a modifier in a nominal phrase, which comprises 69% of all its patterns (Fig. 116). The three nouns which *low* most frequently collocates with are *level*, *rate* and *score*, their total number is 23, 18, and 16. The following concordances illustrate this pattern:

- 358 parenchymal tissue from COPD patients who were current smokers contained lower levels of total human serum albumin, but **higher levels** of carbonylated and oxidized human serum albumin,
- 359 By age category, the prevalence of smoking peaked at 3554 years with **lower rates** of smoking at either extreme of age (Table 1).<
- 360 Of the 6 subscales other than the Face Scale, the Asthmatic Symptoms subscale had the highest score on the transformed 0??100 score on the AHQ-33 (19.4 ± 18.2), and the General health subscale had **the lowest score** on the SF-36 (50.6 ± 19.1).

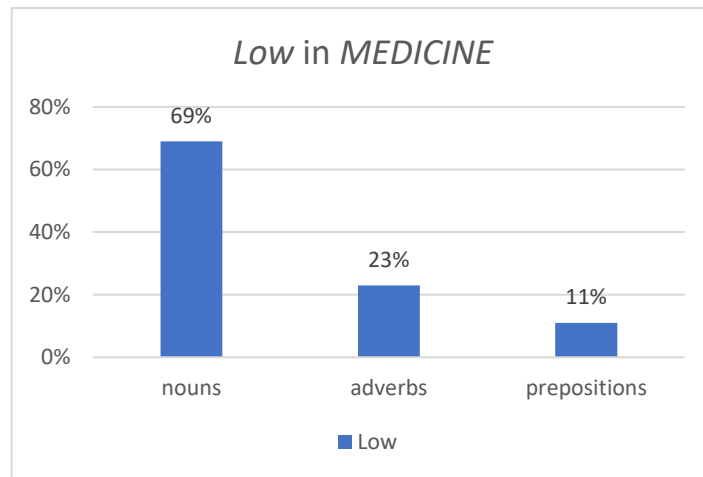


Figure 116. The distribution of lexico-grammatical patterns of *low* in *MEDICINE*

The pattern in which *low* is modified by adverbs is less productive, since it accounts for 23% of all patterns with *this adjective*. As presented in Fig. 115, *significantly* (47 occurrences), *relatively* (17) and *very* (12) are top-frequency adverbs:

- 361 The results showed a **significantly lower** risk of early death by Day 21 (p Z 0.015) with leukapheresis.
- 362 Nevertheless, our study had a **relatively low** number of cases and our findings warrant further study in this area.
- 363 Of these preterm births, **very low** birth weight (VLBW) infants, defined as those with a body weight of 1500 g at birth, represent 0.8% of live births yet

The construction *low + preposition* comprises 11% of all patterns with this adjective in *MEDICINE*. As can be seen in Fig. 115, *low in*, *low than* and *low to* are the three top patterns, but they are used rarely. The instances of concordances are the following:

- 364 Primary and all secondary efficacy variable scores were significantly **lower in** the omalizumab group than in the placebo group (P < .01).
- 365 The obesity prevalence in this study (19.1%) is **lower than** the prevalence rate of 24.0% reported by Campbell [29] among whites with polio.
- 366 After the random selection, sectors were ordered numerically from the **lowest to** the highest number to define the visiting order for the survey team.

Figure 117 demonstrates the distribution of the attributive and predicative forms of *low* in *MEDICINE*. With regard to the predicative function, it occurs less frequently than the attributive one, with the ratio of 30% to 70%.

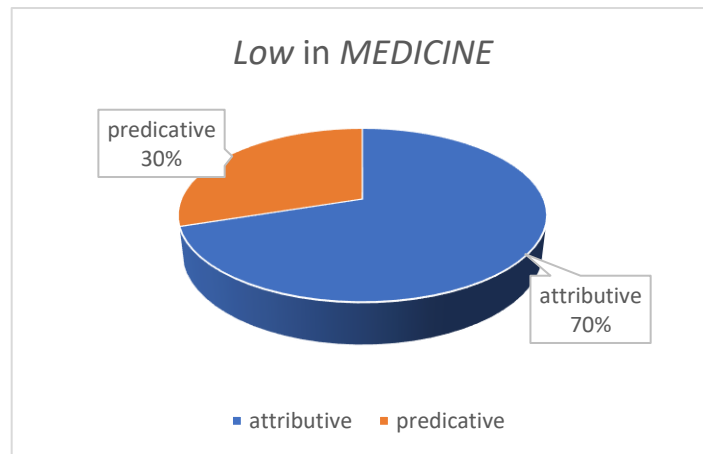


Figure 117. The attributive vs. predicative structure of *low* in *MEDICINE*

| verbs before "low" | | subjects of "be low" | |
|--------------------------|-------------|---|-------------|
| be | 98 10.6 ... | group | 15 11.8 ... |
| were significantly lower | | GL1BDL and GL2BDL groups were significantly lower than those of | |
| | | score | 7 11.1 ... |
| | | rescue medication scores were significantly lower in the omalizumab | |
| | | study | 4 10.0 ... |
| | | this study were lower than | |
| | | IPSS | 3 10.0 ... |
| | | IPSS low and Int-1 | |
| | | patient | 3 9.0 ... |
| | | levels of COPD patients were significantly lower | |
| | | MAP | 2 9.5 ... |
| | | and MAP was significantly lower in the | |
| | | stroke | 2 9.5 ... |
| | | stroke is lower | |
| | | DNSMS | 2 9.5 ... |
| | | the mean DNSMS were consistently lower in the omalizumab | |
| | | dose | 2 9.5 ... |
| | | dose lower | |
| | | frequency | 2 9.4 ... |
| | | frequencies were low | |
| | | age | 2 9.4 ... |
| | | age was lower in the | |

Figure 118. *Verb+ low* pattern in *MEDICINE*

As presented in Fig. 118, the predicative function of *low* is illustrated with the pattern *verbs before low*, which entails *subjects of be low*. Among them, the three nouns *group*, *score* and *study* collocate with *low* most frequently:

- 367 and bile retention ($p < 0.002$) scores of the GL1BDL **group** **were**
 significantly **lower** than those of the BDL group
- 368 However, all SF-36 subscale **scores** **were lower** in patients with
 intermittent asthma than in those with mild persistent asthma, but the
 differences were not
- 369 Non-attendance rate in the present **study** **was lower** in the afternoon (6.8%)
 than in the morning (8.2%).

The corpus data concerning the ten most common collocates of *low* are presented in Table 93. The proportion of parts of speech is tilted to nouns, since 5 of 10 lemmas are nouns (*extremity*, *rate*, *risk*, *level*, and *score*). They are followed by two adverbs (*significantly*, *relatively*), two prepositions (*than*, *back*) and one verb (*associate*). The most significant

collocate of *low* is the adverb *significantly* (*LogDice*=10.98), which creates a comparative structure *significantly lower*, e.g., *scores were significantly lower in the omalizumab group*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|---------------|--------------------|-----------------|---------|---------|
| significantly | 49 | 351 | 6.94 | 10.98 |
| extremity | 27 | 36 | 5.19 | 10.84 |
| than | 57 | 632 | 7.45 | 10.76 |
| relatively | 17 | 57 | 4.11 | 10.11 |
| rate | 29 | 416 | 5.29 | 10.11 |
| back | 16 | 42 | 3.99 | 10.07 |
| associate | 24 | 311 | 4.82 | 10.02 |
| risk | 24 | 335 | 4.82 | 9.98 |
| level | 34 | 684 | 5.69 | 9.95 |
| score | 26 | 445 | 4.99 | 9.90 |

Table 93. The ten most common collocates of *low* in *MEDICINE*

The most productive structural type of lexical bundles with *low* is *verb phrase with non-passive verb* (type 1D). 4-word lexical bundles of this type are more frequent (*pmw*=51.64) than 5-word grams (*pmw*=37.83).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|------------------------------------|--------------|--|--------------|
| 1 | <u>with low ACT scores</u> | 5 | <u>associated with low ACT scores</u> | 5 |
| 2 | <u>very low birth weight</u> | 5 | <u>very low birth weight infants</u> | 4 |
| 3 | <u>associated with low ACT</u> | 5 | <u>with low levels of Min</u> | 3 |
| 4 | <u>low birth weight infants</u> | 5 | <u>for very low birth weight</u> | 3 |
| 5 | <u>associated with a low</u> | 4 | <u>for factors associated with low</u> | 3 |
| 6 | <u>low levels of Min</u> | 3 | <u>year for very low birth</u> | 3 |
| 7 | <u>factors associated with low</u> | 3 | <u>low birth weight infants born</u> | 3 |
| 8 | <u>associated with low levels</u> | 3 | <u>birth year for very low</u> | 3 |
| 9 | <u>with low levels of</u> | 3 | <u>associated with low levels of</u> | 3 |
| 10 | <u>year for very low</u> | 3 | <u>associated with low levels of</u> | 3 |

Table 94. The most frequent 4- and 5-word lexical bundles of *low* in *MEDICINE*

5.6.1.5. *Different* in *MEDICINE*

As presented in Fig. 119, *different* appears in the same constructions as *low*, but the total number of occurrences is different.

| nouns modified by "different" | "different" and/or ... | modifiers of "different" | prepositional phrases |
|---|--|--|----------------------------------|
| combination 9 10.5 *** different combinations of treatment approaches | viral 3 11.4 *** different viral loads | significantly 22 10.7 *** were not significantly different | "different" between ... 4.6% *** |
| approach 7 9.1 *** different approaches | clinical 3 9.4 *** different clinical | not 5 6.7 *** was not different between the two | "different" from ... 4.2% *** |
| setting 6 9.4 *** different settings | many 2 10.5 *** Many different | quite 3 11.1 *** quite different in | "different" in ... 3.0% *** |
| type 5 9.3 *** different types of | Se10 1 10.4 *** Different | very 3 9.5 *** very different | "different" with ... 0.8% *** |
| site 5 9.1 *** as well as different CpG sites investigated | results12 1 10.4 *** results12 and different | any 1 9.7 *** any different | "different" for ... 0.8% *** |
| result 5 8.5 *** different results | linguistic 1 10.4 *** different linguistic | neither 1 9.5 *** neither different | "different" after ... 0.4% *** |
| day 4 9.0 *** on different days of the week | pneumoperitoneal 1 10.4 *** different pneumoperitoneal | somewhat 1 9.4 *** somewhat different | "different" if ... 0.4% *** |
| region 4 8.9 *** in different regions and | cytopenic 1 10.4 *** different cytopenic | much 1 8.9 *** much different | |
| dose 4 8.8 *** different doses of | ethnic 1 10.3 *** different ethnic | slightly 1 8.9 *** slightly different | |
| level 4 7.0 *** of different levels of cytopenias across | geographical 1 10.3 *** different geographical | statistically 1 7.5 *** statistically different | |
| study 4 6.9 *** different studies | biologic 1 10.2 *** different biologic | | |
| language 3 9.0 *** different languages | facial 1 10.2 *** Different facial | | |

Figure 119. Lexico-grammatical patterns of *different* in *MEDICINE*

Out of 237 tokens, as many as 182 perform the function of premodifying adjectives of the head nouns in a nominal phrase. This function is performed by 77% of all patterns with *different* in *MEDICINE* (Fig. 120). The most frequent nouns are *combination*, *approach* and *setting*, which occur 9, 7 and 6 times, respectively.

- 370 In conclusion, our results showed that **different combinations** of physiotherapy treatment approaches may induce similar improvement in functional outcomes among
- 371 As **different approaches** can use similar interventions, it was difficult for the chief researcher to determine the combination of
- 372 In the literature, the overall level of non-attendance in **different settings** has varied from 7.7% to 42.3%.²¹⁴ In the present study, 7.3% of booked visits were not attended.

In the second construction *different* is modified by other word classes, especially adverbs, of which *significantly* is the most productive (22 tokens). *Significantly* is followed by negation *not* (5 tokens) and adverb *quite* (3 tokens):

- 373 lupus nephritis and pauci-immune GN Age and gender were **significantly different** between the lupus nephritis and pauci-immune groups, with the lupus nephritis group having younger and more female
- 374 The outcome of allo-HSCT patients was also **not different** in this trial whatever they received a RIC or a MAC regimen, and the whole allo-HS
- 375 The situation is **quite different** in high-risk patients identified by the presence of a residual vein clot after 3 month

The third pattern in which *different* occurs is *different* + *preposition* and is represented by 34 tokens, which amounts to 14% of all its structures. *Between*, *from* and *in* collocate with *different* most frequently:

- 376 The frequency of coinfection with EBV was not **different between** the two groups.
- 377 it is not possible to state that it is **different from** the proportion of FPT.
- 378 The situation is quite **different in** high-risk patients identified by the presence of a residual vein clot after 3 months of VKA treatment (RVT-group).

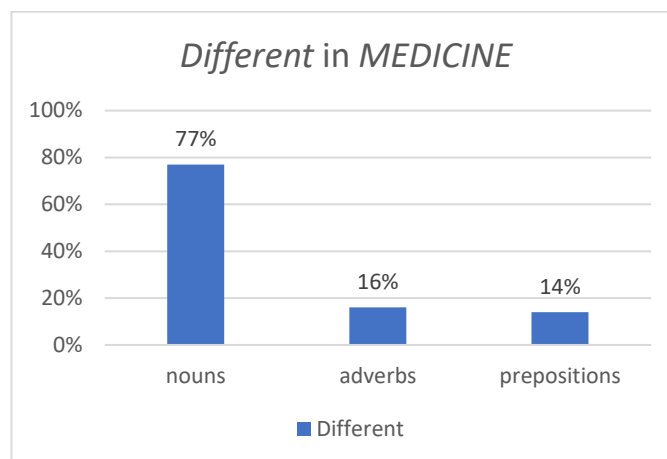


Figure 120. The distribution of lexico-grammatical patterns of *different* in MEDICINE

Fig. 121 provides an account of the distribution of the attributive and predicative structures with *different* in MEDICINE. The proportion is tilted to the former (82%).

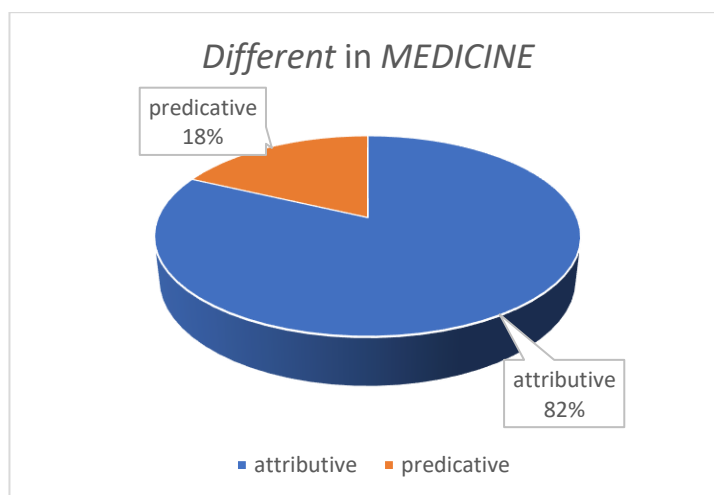


Figure 121. The attributive vs. predicative structure of *different* in MEDICINE

Among the predicative construction of *different*, the verb *to be* is used most frequently, and is represented by as many as 41 tokens (Fig. 122). This entails *subjects of be different* construction, in which *group*, *level* and *patient* are most common nouns:

- 379 The slope of the indomethacin-treated **group was not significantly different** from that of the control group

380 TPV, transition zone index and PSA levels were not significantly different
 381 from the baseline at any time point.
 381 in elderly patients with type 2 diabetes patients were not different from
 those in control group patients, and none of them met the criteria for
 diagnosis of lactic acidosis.

| verbs before "different" | | | subjects of "be different" | | |
|----------------------------------|----|-----|--|---|------|
| be | 41 | 9.4 | group | 4 | 10.5 |
| were not significantly different | | | of the PVL group were not significantly different from those | | |
| employ | 1 | 9.6 | level | 2 | 10.2 |
| employing different | | | levels were not significantly different | | |
| | | | patient | 2 | 8.9 |
| | | | patients was also not different | | |
| | | | Tests | 1 | 9.8 |
| | | | Tests were significantly different | | |
| | | | screenings | 1 | 9.8 |
| | | | screenings were different | | |
| | | | ROM | 1 | 9.8 |
| | | | ROM was not significantly different | | |
| | | | GBP | 1 | 9.8 |
| | | | GBP was different | | |
| | | | GJJ | 1 | 9.8 |
| | | | GJJ was different | | |
| | | | latency | 1 | 9.8 |
| | | | latencies were significantly different | | |
| | | | EBV | 1 | 9.8 |
| | | | EBV was not different | | |
| | | | IgEs | 1 | 9.8 |
| | | | IgEs were not significantly different | | |
| | | | stimulation | 1 | 9.8 |
| | | | stimulation were different | | |

Figure 122. Verb + different pattern in MEDICINE

The ten most common collocation candidates of *different* are summarised in Table 95. The list includes six nouns (*approach, combination, physiotherapy, setting, proportion, region*), one adjective (*different*), one adverb (*significantly*), one verb (*vary*), and one cardinal numeral (*two*). The most crucial collocate of *different* is the adjective *different* ($LogDice=10.57$), e.g., *different therapists have different preferences, the different settings and different chapters*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|---------------|--------------------|-----------------|---------|---------|
| different | 22 | 237 | 4.66 | 10.57 |
| approach | 19 | 213 | 4.33 | 10.43 |
| significantly | 24 | 351 | 4.85 | 10.39 |
| combination | 12 | 102 | 3.44 | 10.18 |
| two | 17 | 354 | 4.07 | 9.88 |
| vary | 7 | 66 | 2.63 | 9.56 |
| physiotherapy | 7 | 69 | 2.63 | 9.55 |
| setting | 8 | 122 | 2.80 | 9.51 |
| proportion | 7 | 87 | 2.62 | 9.47 |
| region | 7 | 98 | 2.62 | 5.42 |

Table 95. The ten most common collocates of *different* in MEDICINE

The last identified pattern concerns the lexical bundles with *different* in MEDICINE sub-corpus (Table 96). *Comparative expression* (type 3E) is the most common type of 4-word

lexical bundles (pmw=68.86), while *noun phrase with of-phrase fragment* (type 3A) occurs most frequently among 5-word grams (pmw=37.83).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--|--------------|--|--------------|
| 1 | were not significantly different | 8 | <u>not significantly different between the</u> | 4 |
| 2 | <u>significantly different between the</u> | 7 | <u>different combinations of physiotherapy treatment</u> | 4 |
| 3 | different between the two | 5 | <u>different combinations of treatment approaches</u> | 4 |
| 4 | was not significantly different | 5 | <u>were not significantly different from</u> | 3 |
| 5 | <u>different combinations of physiotherapy</u> | 4 | different days of the week | 3 |
| 6 | <u>not significantly different between</u> | 4 | <u>showed that different combinations of</u> | 3 |
| 7 | <u>not significantly different from</u> | 4 | on different days of the | 3 |
| 8 | <u>different combinations of treatment</u> | 4 | different between the two groups | 3 |
| 9 | <u>showed that different combinations</u> | 3 | - | - |
| 10 | <u>that different combinations of</u> | 3 | | |

Table 96. The most frequent 4- and 5-word lexical bundles of *different* in *MEDICINE*

Different in *MEDICINE* does not present a full set of adjectival properties, since it does not occur in comparative and superlative structures. This is similar to *different* in *BIOTECHNOLOGY*, *ECOLOGY*, *LINGUISTICS* and *MATERIAL SCIENCE*.

5.6.1.6. Concluding remarks

The most significant observations of the study into the top-frequency adjectives in *MEDICINE* are:

- the most salient construction that each of the five adjectives in *MEDICINE* sub-corpus enters is a nominal phrase in which adjectives perform the function of a modifier of the head noun;
- the proportion between the attributive and predicative constructions with the adjectives in *MEDICINE* is tilted to the former;
- the most common collocates of the five adjectives are nouns. Apart from nouns, the adjectives collocate with adverbs, other adjectives, prepositions and verbs. The exception is *clinical*, which collocates with nouns and adjectives;
- *high*, *significant* and *low* have a full set of properties and are gradable adjectives. *Different* is a partially gradable adjective. *Clinical* is used as a non-gradable adjective in *MEDICINE*;

- in *MEDICINE*, all 5 adjectives enter 4- and 5-word lexical bundles. The patterns of lexical bundles which are most productive in *MEDICINE* are highlighted in Table 97. For both 4- and 5-word lexical bundles most common structural type is *pronoun + verb phrase fragment* (1B). 4-word bundles of this type are more frequent used than 5-word ones, with the ratio of 213.47 pmw to 151.49 pmw.

| | 4-word | | 5-word | |
|----|--------------|--------|--------------|--------|
| | Total number | pmw | Total number | pmw |
| 3A | 43 | 148.05 | 23 | 79.19 |
| 3B | 49 | 168.71 | 34 | 117.06 |
| 3C | 47 | 161.82 | 10 | 34.43 |
| 3D | 33 | 113.62 | 40 | 137.72 |
| 3E | 20 | 68.86 | 12 | 41.32 |
| 1B | 27 | 92.96 | 25 | 86.08 |
| 1D | 62 | 213.47 | 44 | 151.49 |
| 1E | 18 | 61.97 | 13 | 44.76 |
| 2E | 8 | 27.54 | 6 | 20.66 |

Table 97. Structural types of 4- and 5-word lexical bundles in *MEDICINE*

5.7.1. The five top-frequency adjectives in *MATHEMATICS* sub-corpus

Table 98 shows the five most frequent adjectives in *MATHEMATICS* sub-corpus.

| Adjective | Total number | Pmw |
|-----------|--------------|----------|
| finite | 451 | 1,015.98 |
| convex | 433 | 975.43 |
| same | 411 | 925.87 |
| constant | 355 | 799.72 |
| linear | 354 | 797,47 |

Table 98. The five top-frequency adjectives in *MATHEMATICS* sub-corpus

5.7.1.1. *Finite* in *MATHEMATICS*

Finite is the first top-frequency adjective in *MATHEMATICS* and its total number is 451. Figure 123 summarises two constructions: *finite + noun* and *and/or*. *Finite* does not take comparative and superlative forms, and is not modified by adverbs in *MATHEMATICS* sub-corpus.

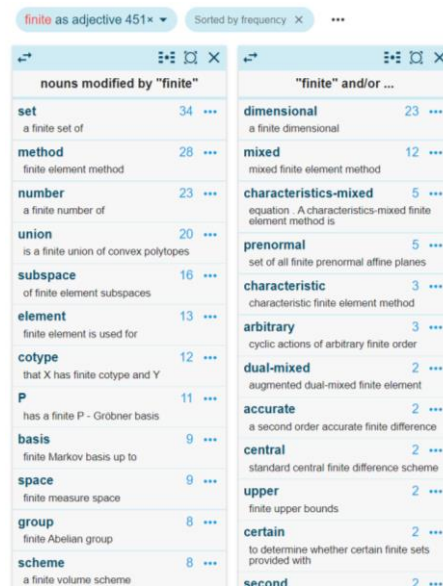


Figure 123. Lexico-grammatical patterns of *finite* in *MATHEMATICS*

In the first structure *finite* functions as a modifier in a nominal phrase, and accounts for 86 % of all its patterns (Fig. 124). The three nouns that collocate with *finite* are *set*, *method* and *number*. Their total number is 34, 28 and 23 tokens.

- 382 Then, up to symmetry there is a **finite set** of polynomials that generates
the ideals I_r for all r .
- 383 A characteristics-mixed **finite element method** is used for the
concentration equation
- 384 Since the double complex $[\]$ has just a **finite number** of non-zero
columns, both associated spectral sequences converge

The second structure is composed of adjectival collocates of *finite*, which accounts for 21% of all its structures. As can be seen in the instances below, *dimensional* with 23 occurrences is most frequently used, followed by *mixed* (12) and a compound adjective *characteristics-mixed* (5):

- 385 One obtains a **finite dimensional** system of stochastic differential
equations approximating the forward rate by applying, for example,
- 386 Standard **mixed finite** element is used for the elliptic electric potential
equation.
- 387 A **characteristics-mixed finite** element method is presented for
approximating the electron and hole concentrations.

The distribution of the two constructions is illustrated in Fig. 124.

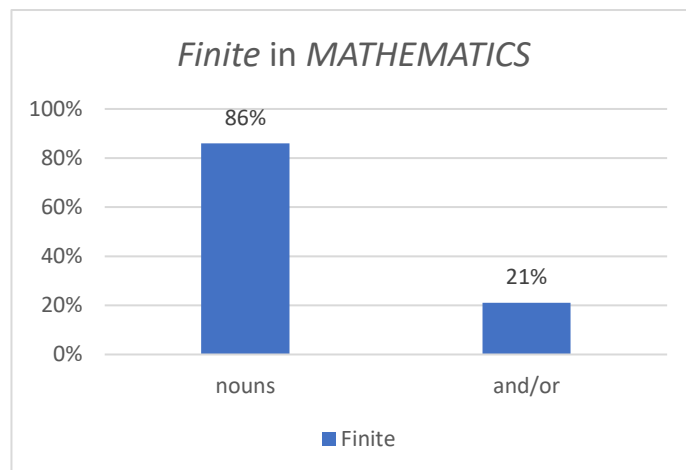


Figure 124. The distribution of lexico-grammatical patterns of *finite* in MATHEMATICS

The attributive pattern of *finite* predominates over the predicative one with the ratio of 90% to 10% (Fig. 125).

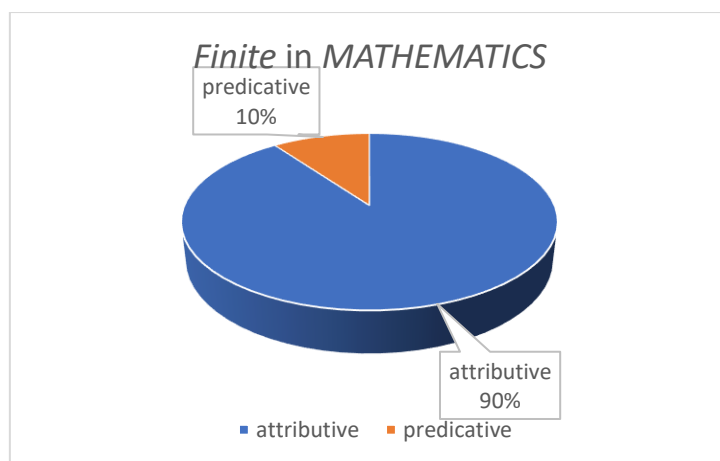


Figure 125. The attributive vs. predicative structure of *finite* in MATHEMATICS

The predicative pattern is illustrated with the following concordances:

- 388 Every auto reduced set of $K\{Y\} \setminus K$ is **finite**.
- 389 Since it is assumed to **be finite**, S can be linearly ordered as $[\]$ for some $n \in \mathbb{N}$.
- 390 In particular, Markov bases for $\ ?$ **are not finite** up to $Sr_1 \times Sr_2 \times Sr_3$ symmetry on $r_1 \times r_2 \times r_3$ arrays for $r_3 \geq 2$ as r_1 and r_2 both tend to infinity.

As presented in Table 99, the vast majority of the ten most common collocates of *finite* ordered according to *LogDice* parameter are nouns (9 of 10). They are related to research process vocabulary, e.g., *method*, *basis*, and objects under analysis, e.g., *interval*, *set*. The most salient nominal collocate is *element* (*LogDice*=11.22), e.g., *the mixed finite element methods*.

The only adjective that collocates with *finite* is *dimensional*, e.g., *the semidiscrete finite dimensional stochastic system*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| element | 60 | 370 | 7.71 | 11.22 |
| dimensional | 24 | 64 | 4.89 | 10.57 |
| union | 27 | 131 | 5.18 | 10.57 |
| subspace | 18 | 142 | 4.22 | 9.95 |
| method | 31 | 627 | 5.49 | 9.88 |
| set | 63 | 1,829 | 7.77 | 9.82 |
| basis | 21 | 308 | 4.54 | 9.82 |
| number | 28 | 630 | 5.21 | 9.73 |
| cotype | 12 | 15 | 3.46 | 9.71 |
| interval | 15 | 135 | 3.85 | 9.71 |

Table 99. The ten most common collocates of *finite* in *MATHEMATICS*

As far as lexical bundles with *finite* are concerned, *noun phrase with of-phrase fragment* (type 3A, pmw=144.17) occurs most frequently as the structural type of 4-word lexical bundles. *Verb phrase with non-passive verb* (1D, pmw=63.08) is the most common type for 5-word grams (Table 100).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|----------------------------------|--------------|-----------------------------------|--------------|
| 1 | a finite number of | 21 | is a finite union of | 13 |
| 2 | a finite set of | 20 | finite union of convex polytopes | 8 |
| 3 | a finite union of | 15 | a finite union of convex | 8 |
| 4 | is a finite union | 13 | a set of finite perimeter | 6 |
| 5 | finite union of convex | 8 | that X has finite cotype | 6 |
| 6 | X has finite cotype | 7 | a faithful finite-type product of | 5 |
| 7 | there is a finite | 7 | X has finite cotype and | 5 |
| 8 | that X has finite | 6 | Y be two finite dimensional | 5 |
| 9 | finite dimensional Banach spaces | 6 | be two finite dimensional Banach | 5 |
| 10 | mixed finite element method | 6 | finite element is used for | 5 |

Table 100. The most frequent 4- and 5-word lexical bundles of *finite* in *MATHEMATICS*

On the basis of the analysis of *finite* we may conclude that it is used as a non-gradable adjective in *MATHEMATICS*. It is not modified by adverbs, and also does not occur in comparative constructions. *Finite* is rarely used predicatively (10% of all its patterns).

5.7.1.2. Convex in *MATHEMATICS*

Convex is the second adjective in the list of top-frequency adjectives in *MATHEMATICS*. According to the definition in *COBUILD* (Sinclair et al., 1995:359) “*convex*

is used to describe something that curves outwards”. Its total number in *MATHEMATICS* sub-corpus is 433. Figure 126 shows lexico-grammatical patterns that *convex* enters.

| modifiers of "convex" | nouns modified by "convex" | "convex" and/or ... |
|---|---|--|
| orthogonally 75 ... orthogonally convex hull | hull 102 ... the convex hull of | polytope 12 ... is a convex polytope |
| locally 2 ... locally convex topology | polygon 60 ... a convex polygon | disjoint 6 ... collection of disjoint convex polygons |
| strictly 2 ... a strictly convex | layer 18 ... the number of convex layers | closed 6 ... the closed convex |
| not 2 ... is not convex | body 18 ... K be a convex body in C2 | minimum 5 ... minimum convex decomposition of a |
| | polyhedron 15 ... an orthogonally convex polyhedron | continuous 5 ... uniformly continuous convex function |
| | K 13 ... a convex body K | compact 5 ... defined on a convex and compact subset K of |
| | set 12 ... convex set | polygonal 4 ... convex polygonal domains |
| | polytope 10 ... finite union of convex polytopes | 2-d 2 ... convex hull problem |
| | position 9 ... vertices are in convex position | proper 2 ... a proper convex subring |
| | subset 9 ... closed convex subset of a Banach | orthogonal 2 ... convex and also orthogonal |
| | CH 7 ... the convex hull CH (P1 | weakly 2 ... convex , weakly compact |
| | problem 7 ... algorithm for the convex decomposition problem | general 2 ... general convex |

Figure 126. Lexico-grammatical patterns of *convex* in *MATHEMATICS*

As presented in Fig. 126, *convex* enters three lexico-grammatical constructions. The most productive is the pattern *convex* + *noun*, in which its role is a premodifier of the head noun, and it comprises 86% of all its patterns. *Hull*, *polygon* and *layer* are top-frequency nouns which *convex* collocates with. The instances of concordances are the following:

- 391 Each of the polytopes is **the convex hull** of ? p-images of the set of A-fixed points in Y .
- 392 In this context, a convex polygon is equivalent to a point set **in convex position**.
- 393 The diameter is also in ?(log k), where k is the number of **convex layers** of P.

The second pattern, namely, *adverb* + *convex* (19%), is almost as common as the third, *and/or* (16%). The most common adverbial modifier is *orthogonally* (75 occurrences), followed far behind by *locally* (2) and *strictly* (2). The examples are:

- 394 An orthogonal polygon P is **orthogonally convex** if any axis-parallel line intersects P in at most one line segment.
- 395 One of the advantages of this **locally convex** topology is the fact that if a set M is weakly compact, then every sequentially weakly continuous map [].
- 396 Strictly convex means that each face is a **strictly convex** polygon.

The third pattern, *and/or*, is the least productive among all constructions with *convex* in *MATHEMATICS*. Among three most common collocates is one noun, *polytope* (12 occurrences), one adjective, *disjoint* (6), and one participial adjective, *closed* (6):

- 397 Then $A(Y)^+$ is a **convex polytope** for every G-gradient map $[\]_p : Z[\]_p$ on Z.

- 398 Since a pair of **disjoint convex** polygons admits two common tangents, a pair of the dual curves intersect at most twice.
- 399 Let C be a **convex closed** located subset of a Hilbert space (H, \cdot, \cdot) .

The percentage distribution of the patterns with *convex* is demonstrated in Fig. 127.

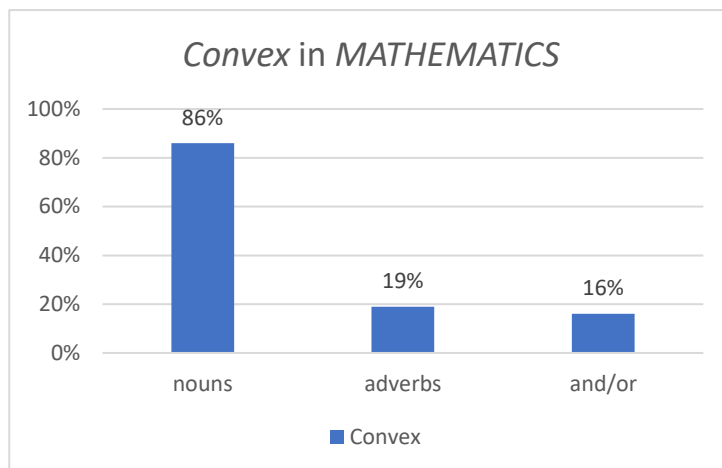


Figure 127. The distribution of lexico-grammatical patterns of *convex* in *MATHEMATICS*

Figure 128 presents the percentage share of the attributive and predicative patterns with *convex*. The attributive form heavily outnumbers the predicative one, since the former comprises as many as 93% of all patterns with *convex* in *MATHEMATICS*.

- 400 Similarly since the function $\log|x|$ is **convex** on $(0, \infty)$, we have $\log|x|$
- 401 \mathbb{R}^n are linearly independent, then the set $\{x\}$ is **convex**, closed, and located.
- 402 Thus all angles in B are **convex**, and so is B .

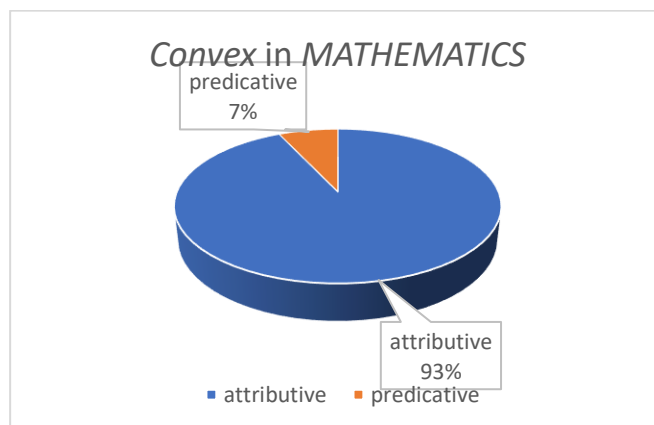


Figure 128. The attributive vs. predicative structure of *convex* in *MATHEMATICS*

As far as the ten most frequent collocates of *convex* are concerned (Table 101), nouns proved to be the most common, 8 of 10. In terms of their semantics, the nouns are related to research process, which is characteristic of particular discipline, e.g., *polyhedron*, *vertices*, *polytope*. The most salient nominal collocate is *hull* ($\text{LogDice}=12.83$). The adverb *orthogonally* is the second most important lemma according to LogDice value (12.21), e.g., *an orthogonally*

convex polyhedron P. The verb *compute* is ranked as the ninth most significant collocate of *convex* (*LogDice*=9.99), e.g., *it suffices to compute the convex hull*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|--------------|--------------------|-----------------|---------|---------|
| hull | 125 | 128 | 11.17 | 12.83 |
| orthogonally | 75 | 87 | 8.65 | 12.21 |
| polygon | 78 | 412 | 8.80 | 11.56 |
| body | 31 | 61 | 5.56 | 11.01 |
| polytope | 24 | 27 | 4.90 | 10.74 |
| layer | 21 | 40 | 4.58 | 10.51 |
| polyhedron | 22 | 97 | 4.68 | 10.41 |
| vertices | 25 | 290 | 4.96 | 10.15 |
| compute | 22 | 278 | 4.65 | 9.99 |
| subset | 18 | 338 | 4.19 | 9.58 |

Table 101. The ten most common collocates of *convex* in *MATHEMATICS*

With regard to the structural patterns of the lexical bundles with *convex*, the most frequent type of 4-word bundles is *noun phrase with of-phrase fragment* (3A, pmw=247.80). The type that predominates among 5-word bundles is verb phrase with non-passive verb (type 1D, pmw=63.08).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|-------------------------------------|--------------|--|--------------|
| 1 | <u>the convex hull of</u> | 45 | <u>the number of convex layers</u> | 14 |
| 2 | <u>of the convex hull</u> | 21 | <u>the convex hull of the</u> | 11 |
| 3 | <u>the orthogonally convex hull</u> | 17 | Let K be a convex | 9 |
| 4 | <u>convex hull of the</u> | 15 | <u>the orthogonally convex hull of</u> | 9 |
| 5 | <u>the number of convex</u> | 14 | K be a convex body | 9 |
| 6 | <u>number of convex layers</u> | 14 | compute the convex hull of | 8 |
| 7 | <u>of a convex polygon</u> | 12 | finite union of convex polytopes | 8 |
| 8 | <u>is a convex polytope</u> | 11 | a finite union of convex | 8 |
| 9 | <u>convex hull of a</u> | 11 | <u>of the convex hull of</u> | 7 |
| 10 | <u>orthogonally convex hull of</u> | 11 | be a convex body in | 7 |

Table 102. The most frequent 4- and 5-word lexical bundles of *convex* in *MATHEMATICS*

As the analysis of *convex* shows, it is modified by adverbs, but it does not occur in the comparative constructions. The predicative pattern with *convex* comprises merely 7% of all its patterns. In *MATHEMATICS*, *convex* is used as a non-gradable adjective.

5.7.1.3. Same in *MATHEMATICS*

Same is the third adjective to be analysed of the top five adjectives in *MATHEMATICS*, with as many as 411 tokens.

As presented in Fig. 129, *same* enters three lexico-grammatical patterns. Overall, of all 411 occurrences, 313 perform the function of a premodifier in a nominal phrase, which is 76% of all patterns with *same* (Fig. 130). *Way*, *time* and *argument* are most frequently used nouns with the total number of 15, 15 and 12 occurrences, respectively.

- 403 In **the same way**, (SE2EF) is seen to be symplectic.
 404 in the technical coherence of a context that disallows substitutivity while at
the sametime admitting quantification in.
 405 **The same argument** will be used in the next section to derive the general
 form of Videnskii's inequality.

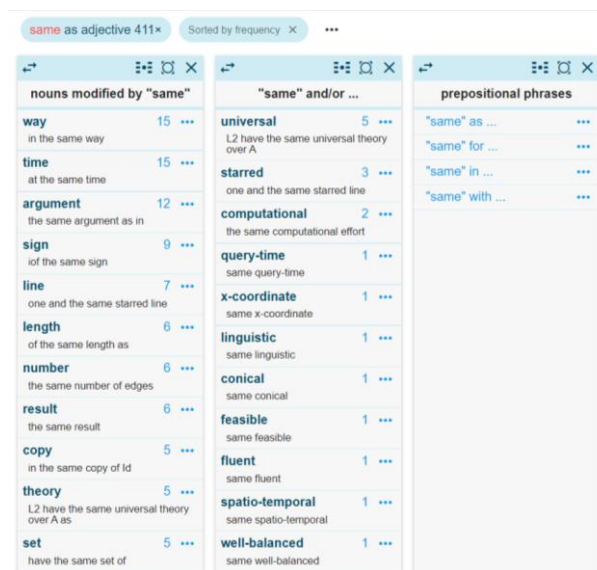


Figure 129. Lexico-grammatical patterns of *same* in *MATHEMATICS*

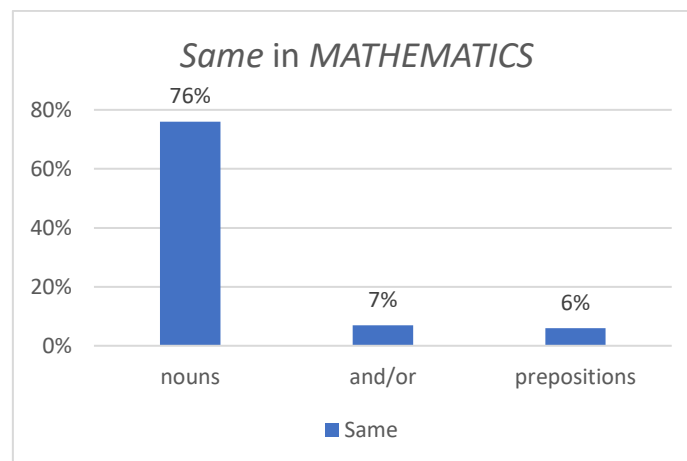


Figure 130. The distribution of lexico-grammatical patterns of *same* in *MATHEMATICS*

And/or is represented by only 31 tokens, which is 7% of all patterns with *same*. It collocates with other adjectives and participial adjectives, e.g., *universal*, *starred* and *computational*:

- 406 Hence $M \neq A \neq N$ if and only if M and N have the **same universal** theory
 over

407 In the second case, b and c are one and the **same starred** line
 408 the electric field intensity can be expected to give improved accuracy for the
same computational effort.

Same + preposition is almost as rare as *and/or*, and can be found in only 6% of all constructions with *same*. Four propositions represent this structure: *as*, *for*, *in* and *with*. The usage is illustrated with the following specimens:

409 Their cyclic order around A_i is the **same as** the order of their other
 endpoints along γ_P .
 410 Nevertheless, the families of the moduli that we work with are the **same for**
 all equations.
 411 the result obtained by the lean optimization algorithm which used only 30
 experiments (or evaluations, which is the **same in** our problem).

All of 411 tokens represent the attributive form of *same*. This adjective has not been found to occur in the predicative constructions (Fig. 131).

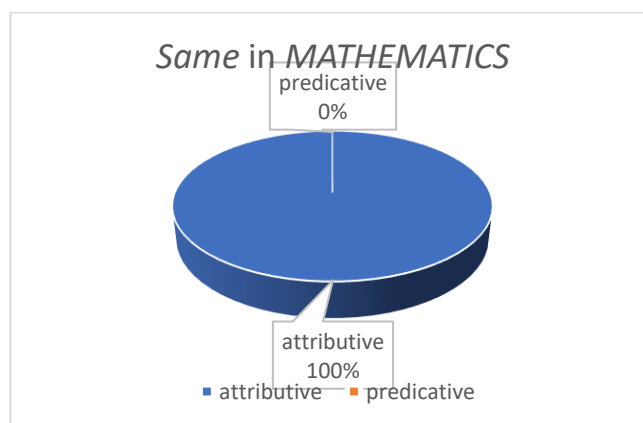


Figure 131. The attributive vs. predicative structure of *same* in MATHEMATICS

With regard to the ten most common collocates of *same*, they are shown in Table 103. It emerges that the most significant lemma according to *LogDice* parameter is the preposition *as* (*LogDice*=10.25) which enters a comparative structure, *same as*, e.g., *conditions are the same as before*. The most common collocates of *same* are nouns (5 of 10), which are research process nouns, e.g., *way*, *sign*. We also observe three verbal collocates: *hold*, e.g., *The same holds for its universal cover*, *have*, e.g., *only if they have the same sets of n-point distance configurations*, and *use*, e.g., *we will use the same family of moduli of continuity*. *Essentially* is the only adverb which collocates with *same*, e.g., *this follows via essentially the same reasoning*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|----------|--------------------|-----------------|---------|---------|
| as | 119 | 2,800 | 10.74 | 10.25 |
| way | 16 | 240 | 3.96 | 9.65 |
| hold | 18 | 375 | 4.19 | 9.55 |
| argument | 13 | 184 | 3.57 | 9.48 |

| | | | | |
|-------------|----|-------|------|------|
| sign | 9 | 59 | 2.99 | 9.29 |
| have | 58 | 2,647 | 7.39 | 9.28 |
| time | 20 | 657 | 4.38 | 9.26 |
| essentially | 8 | 40 | 2.82 | 9.18 |
| copy | 8 | 85 | 2.81 | 9.05 |
| use | 27 | 1,390 | 5.02 | 8.94 |

Table 103. The ten most common collocates of *same* in *MATHEMATICS*

Among lexical bundles, the most common is *comparative expression* (type 3E). 4-word lexical bundles of this type (pmw=87.86) predominate in frequency over the 5-word grams (pmw=42.80).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|-----------------------------|--------------|--------------------------------|--------------|
| 1 | <u>is the same as</u> | 21 | <u>the same as that of</u> | 8 |
| 2 | <u>the same as the</u> | 13 | <u>is the same as the</u> | 6 |
| 3 | at the same time | 10 | have the same universal theory | 5 |
| 4 | in the same way | 9 | <u>the same argument as in</u> | 5 |
| 5 | are the same as | 8 | same universal theory over A | 5 |
| 6 | <u>same as that of</u> | 8 | the same universal theory over | 5 |
| 7 | <u>the same as that</u> | 8 | same argument as in the | 4 |
| 8 | the same number of | 6 | <u>the same as in the</u> | 4 |
| 9 | <u>the same as in</u> | 6 | <u>same as that of a</u> | 4 |
| 10 | <u>the same argument as</u> | 6 | is exactly the same as | 3 |

Table 104. The most frequent 4- and 5-word lexical bundles of *same* in *MATHEMATICS*

In terms of gradability of *same*, we have observed that adverbs do not premodify this adjective. No comparative and predicative forms of *same* have been found in *MATHEMATICS*. Hence, *same* is used as a non-gradable adjective in this sub-corpus.

5.7.1.4. *Constant* in *MATHEMATICS*

Figure 132 summarises the lexico-grammatical patterns that *constant* enters. It is the fourth adjective to discuss, and its total number is 355.

| modifiers of "constant" | nouns modified by "constant" | "constant" and/or ... | prepositional phrases | verbs complemented by "constant" |
|--|---|--|------------------------|---|
| locally b is locally constant 3 ... | C there exists a constant C 36 ... | positive a positive constant 22 ... | "constant" in ... | be is the contraction constant 4 ... |
| modally modally constant 1 ... | c a constant c 13 ... | piecewise piecewise constant solutions of the 11 ... | "constant" over ... | denote denote a generic positive constant 1 ... |
| eventually eventually constant 1 ... | number number 12 ... | certain for certain constant K 4 ... | "constant" of ... | |
| approximately approximately constant 1 ... | solution piecewise constant solutions of the form 8 ... | logical logical constant ? and 3 ... | "constant" on ... | |
| either either constant 1 ... | sign g ? have constant sign on p21 C 7 ... | unconditional is the unconditional constant of (fri 3 ... | "constant" as ... | |
| only only constant 1 ... | K for certain constant K 6 ... | possible is the best possible constant 3 ... | "constant" from ... | |
| not not constant 1 ... | function for the constant function 6 ... | implicit where the constant implicit in the order 2 ... | "constant" for ... | |
| | independent a positive constant independent of 5 ... | absolute is an absolute constant 2 ... | "constant" at ... | |
| | factor the constant factor is 5 ... | nonzero is a nonzero constant 2 ... | "constant" between ... | |
| | u the constant function u 5 ... | mean constant mean curvature 2 ... | | |
| | M for every positive constant M 5 ... | tenseless tenseless and modally constant 1 ... | | |

Figure 132. Lexico-grammatical patterns of *constant* in *MATHEMATICS*

Of 355 tokens, 187 perform the function of a premodifier of the head noun in a nominal phrase. This pattern accounts for 53% of all patterns with *constant* (Fig. 133). The instances of the concordances are:

- 412 Therefore, the sequence $(J(hk))$ is disjoint in $L_p(?)$, and, for scalars $(ak)nk = 1$, we have $[\]$ with **a constant C** independent of n (cf. [20, Theorem 1.f.14]).
- 413 The main result in this paper is the existence of **a constant c** strictly greater than 18 such that $D(P) \subset P$ for every set P .
- 414 In total, we walk along each geodesic **a constant number** of times.

In examples 412 and 413, we can see that both C and c are premodified by *constant* and the letters function as an instance of numerical data. In example 414, a typical noun, *number* is modified by *constant*.

And/or, the second construction to analyse, is not as well-represented as the previous one since it comprises only 21% of all constructions with *constant*. It collocates with other adjectives, three of which are: *positive*, *piecewise* and *certain*, and occur 22, 11 and 4 times, respectively:

- 415 First, recalling $[\]$ with C being a **positive constant** independent of f and j , we apply Hölder's inequality and (1.16) to infer that $[\]$ For $J_2(t)$, we see that by Hölder's
- 416 In this case the PDE is $[\]$ which has **piecewise constant** solutions of the form $[\]$ Let $Z_{nj} := ?H(x_j ? c_{tn})$
- 417 Since $g_1 L_s < ?$, using Proposition 3.1, we obtain $[\]$ for **certain constant K** independent of n .

Similar to the specimens C and c in examples 412 and 413, example 417 also presents that K 's function in a nominal phrase is to signify numerical data. In 417 K is premodified by two adjectives.

42 tokens occur in constructions *constant + preposition*, which comprise 12% of all patterns with this adjective. *Constant in*, *constant over* and *constant of* are the three most frequent collocations, as in the examples below:

- 418 We extend w to a function from $\mathbb{R} \times M$ into \mathbb{R} by setting it to be **constant in** the x direction.
 419 By hypothesis, φ is **constant over** each leaf of F .
 420 $[\]$ for certain constant K (depending only on the q -concavity **constant of** Y).

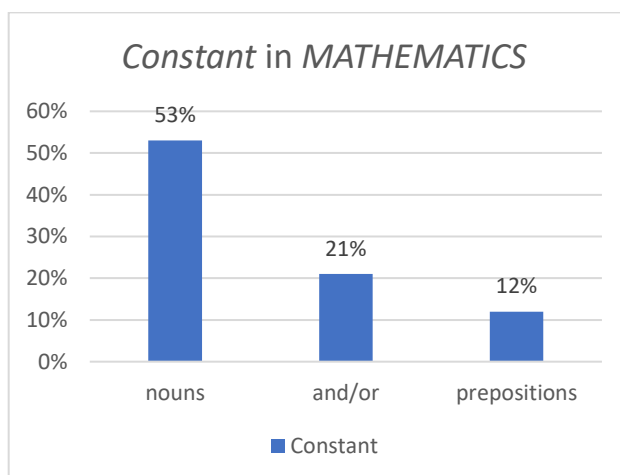


Figure 133. The distribution of lexico-grammatical patterns of *constant* in *MATHEMATICS*

As regards the attributive structure of *constant*, it is represented in an overwhelming majority of cases, 90%. The predicative pattern comprises 10% of all patterns with this adjective. This is presented graphically in Fig. 134.

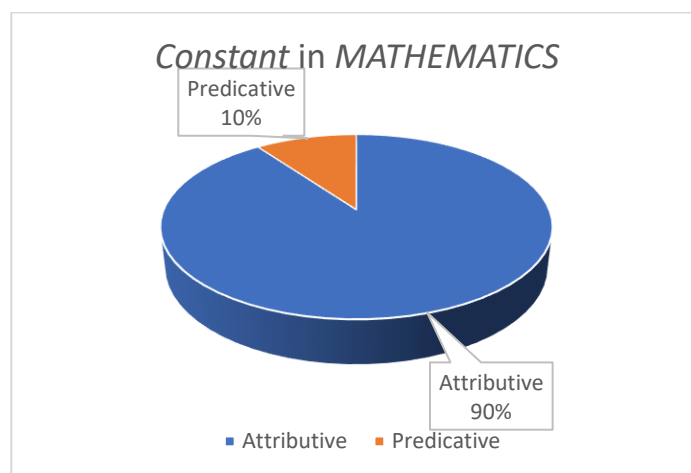


Figure 134. The attributive vs. predicative structure of *constant* in *MATHEMATICS*

Figure 135 demonstrates the predicative form of *constant* using two patterns: *verbs before constant* and *subjects of be constant*. Verb *to be* is used most frequently (30 occurrences), which is followed by other verbs, e.g., *remain* or *denote*:

- 421 Trivially, dug **is constant** over X_0 .
 422 Overall, $p_s(\varphi_0, \varphi_0, n)$ seems to decrease as φ_0 increases, but **remains constant** as φ_0 varies.

423 (H1) (Assumptions on ? and M) ? and M **denote constant**, symmetric, positive definite matrices.

| verbs before "constant" | | subjects of "be constant" | |
|-------------------------|----|------------------------------------|---|
| be | 30 | dug | 5 |
| is constant over | | dug is constant over | |
| imply | 1 | mi | 5 |
| implied constant | | case that ? Mis constant , we have | |
| fix | 1 | positive | 2 |
| fixed constant | | positive constant which | |
| give | 1 | Xi | 2 |
| given constant | | If f Xi is constant and f | |
| denote | 1 | k | 2 |
| denote constant | | time assuming that k is constant | |
| remain | 1 | Kinkelin | 1 |
| remains constant | | Kinkelin constant | |
| | | absolute | 1 |
| | | absolute constant | |
| | | q-concavity | 1 |
| | | q-concavity constant | |
| | | du2g | 1 |
| | | du2g is constant | |
| | | proportional | 1 |
| | | proportional constant | |
| | | contraction | 1 |
| | | contraction constant | |
| | | scenario | 1 |
| | | scenario constant | |

Figure 135. Verb + constant pattern in MATHEMATICS

With regard to the ten most common collocates of *constant*, we can see different parts of speech, all presented in Table 105. The most salient collocate according to *LogDice* parameter is the verb *exist* (*LogDice*=10.71), e.g., *if there exists a constant $C > 0$* . Another verb that collocates with *constant* is *depend* (*LogDice*=9.84), e.g., *but it is a less frequent verbal collocate than exist*. *Constant* collocates with two adjectives: *independent* and *positive* as well as one restrictive adjective, *only*, of which most significant is *independent* (10.50), e.g., *then there exists a constant $C_{rel} > 0$* . The only adverb that is found among collocates of *constant* is *piecewise*, e.g., *The approximate solution is also piecewise constant*. The two nominal collocates of *constant* are: *sign*, e.g., *This function has constant sign on each B_i* , and *dug*, e.g., *In either case, dug is constant over X* . Among other collocates we find one pronoun, *there*, e.g., *then there exists a positive constant C_{eff}* , and one determiner, *some*, e.g., *Also, we have $[\]$ for some constant $C_0 > 0$* .

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| exist | 46 | 543 | 6.74 | 10.71 |
| independent | 23 | 164 | 4.78 | 10.50 |
| positive | 27 | 342 | 5.16 | 10.31 |
| there | 55 | 1,228 | 7.32 | 10.15 |
| piecewise | 11 | 31 | 3.31 | 9.87 |
| depend | 14 | 145 | 3.72 | 9.84 |
| only | 19 | 726 | 4.27 | 9.17 |
| some | 22 | 907 | 4.58 | 9.16 |
| sign | 7 | 59 | 2.63 | 9.11 |
| dug | 6 | 6 | 2.45 | 9.09 |

Table 105. Ten most common collocates of *constant* in *MATHEMATICS*

As shown in Table 106, *constant* occurs only in 4-word lexical bundles, among which the most productive structural type is *verb phrase* (1B, pmw=33.79).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|----------------------------------|--------------|----------------|--------------|
| 1 | there exists a constant C | 12 | - | - |
| 2 | a constant C such that | 5 | | |
| 3 | if there exists a constant | 5 | | |
| 4 | be guarded by a constant | 4 | | |
| 5 | have constant sign on p21 | 4 | | |
| 6 | by a constant number of | 4 | | |
| 7 | a constant number of guards | 4 | | |
| 8 | that there exists a constant | 4 | | |
| 9 | guarded by a constant number | 4 | | |
| 10 | there exists a positive constant | 3 | | |

Table 106. The most frequent 4- and 5-word lexical bundles of *constant* in *MATHEMATICS*

On the basis of presented lexico-grammatical constructions with *constant*, it can be easily observed that it does not take comparative and superlative form. It is modified by modifiers of degree, but they are almost absent in the sub-corpus, since they comprise merely 2% of all patterns with *constant*. The predicative function of *constant* has been found in 10% of all its structures. *Constant* in *MATHEMATICS* is used as a non-gradable adjective.

5.7.1.5. *Linear* in *MATHEMATICS*

The last adjective is *linear* with a very close number of hits to *constant*, 354 occurrences. As can be seen in Fig. 136, *linear* collocates with nouns, other adjectives, and several modifiers.

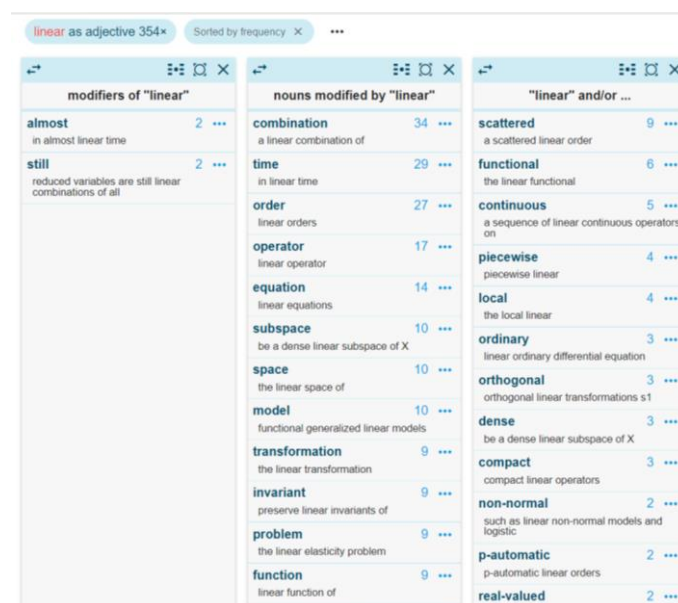


Figure 136. Lexico-grammatical patterns of *linear* in *MATHEMATICS*

The pattern *linear* + *noun* is the most productive and accounts for 92% of all patterns with *linear*. The three nouns that collocate with this adjective are *combination*, *time* and *order*, with the total number of 34, 29 and 27 occurrences. This is illustrated with the concordances below:

- 424 We can write each Keel class as a **linear combination** of classes in the Kapranov basis by calculating the intersection matrix given by pairing the Keel classes
- 425 We check in **linear time** whether it intersects any of the current edges of G.
- 426 Suppose L is a **linear order** of rank $\cdot \cdot$ with an \cdot -p-automatic presentation

And/or, the second construction, is less common than the first one and comprises 28% of all patterns with *linear*. Its collocates are adjectives and participial adjectives, e.g., *scattered*, *functional* and *continuous*:

- 427 Suppose A is a **scattered linear** order and E is a finite partition of A with $\text{rk}(B) \cdot$ for all $B \cdot E$
- 428 As in the case of the **functional linear** regression model, in the FLR model we have to take into account different aspects.
- 429 D) is a **linear continuous** operator, where $D \cdot \mathbb{R}^2$ is a Lipschitz-continuous domain.

Modifiers of degree and prepositions co-occurring with *linear* are very rare in the sub-corpus. Their frequency is at the level of 1% - 2%, which is of marginal importance in the analysis.

The percentage share of the most common constructions with *linear* is presented in Fig. 137.

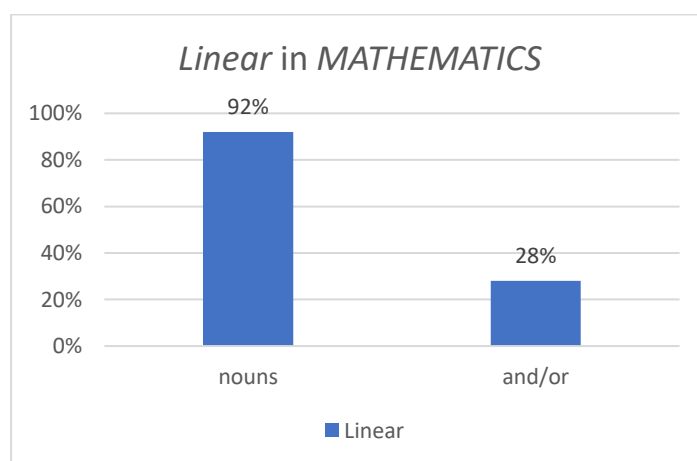


Figure 137. The distribution of lexico-grammatical patterns of *linear* in *MATHEMATICS*

As far as the attributive and predicative patterns are concerned, the former comprises 97% of all patterns with *linear*. The predicative form accounts only 3 % as shown in Fig. 138. The following instances illustrate the predicative structure:

430 k is strongly measurable and $k(s, t)$ **is linear**, continuous.
 431 Similarly, phases 2 and 3 of the algorithm **are linear**
 432 This semi-linear marching scheme results in a full discretization which **is linear**, in contrast to the typical nonlinear formulation

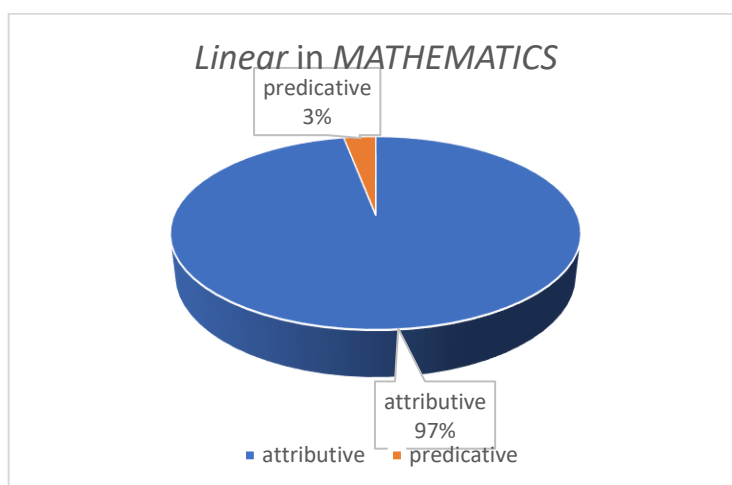


Figure 138. The attributive vs. predicative structure of *linear* in *MATHEMATICS*

Table 107 summarises the ten most common lemmas of *linear* ordered in accordance with *LogDice* parameter. Nouns outnumber other parts of speech, since there are 8 of them in the list. Nominal collocates refer to research process, e.g., *combination*, *order*, *operator*, which is characteristic of topics discussed in this particular discipline. Among most significant collocates of *linear*, one adjective (*functional*) and one participial adjective (*scattered*) are found, e.g., *functional generalized linear models*, *a scattered linear order*, which are mathematical terms.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| combination | 34 | 67 | 5.82 | 11.37 |
| order | 47 | 660 | 6.80 | 10.57 |
| functional | 20 | 136 | 4.46 | 10.39 |
| time | 37 | 657 | 6.02 | 10.23 |
| regression | 11 | 83 | 3.30 | 9.69 |
| rank | 11 | 87 | 3.30 | 9.67 |
| elasticity | 9 | 10 | 3.00 | 9.66 |
| scattered | 9 | 17 | 3.00 | 9.63 |
| subspace | 12 | 142 | 3.44 | 9.63 |
| operator | 21 | 515 | 4.52 | 9.63 |

Table 107. The ten most common collocates of *linear* in *MATHEMATICS*

With regard to the lexical bundles with *linear*, only few examples have been found in *MATHEMATICS* (Table 108). The most common type of 4-word grams is *prepositional phrase* (3D, pmw=20.27).

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|---|---------------------------|--------------|----------------|--------------|
| 1 | the mean linear intercept | 3 | - | - |
| 2 | linear intercept and the | 3 | | |
| 3 | The mean linear intercept | 3 | | |

Table 108. The most frequent 4- and 5-word lexical bundles of *linear* in *MATHEMATICS*

On the basis of the analysis of lexico-grammatical patterns with *linear* we observe that it collocates with two modifiers (*almost, still*). *Linear* does not take comparative or superlative form. The predicative pattern of *linear* accounts merely for 3%. *Linear* in *MATHEMATICS* is used as a non-gradable adjective.

5.7.1.6. Concluding remarks

The results of the analysis of the top-frequency adjectives in *MATHEMATICS* could be summarised in the following points:

- the principal structure that each of the five adjectives in *MATHEMATICS* sub-corpus enters is a nominal phrase in which adjectives perform the function of a modifier of the head noun;
- the proportion between the attributive and predicative form of adjectives in *MATHEMATICS* is tilted to the former;
- *finite, convex, same, constant and linear* are used as non-gradable adjectives in *MATHEMATICS*;
- the vast majority of the most salient collocates of *finite, convex, and linear* are nouns. These adjectives collocate with a few adjectives. The collocation candidates of *same* and *constant* are more varied, since they collocate with verbs, adverbs, adjectives, and determiners;
- the three adjectives: *finite, convex* and *same* enter both 4- and 5-word lexical bundles. The remaining two adjectives: *constant* and *linear* enter a couple of 4-word lexical bundles, but do not enter 5-word bundles at all. The types of lexical bundles that predominate in *MATHEMATICS* are highlighted in yellow (Table 109). It can be observed that the most frequent structural type both for 4- and 5-word bundles is *noun phrase with of-phrase fragment* (type 3A).

| | 4-word | | 5-word | |
|----|--------------|--------|--------------|--------|
| | Total number | pmw | Total number | pmw |
| 3A | 184 | 414.50 | 77 | 173.46 |

| | | | | |
|----|----|--------|----|--------|
| 3B | - | - | 14 | 31.54 |
| 3C | 34 | 76.59 | - | - |
| 3D | 65 | 146.43 | 7 | 15.77 |
| 3E | 39 | 87.85 | 19 | 42.80 |
| 1B | 22 | 49.56 | - | - |
| 1D | 68 | 153.18 | 75 | 168.95 |
| 1E | 4 | 9.01 | - | - |
| 2C | 5 | 11.26 | - | - |
| 2E | 10 | 22.52 | 6 | 13.52 |

Table 109. The most frequent structural types of 4- and 5-word lexical bundles in *MATHEMATICS*

5.8.1. The five top-frequency adjectives in *POLITICAL SCIENCE* sub-corpus

Table 110 lists the five most frequent adjectives in *POLITICAL SCIENCE* sub-corpus.

| Adjective | Total number | Pmw |
|-----------|--------------|----------|
| political | 2,577 | 3,994.13 |
| public | 1,198 | 1,856.80 |
| economic | 764 | 1,184.14 |
| different | 703 | 1,089.59 |
| social | 682 | 1,057.04 |

Table 110. The five top-frequency adjectives in *POLITICAL SCIENCE* sub-corpus

5.8.1.1. *Political* in *POLITICAL SCIENCE*

As presented in Fig. 139, the first adjective to analyse is *political* with the total number of 2,577.

political as adjective 2,577 × Sorted by frequency × ...

| nouns modified by "political" | "political" and/or ... |
|--|--|
| party political parties 180 ... | social social and political 34 ... |
| interest political interest 76 ... | economic political and economic 30 ... |
| system the political system 68 ... | new new political 24 ... |
| trust political trust 64 ... | domestic domestic political 17 ... |
| actor political actors 64 ... | different with different political 15 ... |
| elite political elites 45 ... | other and other political 15 ... |
| institution political institutions 39 ... | institutional institutional and political 14 ... |
| authority political authorities 38 ... | administrative political and administrative 12 ... |
| control of political control 37 ... | major the major political parties 10 ... |
| competition of political competition 29 ... | specific a specific political 10 ... |
| environment the political environment 28 ... | American of American political 10 ... |
| participation 27 ... | international 10 ... |

Figure 139. Lexico-grammatical patterns of *political* in *POLITICAL SCIENCE*

Its most common collocates are nouns. *Political* is a premodifier of the head noun in nominal phrase and this function accounts for 94% of all its patterns. *Party*, *interest* and *system* are the top-frequency nouns with 180, 76 and 68 occurrences, respectively. The instances of concordances are the following:

- 433 When **political parties** are seen as lukewarm about a policy, rather than wedded to it, opportunistic third-party campaigns will be
- 434 Study used a different question for **political interest**, the initial distribution of cognitive mobilization is not comparable to the earlier surveys
- 435 First, when **the political system** is complex.

The second pattern, namely, *and/or*, is represented by 24% of tokens, as demonstrated in Fig. 140. In this construction *political* collocates with other adjectives, e.g., *social*, *economic* and *new* (34, 30 and 24 occurrences):

- 436 The informal vote rate is an indicator of **social and political** exclusion, with particular groups of Australians being inordinately disadvantaged.
- 437 This model not only implies that Ireland's geographical position no longer confines it to the **economic and political** periphery of Europe, it also enables Ireland to be presented in official discourse at the 'centre' of Europe.
- 438 **New political** actors then drastically rewrite the constitution, redefine state-society relations, institute new institutional

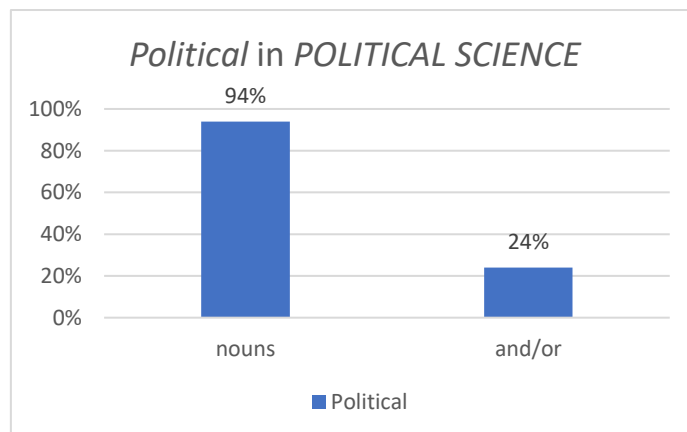


Figure 140. The distribution of lexico-grammatical patterns of *political* in *POLITICAL SCIENCE*

Regarding the attributive and predicative structures with *political*, the former is represented by 100 % of tokens, which means that *political* does not enter the predicative patterns (Fig. 141).

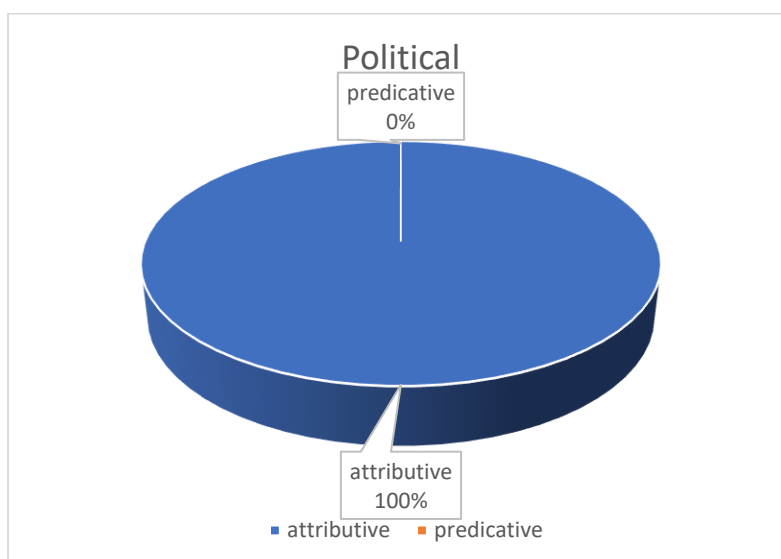


Figure 141. The attributive vs. predicative structure of *political* in *POLITICAL SCIENCE*

As can be observed in Table 111, the most significant collocate of *political* is the noun *party* according to *LogDice* value (10.49), e.g., *the two major parties on the political spectrum*. Other nouns that collocate with *political* are *interest*, *trust* and *actor*. We also notice four prepositional collocates *of*, *to*, *in* and *by*, and two linking words *and* and *or*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|----------|--------------------|-----------------|---------|---------|
| party | 259 | 3,304 | 15.40 | 10.49 |
| and | 869 | 19,705 | 27.22 | 10.32 |
| interest | 105 | 609 | 10.05 | 10.08 |

| | | | | |
|-------|-----|--------|-------|-------|
| of | 925 | 26,440 | 27.47 | 10.03 |
| to | 589 | 16,804 | 21.93 | 9.96 |
| in | 581 | 17,226 | 21.69 | 9.91 |
| trust | 89 | 478 | 9.26 | 9.90 |
| or | 154 | 2,924 | 11.61 | 9.84 |
| actor | 84 | 462 | 8.99 | 9.82 |
| by | 167 | 3,857 | 11.91 | 9.73 |

Table 111. The ten most common collocates of *political* in *POLITICAL SCIENCE*

Among lexical bundles with *political*, the most frequent structural type for 4-word grams is *prepositional phrase* (3D, pmw=46.50), and *noun phrase with other post-modifier fragment* (3B, pmw=27.90) for 5-word grams.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--|--------------|--|--------------|
| 1 | <u>between political interest and</u> | 12 | <u>direct democracy and political trust</u> | 9 |
| 2 | democracy and political trust | 10 | <u>relationship between political interest and</u> | 7 |
| 3 | levels of political interest | 9 | <u>the relationship between political interest</u> | 6 |
| 4 | <u>direct democracy and political</u> | 9 | the emergence of new political | 6 |
| 5 | of the political system | 9 | of direct democracy on political | 5 |
| 6 | in the political process | 9 | between citizens and political authorities | 5 |
| 7 | <u>relationship between political interest</u> | 7 | direct democracy on political trust | 5 |
| 8 | attention to political news | 7 | political consequences of party system | 4 |
| 9 | <u>the relationship between political</u> | 7 | in the political penal-labor camps | 4 |
| 10 | a political party or | 6 | political news were more likely | 4 |

Table 112. The most frequent 4- and 5-word lexical bundles of *political* in *POLITICAL SCIENCE*

On the basis of the analysis of *political* in *POLITICAL SCIENCE* sub-corpus, it is clear that it is not premodified by adverbs and neither does it occur in the comparative and predicative structures. *Political* is used as a non-gradable adjective.

5.8.1.2. *Public* in *POLITICAL SCIENCE*

Public is the second adjective to discuss and its total number comprises 1,198 in *POLITICAL SCIENCE*.

public as adjective 1,198* Sorted by frequency X ...

| nouns modified by "public" | "public" and/or ... |
|---|--|
| service 114 ... the public service | private 40 ... private and public |
| sector 82 ... in the public sector | nonpartisan 9 ... of a nonpartisan public service |
| opinion 57 ... public opinion | senior 9 ... the senior public service |
| policy 53 ... public policy | traditional 5 ... of traditional public |
| servant 47 ... public servants | new 5 ... new public management |
| administration 43 ... public administration | open 4 ... public, open |
| manager 35 ... public managers | other 4 ... on other public |
| value 27 ... of public value | outcome-based 3 ... outcome-based public management |
| debate 21 ... public debate | impartial 3 ... impartial public administration and management |
| reform 20 ... public service reform | top 3 ... top public service posts |
| support 18 ... public support for | widespread 3 ... widespread public support for |
| official 16 ... public officials | Canadian 3 ... the Canadian public service |

Figure 142. Lexico-grammatical patterns of *public* in *POLITICAL SCIENCE*

Figure 142 demonstrates the two most frequent lexico-grammatical patterns of *public*. The first is *public* + *noun*, in which *public* is the pre-modifier of the head noun. This construction comprises 96% of all constructions with *public*. The most common nouns that are collocates of *public* are: *service* (114 occurrences), *sector*(82) and *opinion* (57). They are illustrated with the following concordances:

- 439 He repeated his intention to make **the public service** "more efficient" at the month's end, and by September was able to tell the BCA not only that he would enhance an
- 440 As a consequence, there is a need for **the public sector** to be more creative, innovative and less risk averse in order to adapt to our rapidly changing world (Musgrave, 2014).
- 441 Zimbabwe faced a more acute economic crisis than Kenya in 2008, which might have softened **public opinion** about high spending levels.

The construction *and/or* is not as well-represented as *public* + *noun*, since it accounts merely for 19 % of all patterns with *public*. The percentage comparison of the two structures is illustrated graphically in Fig. 143. Among the collocates we can find other adjectives and nouns, e.g., *private*, *nonpartisan* and *senior*, whose total number is 40, 9 and 9, respectively.

- 442 VMM is based on **public and private** sector business and economic analysis theories and best practices, and provides the structure, tools,
- 443 It depends on the institutional strengths and defenses of the nonpartisan public service.
- 444 Second, the **senior public** service is staffed and managed independently of the prime minister, thus reducing, if not eliminating, the incentive

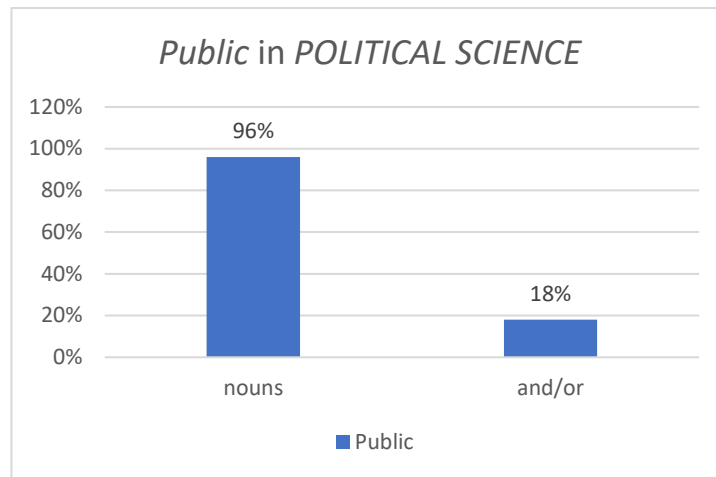


Figure 143. The distribution of lexico-grammatical patterns of *public* in *POLITICAL SCIENCE*

Figure 144 shows that *public* occurs in the attributive form in 99.5% of the cases in *POLITICAL SCIENCE*. The predicative pattern is found in only 0.5% of all constructions with *public*.

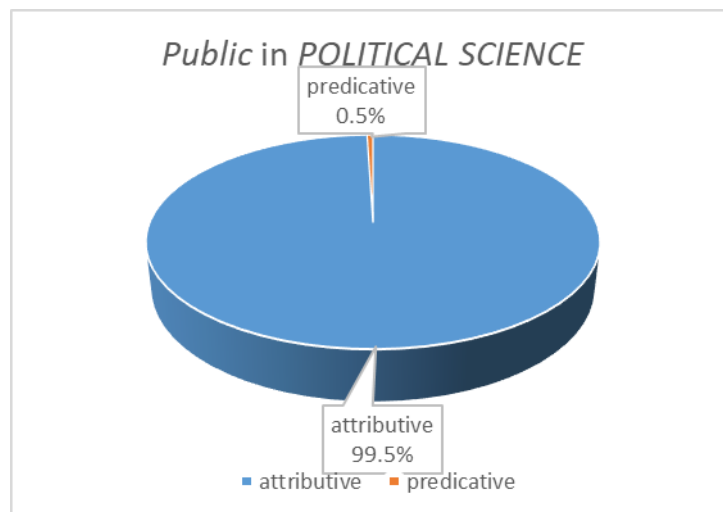


Figure 144. The attributive vs. predicative structure of *public* in *POLITICAL SCIENCE*

The ten most common collocates of *public* ordered in accordance with *LogDice* parameter are enumerated in Table 113. Among the collocates, nine of ten lemmas are nouns, which in terms of their semantics, refer to a topic characteristic of a particular discipline, e.g., *administration, manager*. The most salient lemma is *service* (*LogDice*=11.63), e.g., *the social composition of the public service at senior levels*. Only one adjective is found in the list, namely, *private*, e.g., *execution of formerly public responsibilities by private companies*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|---------|--------------------|-----------------|---------|---------|
| service | 176 | 625 | 13.19 | 11.63 |
| sector | 131 | 336 | 11.40 | 11.45 |
| opinion | 78 | 273 | 8.78 | 10.76 |

| | | | | |
|----------------|-----|-------|------|-------|
| administration | 60 | 299 | 7.69 | 10.36 |
| servant | 49 | 66 | 6.99 | 10.31 |
| private | 56 | 305 | 7.42 | 10.25 |
| policy | 103 | 1,916 | 9.85 | 10.08 |
| manager | 39 | 104 | 6.22 | 9.94 |
| management | 43 | 306 | 6.48 | 9.87 |
| value | 55 | 846 | 7.24 | 9.78 |

Table 113. The ten most common collocates of *public* in *POLITICAL SCIENCE*

As far as the lexical bundles with *public* are concerned, the most productive patterns are: *prepositional phrase* (type 3D, pmw=123.99) for 4-word bundles and *noun phrase with of-phrase fragment* (type 3A, pmw=82.14) for 5-word grams.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|----------------------------|--------------|--------------------------------------|--------------|
| 1 | of the public service | 26 | the public's evaluation of the | 9 |
| 2 | in the public sector | 24 | public's evaluation of the president | 8 |
| 3 | of the general public | 13 | public's assessment of the president | 7 |
| 4 | the public's evaluation of | 12 | the public's assessment of the | 7 |
| 5 | public's evaluation of the | 9 | public's personal evaluation of the | 5 |
| 6 | of the public sector | 9 | the public's personal evaluation of | 5 |
| 7 | dimension of the public's | 8 | of the public's evaluation of | 5 |
| 8 | in the public service | 8 | level of public engagement in | 4 |
| 9 | the public's assessment of | 7 | dimension of the public's assessment | 4 |
| 10 | public's assessment of the | 7 | dimension of the public's evaluation | 4 |

Table 114. The most frequent 4- and 5-word lexical bundles of *public* in *POLITICAL SCIENCE*

As regards gradability, *public* does not collocate with adverbs. It has not been found in comparative structures. The predicative pattern of *public* comprises only 0.5%. *Public* is used as a non-gradable adjective in *POLITICAL SCIENCE*.

5.8.1.3. *Economic* in *POLITICAL SCIENCE*

Economic, whose total number is 764 (pmw=1,184.14), is the third adjective to analyse in *POLITICAL SCIENCE*, as Figure 145 demonstrates.

economic as adjective 764* Sorted by frequency X ...

| nouns modified by "economic" | "economic" and/or ... | modifiers of "economic" |
|---|---|--|
| crisis economic crises 57 ... | social economic and social 61 ... | explicitly explicitly economic 2 ... |
| growth of economic growth 54 ... | political political and economic 30 ... | not not economic 2 ... |
| policy economic policy 38 ... | British British economic policy making 7 ... | |
| condition of economic conditions 33 ... | narrow narrow economic self-interest or 5 ... | |
| performance economic performance 21 ... | structural structural economic change 5 ... | |
| variable economic variables 14 ... | low periods of low economic growth 5 ... | |
| downturn economic downturn 13 ... | diplomatic diplomatic or economic contact 5 ... | |
| crime economic crimes 13 ... | other the other economic 5 ... | |
| development economic development 13 ... | objective measures of objective economic conditions 4 ... | |
| issue on economic issues 12 ... | weak a weak economic performance 4 ... | |
| reform of economic reform 11 ... | good good economic performance 4 ... | |

Figure 145. Lexico-grammatical patterns of *economic* in *POLITICAL SCIENCE*

Among most common collocates of *economic* are nouns, which create the pattern *economic + noun*, which accounts for 90% of all patterns with this adjective. The most frequent nominal collocates are: *crisis* (57 occurrences), *growth* (54) and *policy* (38).

- 445 Our argument is that **economic crises** reduce the nationalisation of the party system.
- 446 Hence, we expect a negative effect of **economic growth** on privatization proceeds—low growth will increase a government's willingness to launch
- 447 New research on postconflict **economic policy** provides one set of clues for Africa.

Well-represented is also the pattern *and/or*, in which *economic* collocates with other adjectives, e.g., *social*, *political* and *British*. *And/or* accounts for nearly 40% of all patterns with *public*. The graphical comparison of constructions with *economic* is presented in Fig. 146.

- 448 Centre-periphery, **economic and social** ideological dimensions are portrayed as each having a theoretically important and non-negligible
- 449 The **political and economic** leaders of all three countries held more summits under NAFTA than in all their histories before.
- 450 Second, by identifying agreement with the Fund as the keystone to the credibility of **British economic** strategy, a convincing case was made

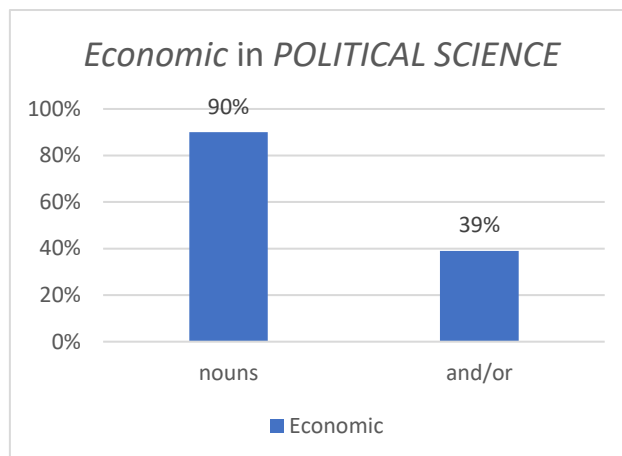


Figure 146. The distribution of lexico-grammatical patterns of *economic* in *POLITICAL SCIENCE*

As shown in Fig. 145, there are modifiers of degree among collocates of *economic*, but their frequency is too low to be taken into consideration in our analysis, since they account for 1% of all patterns with *economic*.

Fig. 147 presents that the attributive structure with *economic* occurs in 100% of specimens. This means that *economic* does not enter the predicative form.

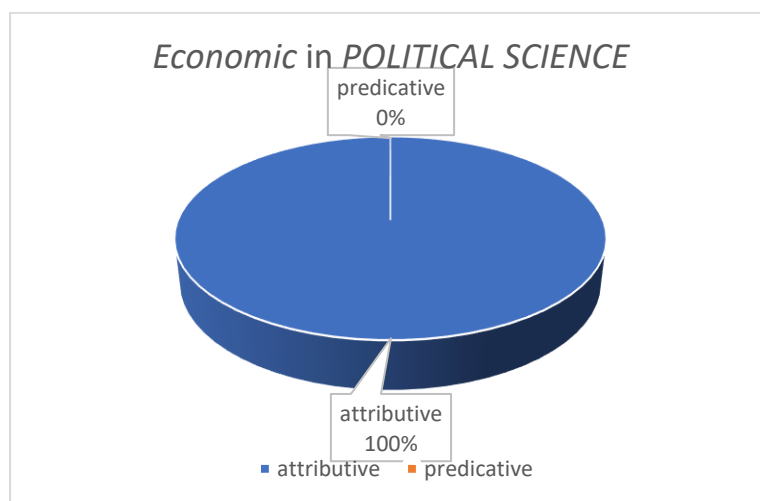


Figure 147. The attributive vs. predicative structure of *economic* in *POLITICAL SCIENCE*

Table 115 provides the ten most common collocates of *economic* in *LogDice* order. Similar to *public*, the vast majority of collocates of *economic*, 8 of 10, are nouns. Nominal collocates are related to the topic which is related to a particular discipline, e.g., *nationalization*, *crime*, *crisis*. There are research process nouns as well, e.g., *condition*, *impact*, *growth*. Of these, the most significant collocate of *economic* is *growth* (*LogDice*=11.18), e.g., *the relationship between economic growth and party system nationalization*. Only two adjectives are mentioned in the list, namely, *social*, e.g., *social and economic groups*, and *political*, e.g., *negative impact on the political, economic, and societal institutions of a state*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-----------------|--------------------|-----------------|---------|---------|
| growth | 67 | 179 | 8.16 | 11.18 |
| crisis | 67 | 327 | 8.15 | 10.97 |
| social | 81 | 683 | 8.92 | 10.84 |
| condition | 38 | 251 | 6.12 | 10.26 |
| nationalisation | 27 | 127 | 5.17 | 9.96 |
| policy | 71 | 1,916 | 8.20 | 9.76 |
| crime | 20 | 94 | 4.45 | 9.58 |
| impact | 25 | 437 | 4.91 | 9.41 |
| performance | 21 | 321 | 4.51 | 9.31 |
| political | 62 | 2,577 | 7.55 | 9.25 |

Table 115. The ten most common collocates of *economic* in *POLITICAL SCIENCE*

With regard to the lexical bundles with *economic*, *noun phrase with of-phrase fragment* (type 3A) outnumbers other structural types both for 4- and 5-word bundles. The frequency of 4-word bundles of this type outnumbers 5-word ones, with the ratio of 51.15 pmw to 31.00 pmw.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--|--------------|--|--------------|
| 1 | <u>the impact of economic</u> | 10 | <u>the effect of economic conditions</u> | 4 |
| 2 | <u>the effect of economic</u> | 9 | <u>the effect of economic crises</u> | 4 |
| 3 | <u>the relationship between economic</u> | 6 | <u>the impact of economic conditions</u> | 3 |
| 4 | <u>effect of economic crises</u> | 5 | <u>the economic statement of May</u> | 3 |
| 5 | <u>economic and social dimensions</u> | 5 | <u>the impact of economic growth</u> | 3 |
| 6 | <u>impact of economic crises</u> | 5 | <u>the impact of economic crises</u> | 3 |
| 7 | <u>of economic conditions on</u> | 4 | <u>of economic growth in the</u> | 3 |
| 8 | <u>of economic and social</u> | 4 | - | - |
| 9 | <u>effect of economic conditions</u> | 4 | | |
| 10 | <u>of economic crises upon</u> | 4 | | |

Table 116. The most frequent 4- and 5-word lexical bundles of *economic* in *POLITICAL SCIENCE*

On the basis of the lexico-grammatical patterns presented in this section, we observe that *economic* in *POLITICAL SCIENCE* is presented as a non-gradable adjective, since it is not modified by adverbs and does not occur in the comparative and predicative patterns.

5.8.1.4. *Different* in *POLITICAL SCIENCE*

Fig. 148 demonstrates lexico-grammatical patterns with *different*, whose total number is 703. Most frequent is the pattern *different* + *noun*, which comprises 84% of all structures with this adjective. The three nouns that collocate with *different* most commonly are *level* (31), *type* (25) and *way* (21):

- 451 One set occurs across **different levels** of government
- 452 Consequently, we need to identify **different types** of issue dimensions and compare the reactions of voters and leaders.
- 453 As we noted above, there are **different ways** of conceptualizing loyalty

| nouns modified by "different" | "different" and/or ... | modifiers of "different" | prepositional phrases | verbs complemented by "different" |
|--|---|--|----------------------------|--|
| level different levels of government 31 ... | political with different political 15 ... | very very different 21 ... | "different" from | be Are age groups different 3 ... |
| type different types of 25 ... | many many different ways 10 ... | quite quite different from the 16 ... | "different" in | offer The parties must offer the voters different political alternatives 2 ... |
| way different ways 21 ... | ideological different ideological 4 ... | significantly significantly different from zero 13 ... | "different" for | |
| country in different countries 17 ... | regulatory different regulatory regimes 3 ... | slightly a slightly different 6 ... | "different" across | |
| party from different parties 13 ... | institutional different institutional 3 ... | somewhat is somewhat different 5 ... | | |
| generation different generations of Australians 12 ... | economic different economic sectors in 3 ... | completely completely different from 4 ... | | |
| dimension different dimensions 11 ... | activist different activist traditions 2 ... | rather a rather different 4 ... | | |
| group the different voter groups 11 ... | generational different generational cohorts 2 ... | fundamentally fundamentally different 3 ... | | |
| kind different kinds of 9 ... | educational different educational groups 2 ... | subtly subtly different 2 ... | | |
| form different forms of 9 ... | functional different functional 2 ... | entirely entirely different 2 ... | | |
| view with different editorial views 8 ... | much much different 2 ... | | | |

Figure 148. Lexico-grammatical patterns of *different* in *POLITICAL SCIENCE*

13% of the tokens enter the construction *modifier + different*, among which the most common are adverbs, e.g., *very*, *quite* and *significantly* (21, 16 and 13 occurrences respectively). The following concordances illustrate this pattern:

- 454 However, a Republican governor experiences a **very different** decision framework
- 455 Measuring flows and transactions is **quite different** from measuring values
- 456 Individuals appointed to these positions look **significantly different** from other types of appointees.

12% of the tokens represent the construction *and/or*, in which *different* collocates with other adjectives and determiners. *Political*, *many* and *ideological* are most frequent collocates in this pattern:

- 457 The parties must offer the voters **different political** alternatives (formulated in the party programs)
- 458 As Table 5 demonstrates, readers of all papers were also exposed to **many different** frames on YtE.
- 459 social circumstances of each country sometimes introduces issues into the political debate that give rise to additional dimensions on which parties adopt **different ideological** stances'.

The comparison of constructions with *different* is presented graphically in Fig. 149.

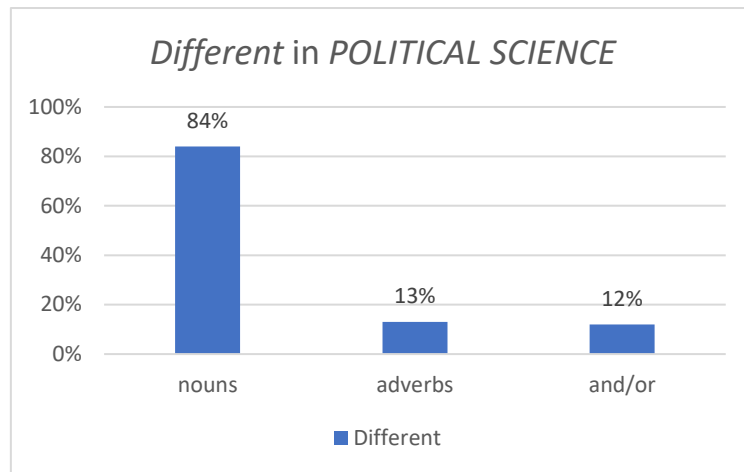


Figure 149. The distribution of lexico-grammatical patterns of *different* in *POLITICAL SCIENCE*

With regard to the attributive form of *different*, it is represented in the vast majority of concordances, namely, 91%. The predicative pattern comprises 9% of all patterns typical of this adjective (Fig. 150):

- 460 Davenport's claim is then borne out, though with the caveat that the difference in the two total effects calculated this way **is not statistically different** from zero.
- 461 Norris (2010), for example, predicts that in 2020 digital government will not be significantly different from today's e-government, with a similar range of transactions and degree of interactivity that is currently available, and only limited transformation
- 462 The treatment groups **are slightly different** in terms of some of the socioeconomic characteristics (F-test, last column).

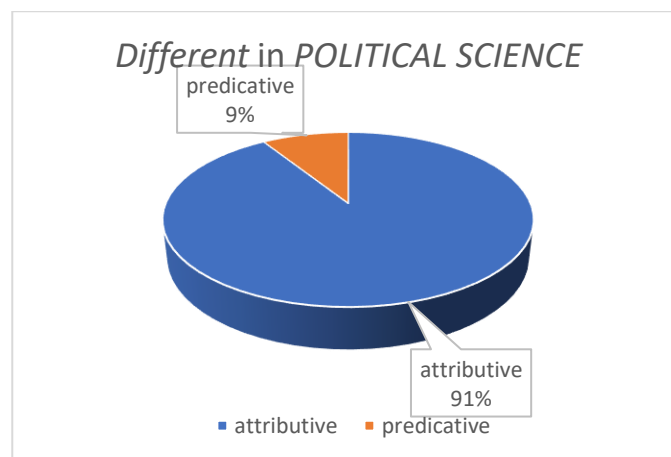


Figure 150. The attributive vs. predicative structure of *different* in *POLITICAL SCIENCE*

Among the ten most common collocates of *different* ordered in accordance with *LogDice* parameter, we see that the collocation representatives are more varied than the two previous adjectives, *public* and *economic* (Table 117). As presented by *LogDice* value (10.00), the most significant collocate of *different* is the adjective *different* with which it co-occurs, e.g., *different venues require different framing emphases*. With regard to nouns, there are four

collocation candidates: *type*, *way*, *level* and *group*, which are related to research process. Other parts of speech include two prepositions (*across*, *from*), two adverbs (*very*, *quite*) and one cardinal numeral (*two*).

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-----------|--------------------|-----------------|---------|---------|
| different | 44 | 703 | 6.54 | 10.00 |
| type | 30 | 315 | 5.42 | 9.92 |
| way | 31 | 508 | 5.48 | 9.71 |
| across | 24 | 365 | 4.83 | 9.52 |
| very | 23 | 396 | 4.72 | 9.42 |
| level | 39 | 1,184 | 6.07 | 9.40 |
| quite | 17 | 156 | 4.09 | 9.34 |
| from | 63 | 2,643 | 7.63 | 9.27 |
| two | 31 | 990 | 5.40 | 9.23 |
| group | 31 | 574 | 4.58 | 9.14 |

Table 117. The ten most common collocates of *different* in *POLITICAL SCIENCE*

As far as the lexical bundles with *different* are concerned, *noun phrase with of-phrase fragment* (type 3A, pmw=20.15) is the most productive type of 4-word lexical bundles, and *noun phrase with other post-modifier* (type 3B, pmw=9.30) is most frequently used of 5-word grams.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--------------------------------------|--------------|--|--------------|
| 1 | <u>at different levels of</u> | 9 | <u>at different levels of government</u> | 4 |
| 2 | different levels of government | 9 | <u>voter groups with different political</u> | 3 |
| 3 | quite different from the | 5 | groups with different political orientation | 3 |
| 4 | different generations of Australians | 4 | - | - |
| 5 | significantly different from zero | 4 | | |
| 6 | different ways in which | 4 | | |
| 7 | is significantly different from | 3 | | |
| 8 | in the different countries | 3 | | |
| 9 | the different voter groups | 3 | | |
| 10 | <u>voter groups with different</u> | 3 | | |

Table 118. The most frequent 4- and 5-word lexical bundles of *different* in *POLITICAL SCIENCE*

Overall, it can be stated that this adjective is modified by adverbs, including *very*. *Different* occurs in the predicative form in 9% of cases. *Different* in *POLITICAL SCIENCE* is a partially gradable adjective.

5.8.1.5. *Social* in *POLITICAL SCIENCE*

The last top-frequency adjective in *POLITICAL SCIENCE* is *social*, whose total number is 682. As presented in Fig. 151 it enters two collocational patterns.

social as adjective 682* Sorted by frequency X ...

| nouns modified by "social" | "social" and/or ... |
|--|---|
| welfare 48 ... to liberal social welfare / health-care | economic 61 ... economic and social |
| medium 42 ... on social media | liberal 36 ... to liberal social welfare / health-care |
| group 21 ... social groups | political 34 ... social and political |
| policy 20 ... liberal social welfare policies | democratic 14 ... social democratic parties |
| representation 16 ... social representations of left and | other 10 ... and other social |
| exclusion 14 ... of social exclusion | ecological 7 ... to Kenya's social , ecological , and administrative |
| norm 14 ... prevalent social norms | technical 7 ... the technical and social factors that |
| dimension 14 ... economic and social dimensions | media-based 5 ... communication strategies for social media-based diplomacy |
| heterogeneity 13 ... of social heterogeneity | prevalent 5 ... with the prevalent social norms |
| movement 11 ... and social movements | cultural 5 ... social and cultural issues |
| value 11 ... Social value | operational 4 ... strategic , operational , social , and financial |
| cleavage 10 ... social cleavages | |

Figure 151. Lexico-grammatical patterns of *social* in *POLITICAL SCIENCE*

In the first pattern, namely, *social* + *noun*, *social* is a premodifier of the head noun. This accounts for 86% of all its patterns (Fig. 152). *Welfare* (48), *medium* (42) and *group* (21) are the three most frequently used nouns:

- 463 I expect that Democratic governors will devote more agenda space to liberal **social welfare** and health-care policies than their non-Democratic counterparts
- 464 Case selection Multiple steps have been carried out to select the objects of analyses: 1) **the social medium** used for diplomacy in GCC countries and
- 465 This should be especially true among **social groups** for whom concrete elements in the social representations of right and left were particularly salient.

Structures with adjectival collocates within the *and/or* class proved to be well-marked in the sub-corpus, since they comprise 43% of all patterns with *social*. *Economic*, *liberal* and *political* are most frequent adjectives in this construction:

- 466 In addition to ideological positioning on **economic and social** stances, centre-periphery issues add a third ideological dimension that needs to be acknowledged.
- 467 This research examines the internal, state determinants of gubernatorial agenda attention to liberal social welfare/health-care policy.
- 468 The impact of FOI is "highly idiographic" and the "**social and political** contexts and specific histories of different countries" need to be taken into account

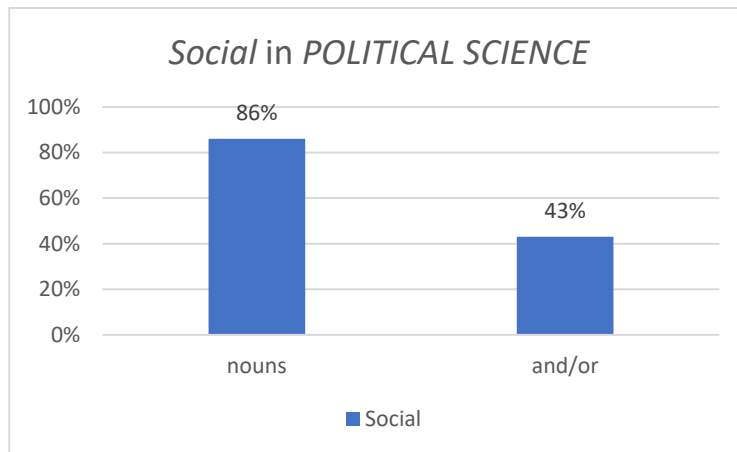


Figure 152. The distribution of lexico-grammatical patterns of *social* in *POLITICAL SCIENCE*

In terms of the attributive pattern of *social*, it is used in 100% of findings in *POLITICAL SCIENCE* sub-corpus. *Social* does not enter the predicative structure. This relation is presented graphically in Fig. 153.

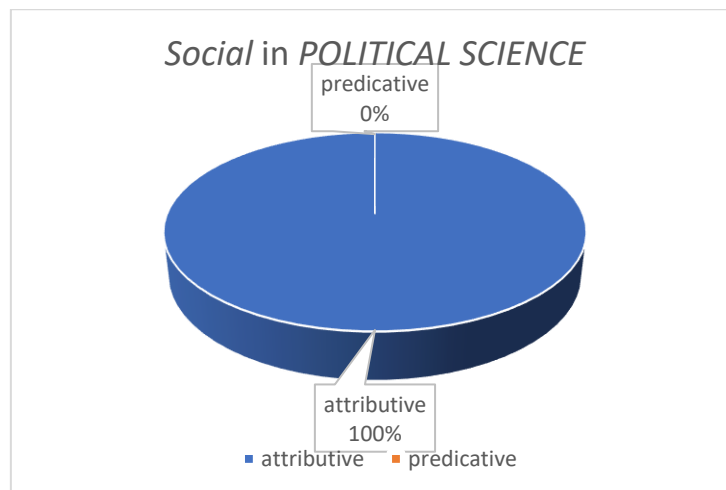


Figure 153. The attributive vs. predicative structure of *social* in *POLITICAL SCIENCE*

The data for the ten most common collocates of *social* ordered according to *LogDice* index are summarised in Table 119. The majority of collocates of *social* are nouns (8 of 10), which is a result similar to *public* and *economic*. The most salient of the nouns is *welfare* (*LogDice*=11.67), e.g., *the benefits of social welfare policies*. The nouns are related to the topic which is discussed in a particular discipline, e.g., *medium*, *policy*, *agenda*, *exclusion*. Among other parts of speech, we find two adjectives: *economic*, e.g., *the economic and social exclusion*, and *liberal*, e.g., *liberal agenda attention to social welfare/health-care policy*.

| Lemma | Cooccurrence count | Candidate count | T-score | LogDice |
|-------------|--------------------|-----------------|---------|---------|
| welfare | 79 | 115 | 8.88 | 11.67 |
| medium | 62 | 333 | 7.84 | 10.97 |
| health-care | 41 | 44 | 6.40 | 10.85 |

| | | | | |
|-----------|----|-------|------|-------|
| economic | 81 | 764 | 8.92 | 10.84 |
| liberal | 40 | 193 | 6.30 | 10.55 |
| movement | 27 | 172 | 5.17 | 10.02 |
| group | 35 | 574 | 5.83 | 9.83 |
| policy | 69 | 1,916 | 8.10 | 9.77 |
| exclusion | 18 | 52 | 4.23 | 9.65 |
| agenda | 22 | 243 | 4.64 | 9.61 |

Table 119. Ten most common collocates of *social* in *POLITICAL SCIENCE*

In the case of the lexical bundles with *social*, noun phrases outnumber other structural types. The most common pattern for 4-word grams is *other noun phrase* (type 3C, pmw=46.50), and *noun phrase with other post-modifier* (type 3B, pmw=44.95) for 5-word bundles.

| n | 4-word bundles | Total number | 5-word bundles | Total number |
|----|--|--------------|--|--------------|
| 1 | <u>to liberal social welfare</u> | 23 | <u>space to liberal social welfare</u> | 8 |
| 2 | <u>social welfare and health-care</u> | 12 | <u>attention to liberal social welfare</u> | 6 |
| 3 | <u>liberal social welfare policies</u> | 8 | <u>agenda space to liberal social</u> | 6 |
| 4 | <u>space to liberal social</u> | 8 | <u>social welfare and health-care policy</u> | 5 |
| 5 | <u>attention to liberal social</u> | 6 | <u>agenda attention to liberal social</u> | 5 |
| 6 | <u>attention to social welfare</u> | 6 | <u>liberal social welfare and health-care</u> | 5 |
| 7 | <u>of social decision procedure</u> | 5 | <u>social representations of left and</u> | 5 |
| 8 | <u>economic and social dimensions</u> | 5 | <u>agenda attention to social welfare</u> | 4 |
| 9 | <u>social representations of left</u> | 5 | <u>types of social decision procedure</u> | 4 |
| 10 | <u>liberal social welfare and</u> | 5 | <u>social welfare and health-care policies</u> | 4 |

Table 120. The most frequent 4- and 5-word lexical bundles of *social* in *POLITICAL SCIENCE*

In terms of gradability of *social*, we see that this adjective is not premodified by adverbs. It has not been found in the comparative and predicative patterns. Therefore, *social* in *POLITICAL SCIENCE* is classified as a non-gradable adjective.

5.8.1.6. Concluding remarks

From the results we can draw the following conclusions:

- the most essential pattern that each of the five adjectives in *POLITICAL SCIENCE* sub-corpus enters is a nominal phrase in which adjective premodifies the head noun;
- the attributive form of adjectives heavily outnumbers the predicative form;
- 4 of 5 adjectives, namely, *political*, *public*, *economic* and *social* are used as non-gradable adjectives. *Different* is presented as a partially gradable adjective in *POLITICAL SCIENCE*;
- the vast majority of the most common collocates of *public*, *economic* and *social* are nouns. We find a few instances of adjectival collocates of the aforementioned three

adjectives. *Political* and *different* collocate with more types of parts of speech than the previous three adjectives;

- all 5 adjectives enter both 4- and 5-word lexical bundles. The most productive structural type of 4-word lexical bundles in *POLITICAL SCIENCE* is 3D, *prepositional phrase*, pmw=251.09. *Noun phrase with of-phrase fragment* (type 3A) is most common type of 5-word grams, pmw=142.59 (Table 121).

| | 4-word | | | 5-word | |
|----|--------------|--------|----|--------------|--------|
| | Total number | pmw | | Total number | pmw |
| 3A | 93 | 144.14 | 3A | 92 | 142.59 |
| 3B | 61 | 94.54 | 3B | 53 | 82.14 |
| 3C | 63 | 97.64 | 3C | 23 | 35.65 |
| 3D | 162 | 251.09 | 3D | 26 | 40.30 |
| 3E | 3 | 4.65 | 3E | 4 | 6.20 |
| 1D | 9 | 13.95 | 1D | - | - |

Table 121. Structural types of 4- and 5-word lexical bundles in *POLITICAL SCIENCE*

Chapter 6 - Discussion

The chapter aims to discuss the results presented in Chapter 5 and answer the research questions formulated in Chapter 4.

6.1. The distribution of adjectives

The main purpose of the section is to present and compare the distribution of the five top-frequency adjectives across the seven sub-corpora.

6.1.1. Disciplinary variation in the distribution of adjectives

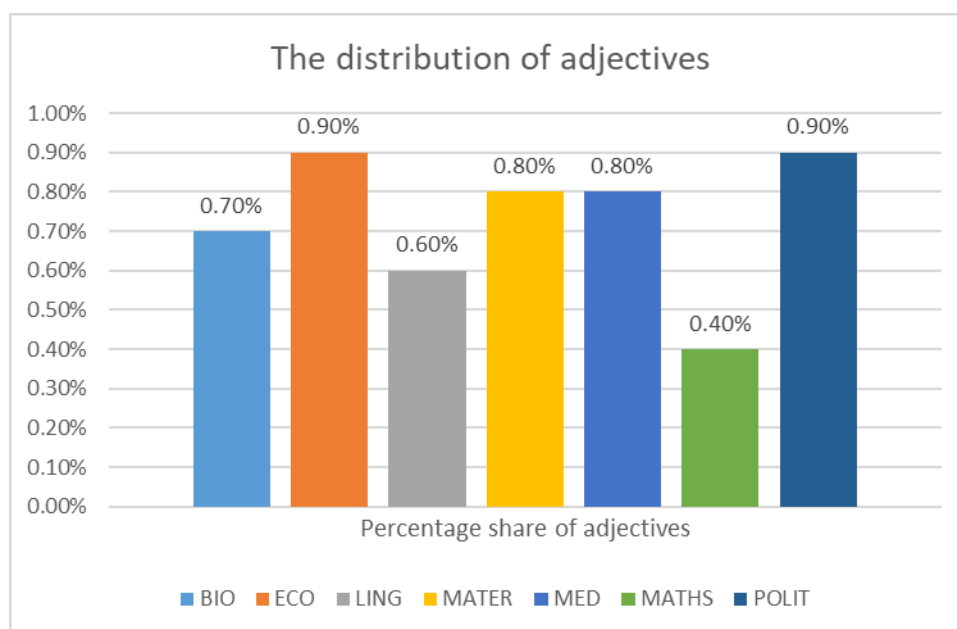


Figure 154. The distribution of adjectives in the sub-corpora

As presented in Fig. 154, the five top-frequency adjectives constitute less than 1% of each sub-corpus. As can be seen the values are provided as a percentage ratio of the number of top-frequency adjectives to the total number of words.

The highest proportion of adjectives, namely, 0.9%, is observed in *ECOLOGY* and *POLITICAL SCIENCE*. A slightly lower number of adjectives, at the level of 0.8%, is found in *MEDICINE* and *MATERIAL SCIENCE*. The lowest share of adjectives has been found in *MATHEMATICS*, i.e., 0.4% of all words in the sub-corpus. The number of adjectives across the sub-corpora is low, but it is important to bear in mind that the analysis is limited to only five top-frequency adjectives.

The findings obtained in this thesis corroborate Okulicz-Kozaryn's (2013) observations, who concentrated on lexis from a cross-disciplinary perspective. In his research the fewest number of adjectives and adverbs is found in mathematics and natural science, while RAs in social science and humanities contain the majority of adjectives and adverbs. As Biber and Gray's (2016:114) study provides, the highest distribution of adjectives is found in humanities, which are followed by social science and specialist science. This stays in contrast to our findings, since *POLITICAL SCIENCE* has a greater share of adjectives than *LINGUISTICS*. In Soler's (2002) study, which investigated adjectives in RAs in biochemistry, it was noticed that they were very rarely used. One important caveat in Soler's analysis is that it is limited only to five RAs. Interesting observations on the distribution of adjectives come from Green and Lambert (2018), who focused on wordlists of 50 most frequent lemmas across eight disciplines. On average, 4 of 50 lemmas are adjectives in each wordlist, which means that adjectives constitute 8%. This is not in agreement with the data in our corpus.

The low distribution of adjectives across different disciplines in the ELC is similar to the results in Okulicz-Kozaryn's (2013) and Soler's (2002) studies. There is also a marked difference in adjective distribution between our study and Biber and Gray's (2016) and Green and Lambert's (2018) research.

As can be observed in this section, adjectives are not equally distributed across disciplines. The subject literature provides factors against common use of adjectives in written academic prose. Osmond (2013) and Zinsser (2006) indicate that unnecessary adjectives should be avoided in academic writing, since they may distract the reader. This may lead to a lower comprehensibility of the text. Okulicz-Kozaryn points out (2013:679) that papers which are comprehensible can reach more readers also outside of academia. The aforementioned issues may support the fact that the number of the top-frequency adjectives in the ELC is low.

6.2. Common and discipline-specific adjectives

The salient purpose of the study was to examine the presence of the top-frequency adjectives in the seven sub-corpora and their specificity. The research was designed to identify adjectives that are commonly used across disciplines (common adjectives) as well as those adjectives that are specific of particular discipline (discipline-specific adjectives). Table 122 shows top-frequency adjectives for each of the seven sub-corpora. Adjectives that are shared in at least two disciplines are marked with colour.

| Discipline | Adj 1 | Adj 2 | Adj 3 | Adj 4 | Adj 5 |
|------------|-----------|------------|-------------|-----------|--------------|
| BIO | high | different | low | fatty | total |
| ECO | high | low | different | large | significant |
| LING | academic | linguistic | different | social | particular |
| MATER | high | different | low | large | experimental |
| MED | high | clinical | significant | low | different |
| MATHS | finite | convex | same | constant | linear |
| POLIT | political | public | economic | different | social |

Table 122. The top-frequency adjectives in the seven sub-corpora

The table lists 35 adjectives, 20 of these are shared adjectives (marked with colours). The remaining 15 adjectives occur in one discipline only. An adjective that occurs in six disciplines is *different*. It is followed by *high* and *low*, each of which occurs in four disciplines. *Significant*, *large* and *social* co-occur in two disciplines.

6.2.1. Cross-discipline check of adjectives

To verify if the seven sub-corpora use common adjectives or discipline-specific, a cross-discipline check was performed involving 35 top-frequency adjectives. Each adjective was checked for its occurrence in the remaining six sub-corpora. To illustrate this approach we need to look at the data in Table 123. The 5 top-frequency adjectives in particular discipline are marked with the same colour, e.g., *high*, *different*, *low*, *fatty*, *total*, which are top adjectives in *BIOTECHNOLOGY*. The following instance illustrates the strategy: if we analyse adjective *high* in *BIOTECHNOLOGY*, we can see that it occurs 2749 pmw in this sub-corpus, 2783 pmw in *ECOLOGY*, 792 pmw in *LINGUISTICS*, etc. If we turn to the columns on the right we can see the frequency of *high* in the remaining disciplines. A particular adjective is classified as common if its frequency exceeds 400 pmw at least in three disciplines. *High* is a common adjective, since its frequency in six disciplines reaches far more than 400 pmw.

| Discipline | Adjective | BIO | ECO | LING | MATER | MED | MATHS | POLIT |
|------------|-----------|-------------|------|------|-------|------|-------|-------|
| BIO | high | 2749 pmw | 2783 | 792 | 2290 | 2286 | 297 | 1046 |
| | different | 1642 | 1755 | 1130 | 2137 | 2843 | 583 | 1089 |
| | low | 1477 | 1863 | 389 | 1890 | 1535 | 428 | 633 |
| | fatty | 919 | 15 | - | 10 | 48 | - | - |

| | | | | | | | | |
|-------|--------------|------|------|------|------|------|------|------|
| | total | 739 | 1198 | 129 | 696 | 619 | 322 | 103 |
| ECO | high | 2749 | 2783 | 792 | 2290 | 2286 | 297 | 1046 |
| | low | 1477 | 1863 | 389 | 1890 | 1535 | 428 | 633 |
| | different | 1642 | 1755 | 1130 | 2137 | 2843 | 583 | 1089 |
| | large | 360 | 1654 | 395 | 957 | 664 | 626 | 644 |
| | significant | 586 | 1244 | 526 | 569 | 1635 | 74 | 742 |
| LING | academic | 4 | 2 | 1429 | 7 | 24 | 2 | 35 |
| | linguistic | - | - | 1377 | - | 17 | 27 | 15 |
| | different | 1642 | 1755 | 1130 | 2137 | 2843 | 583 | 1089 |
| | social | - | 35 | 807 | 5 | 127 | 2 | 1057 |
| | particular | 201 | 201 | 792 | 207 | 72 | 736 | 491 |
| MATER | high | 2749 | 2783 | 792 | 2290 | 2286 | 297 | 1046 |
| | different | 1642 | 1755 | 1130 | 2137 | 2843 | 583 | 1089 |
| | low | 1477 | 1863 | 389 | 1890 | 1535 | 428 | 633 |
| | large | 360 | 1654 | 395 | 957 | 664 | 626 | 644 |
| | experimental | 474 | 225 | 92 | 905 | 96 | 135 | 37 |
| MED | high | 2749 | 2783 | 792 | 2290 | 2286 | 297 | 1046 |
| | clinical | 51 | 2 | 14 | 232 | 1697 | - | - |
| | significant | 586 | 1244 | 526 | 569 | 1635 | 74 | 742 |
| | low | 1477 | 1863 | 389 | 1890 | 1535 | 428 | 633 |
| | different | 1642 | 1755 | 1130 | 2137 | 2843 | 583 | 1089 |
| MATHS | finite | 26 | - | 67 | 173 | - | 1015 | 1 |
| | convex | 14 | 4 | - | 2 | - | 975 | 1 |
| | same | 695 | 758 | 722 | 879 | 426 | 925 | 650 |
| | constant | 406 | 144 | 40 | 533 | 51 | 799 | 72 |
| | linear | 352 | 309 | 65 | 393 | 96 | 797 | 43 |
| POLIT | political | - | 11 | 166 | - | - | 2 | 3994 |
| | public | 17 | 21 | 137 | 5 | 96 | - | 1856 |
| | economic | 26 | 65 | 88 | 12 | 24 | 11 | 1184 |
| | different | 1642 | 1755 | 1130 | 2137 | 2843 | 583 | 1089 |
| | social | - | 35 | 807 | 5 | 127 | 2 | 1057 |

Table 123. Cross-discipline check of the top-frequency adjectives

The ratio of common (63%) to discipline-specific adjectives (37%) is presented graphically in Fig. 155, and the adjectives are:

- common – *high, different, low, total, large, significant, particular, same, constant*;

- discipline-specific – *fatty, academic, linguistic, experimental, clinical, finite, convex, linear, political, public, economic, social.*

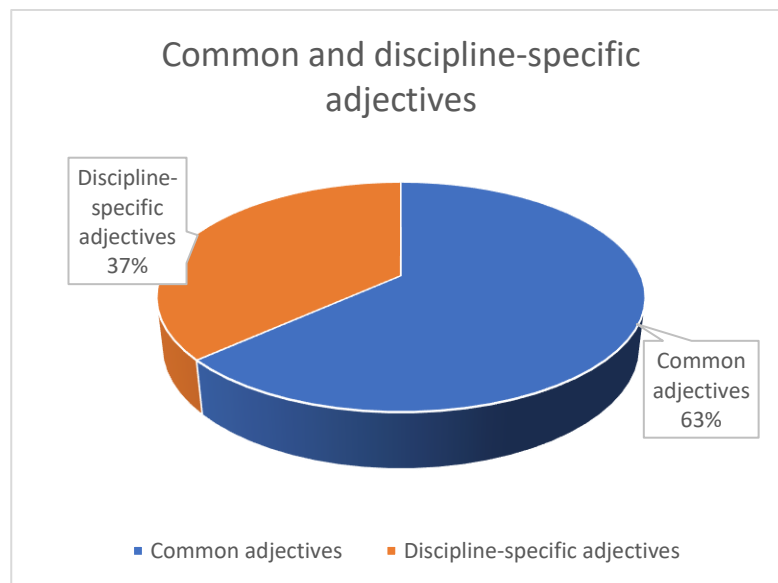


Figure 155. Common vs. discipline-specific adjectives across the seven sub-corpora

As Biber and Gray (2016:6) point out, the aim of conducting research across academic disciplines is to discover new phenomena and information and to interpret them as well as provide reasons why the phenomena occurred. This may result in the use of highly specialised and technical lexis, which in turn is hard to understand for non-experts. Osuchowska (2016:25) indicates that specialist vocabulary is one of the most frequently discussed issues in interdisciplinary research and may be seen as a barrier.

The instances of technical lexis are encountered in the concordances from the ELC presented in Chapter 5, e.g., *omalizumab, nanoparticles, Lipschitz-continuous domain, ELF discourse, lupus nephritis group* and *calorimetry*. The emergence of discipline-specific terms is also caused by the evolution of disciplines. This also means that scientists work on more specialised and complex topics than they used to in the past for which they need specialised lexis (Estes et al. 2018). Some terms that were used, e.g., in the 1930s are no longer needed and are replaced by newly coined expressions (Anderson et al., 2021:6-7). Interesting observations come from Biber and Gray (2016), who analysed RAs with regard to constellations of linguistic features, including adjectives. It can be clearly noticed that RAs in Biber and Gray's (2016) study contain discipline-specific adjectives in particular disciplines, e.g., *weedy, biological* (biology), *ecological, taxonomic* (ecology), *moral, metaphysical, philosophical* (history) as well as common adjectives which occur in academic writing regardless of the discipline, e.g.

high, similar, significant, great, relevant. Meisner (1994) stresses that the most significant keywords in environmental discourse are *environmental* and *natural*. Mičić (2013), who analysed Language for Special Purposes (LSP) of medicine, draws our attention to the use of certain adjectives in this discourse and classifies them as:

- nature of illness – *mental, metabolic*
- severity – *slight, mild, severe, serious*
- localization – *pulmonary, cardiac*
- extent – *total, endemic*
- age – *infantile, senile*
- cause – *bacterial, viral*.

Lei and Liu (2016) developed a new medical academic word list (MAVL) which includes both common and discipline-specific adjectives. The words in the list are presented alphabetically, but it is not possible to refer to their frequency. Among common adjectives there can be found, e.g., *high, normal, specific, significant*. The instance of discipline-specific adjectives are as follow: *bacterial, extracellular, heterogenous, lateral*.

On the basis of the observations provided above, the presence of particular adjectives in academic prose depends on content and topic which is discussed in particular discipline. We can distinguish adjectives that are common or even universal in RAs, e.g., *high, low, significant*, which occur across disciplines, as well as adjectives that are encountered only in certain discipline. This means that a reader should expect particular adjectival lexis in particular disciplines.

It would be noteworthy to look at the reasons of the use of specialised terms from authors' perspective. Osuchowska (2016:25-26) indicates that the first one, as provided by Hayes (1992:739), refers to scholars who are “explicit in their referencing and economical with space”, and these aspects may be caused by editorial and review guidelines. The second reason is that both jargon and technical vocabulary can simplify communication between experts in the same disciplinary field (King and Brownell, 1976, Becher, 1989). Osuchowska (2016:26) adds that the problem of specialised terms aggravates if “a word changes disciplines”. A particular word in a different discipline needs to be used with different frequency, range and collocates with which it was not used in the previous disciplinary field (Osuchowska, 2016:27). The above-mentioned aspects of using specialised terms are an inseparable part of research and

its progress, but one should not forget that technical vocabulary still remains challenging for novice researchers.

As noted by Gray (2015), linguistic variation in academic writing across disciplines may be caused by situational aspects. The use of some of the linguistic devices could be caused by specific differences across disciplines, e.g., adverbials (*however, therefore*) in theoretical physics. Other linguistic and grammatical devices, e.g., past tense verbs, are connected with type of research, i.e., qualitative, quantitative, theoretical research, and occur regardless of discipline. A notable example is a qualitative journal article which uses more narrative devices than other types of texts, quantitative or theoretical ones.

The findings of our study stay in line with Lei and Liu's (2016) and Biber and Gray's (2016) observations, among which we notice that RAs from different academic disciplines contain both common and discipline-specific lexis. Adjectives classified as common adjectives in our study have also been found in Lei and Liu's (2016) and Biber and Gray's (2016) analyses, e.g., *high, similar, significant*. The classification of adjectives in medicine proposed by Mičić (2013) cannot be used with discipline-specific adjective *clinical* in *MEDICINE* in our study, since it does not fit any semantic category.

6.2.2. Gradability and semantic classification of the top-frequency adjectives

This section endeavours to present a semantic classification of the top-frequency adjectives in the ELC as well as the five top-frequency adjectives across the seven disciplines with regard to properties they carry.

The first step involves an analysis of adjectives in the ELC and in the seven sub-corpora in terms of their gradability. Here we use a three-point scale consisting of full-gradability, partial gradability and non-gradability as discussed in Chapter 5.

| Gradable | Partially gradable | Non-gradable |
|-------------|--------------------|--------------|
| high | different | fatty |
| low | | economic |
| large | | convex |
| small | | same |
| similar | | linguistic |
| important | | academic |
| significant | | total |
| | | experimental |
| | | clinical |
| | | finite |
| | | political |
| | | public |
| | | constant |
| | | linear |
| | | particular |
| | | social |

Table 124. Gradable, partially gradable and non-gradable adjectives in the ELC

Table 124 contains the total of 24 adjectives, since some of the top-frequency adjectives across the seven sub-corpora overlap. As shown in Table 124, they are classified according to their gradability and are subdivided into three parts. The first column (gradable) provides lemmas that have a full set of properties in the sense of Quirk et al. (1985:402-403) and Huddleston and Pullum (2002). These are: attributive and predicative function, ability to be premodified by adverbs and the intensifier *very*, and taking comparative and superlative degrees. To this group belong 7 of 24 adjectives. The second group (partially gradable) includes only one lemma, namely, *different*, referred to as partially gradable adjective, since it occurs in the attributive and predicative function, is modified by adverbs and intensifier *very*, but does not occur in comparative structures. The last group (non-gradable) comprises 16 lemmas. 6 of them exhibit only one property, namely, attributive function: *political*, *total*, *fatty*, *academic*, *experimental* and *clinical*. The remaining 10 adjectives: *economic*, *convex*, *linguistic*, *finite*, *public*, *constant*, *linear*, *same*, *particular* and *social*, are used attributively and additionally have at least one of the two properties: they are modified by few adverbs and occur rarely in the predicative structure. The properties of the collected adjectives are illustrated in Fig. 156.

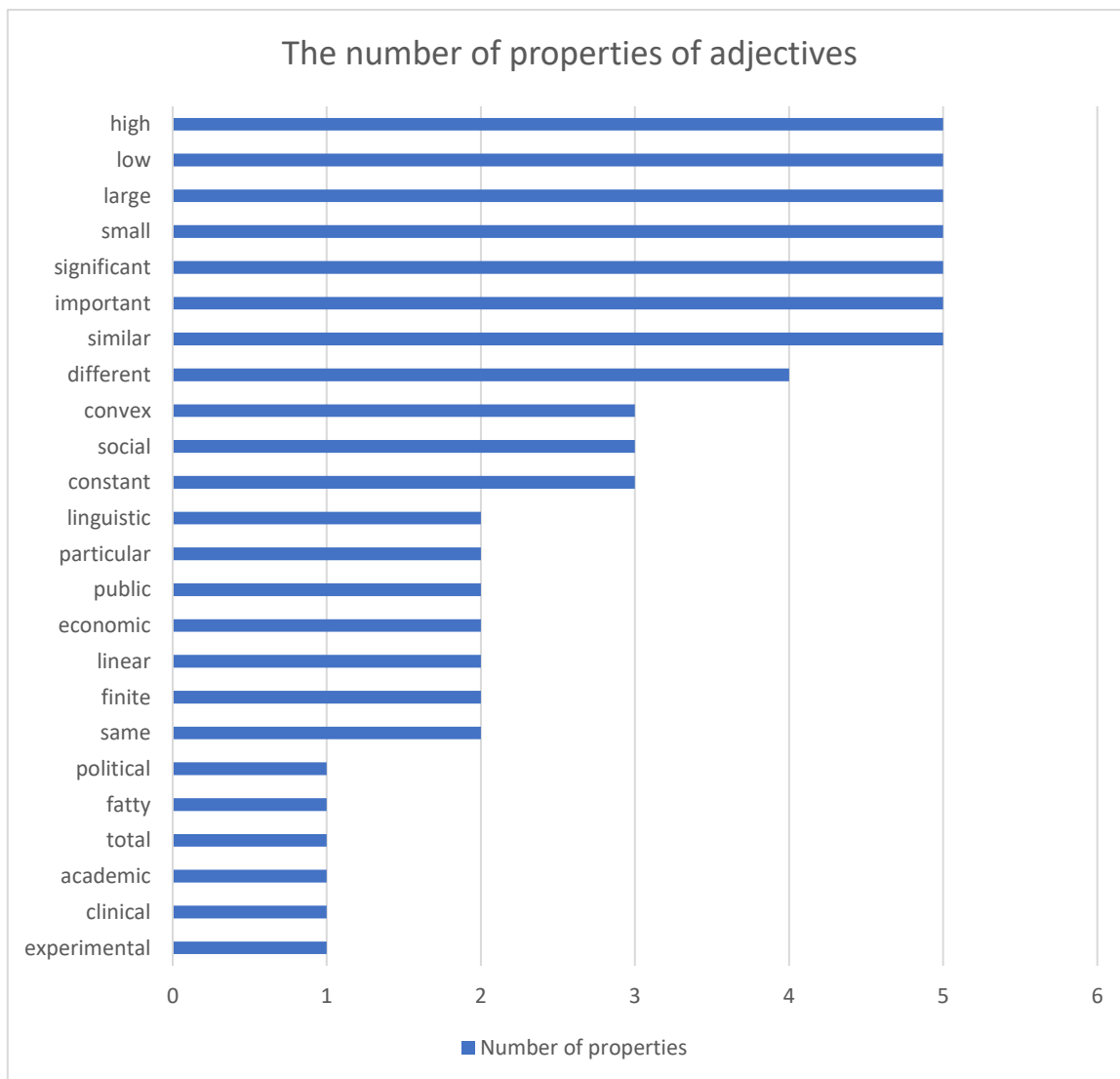


Figure 156. The properties of the top-frequency adjectives

Interestingly, nine of the adjectives of the second and third groups, namely, *different*, *political*, *total*, *social*, *linguistic*, *academic*, *clinical*, *experimental* and *public*, have been found only in a few comparative constructions. The following concordances illustrate the issue:

CNVs encompass **more total** nucleotides and arise more frequently than SNPs.

reducing public expenditure and lent it **more political** weight

As a result, **more experimental** data on the foams of interest subjected to the anticipated operating conditions are required.

Minimally invasive approaches have found **more clinical** usage in the management of UFs

learners had to recognize the **more academic** sentence of two sentences

The aforementioned instances present a gradable use of adjectives. Huddleston and Pullum (2002:531) explain that the distinction between gradability and non-gradability of adjectives, is

applied to senses and uses of adjectives “rather than to adjectives as lexemes”. In the instances provided above, we observe different senses of the lexemes which lead us to profiling of the lexemes to emphasize the metalinguistic use. As Bartmiński (1993) proposes, profiling a notion or an object is defined as presenting it in a particular way, based on a variant of the notion or object, which refers to a variant of meaning. The profile of a notion, which is the effect of profiling process, is a variant created by a dominant factor, namely, semantic dominant (*translation mine BG*). Bartmiński adds that different profiles do not denote different meanings, they, in turn, refer to the ways which aim to organise semantic content within basic meaning.

The above-presented adjectives can also be ordered by particular semantic categories as presented by Biber et al. (2002). The classification has two main categories: descriptors and classifiers. Descriptors are adjectives that express size, colour, time, evaluation, emotions, etc. The characteristic feature of these adjectives is their gradability. Classifiers, in turn, are adjectives whose role is to limit the reference of the noun and they are further subdivided into: relational/restrictive adjectives, which restrict the noun’s referent concerning other referents, affiliative classifiers, which refer to nationality of the referent, and, finally, topical classifiers, which express the subject or specific type of a given noun. In our corpus the analysed adjectives fall into the following classes:

- descriptors of size: *high, low, large, small*;
- classifiers:
 - relational/restrictive – *different, significant, particular, total, same, finite, constant, important, similar*;
 - topical classifiers – *social, academic, linguistic, political, public, economic, linear, clinical, experimental, fatty, convex*.

The analysis of adjectives in the ELC corroborates Biber et al.’s (2002:199) observations that academic texts contain more classifiers than descriptors. There are no adjectives of the affiliative type in the ELC.

6.2.3. Academic Word Lists

With reference to the presented adjectives in the ELC, the occurrence of the top-frequency adjectives was also examined in comparison with three lists. The first of them was *Academic Word List* (henceforth AWL, Coxhead, 1998). The AWL was compiled of 3.5 million words of written academic texts and includes 570 word families which account nearly for 10% of academic articles and 1.4% of fiction texts. The second list, *New Academic Word List 1.0*

(henceforth NAWL), comprises 288 million words, 86.3% of which constitutes academic journals, non-fiction and student essays, 12.6% is represented by academic textbooks and, finally, 1.1% comprise oral texts from *Michigan Corpus of Academic Spoken* (MICASE) and *British Academic Spoken English* (BASE). *New General Service List* (NGSL), the third list, is 273 million-word list which was compiled using a great many types of texts: learner, fiction, journals, magazines, non-fiction, radio, spoken, as well as documents and television. It is important to emphasize that 86% of NGSL is included in NAWL.

As regards AWL, only 6 of our 24 top-frequency adjectives, namely, *similar*, *significant*, *constant*, *academic*, *finite* and *economic* belong there (Table 125). Of these, *similar*, *significant* and *economic*, are presented in sublist 1, which proves their high frequency in AWL. The 24 adjectives were also scanned with *LexTutor* (<http://lextutor.ca>), the platform to analyse lexis, in order to see if they belong to basic or academic wordlists. 13 of 24 adjectives, namely, *high*, *low*, *large*, *small*, *different*, *particular*, *total*, *same*, *important*, *social*, *political*, *public* and *fatty* belong to basic vocabulary list, as *LexTutor* indicates. 6 adjectives, are classified as academic: *significant*, *finite*, *constant*, *similar*, *academic* and *economic*, which also have been found in AWL. The remaining 5 adjectives: *linguistic*, *linear*, *clinical*, *experimental* and *convex* are classified as off-list vocabulary, which means that they belong neither to basic vocabulary, nor academic list. Usually they are discipline-specific.

The second list of academic vocabulary, NAWL 1.0, includes three adjectives, *linguistic*, *finite* and *linear*, which occupy the 20th, 26th and 16th position, respectively, in this list. Regarding the last list, NGSL, it includes all 24 top-frequency adjectives from the ELC. Of these, the most salient adjectives are: *same*, *high*, and *different* as shown in Table 125.

| Lemma | AWL Coxhead | NAWL 1.0 | NGSL |
|-------------|-------------|----------|-------|
| high | - | - | 148 |
| low | - | - | 283 |
| large | - | - | 210 |
| small | - | - | 186 |
| important | - | - | 190 |
| similar | sublist 1 | - | 594 |
| different | - | - | 149 |
| significant | sublist 1 | - | 720 |
| convex | - | - | 12497 |
| constant | sublist 3 | - | 1666 |

| | | | |
|--------------|-----------|---------|-----------|
| fatty | - | - | 6873 |
| total | - | - | 569 |
| academic | sublist 5 | - | 1749 |
| particular | - | - | 467 |
| linguistic | - | pos. 20 | 3103 (20) |
| social | - | - | 381 |
| experimental | - | - | 2741 |
| clinical | - | - | 2365 |
| finite | sublist 7 | pos. 26 | 3588 (26) |
| same | - | - | 122 |
| linear | - | pos. 16 | 16 (16) |
| political | - | - | 395 |
| public | - | - | 287 |
| economic | sublist 1 | - | 493 |

Table 125. The top-frequency adjectives in the word lists

The top-frequency adjectives from the ELC confirm the observations of the high-frequency adjectives obtained in previous research. In the study by Kartal (2017), the list of 100 most frequent adjectives in COCA in academic texts is demonstrated. Within the 20 most common adjectives there are: *social, political, public, important, different, high, economic and significant*.

Tutin (2010) compared evaluative adjectives in linguistics and economics and found the following most common instances: *important, different, great*. Omidian and Siyanova-Chanturia (2021) analysed empirical texts across ten disciplines concentrating on the distribution of the most frequent words. The following adjectives have been found to be most common in their study: *different, higher, political, academic, dental, mechanical*. In a cross-disciplinary research conducted by Giannoni (2010a), who concentrated on four values: goodness, size, novelty and relevance markers, adjectives were mostly encountered in the size group, e.g., *large, small*, and novelty, e.g. *new, modern*. Adjectives *particular* and *important* have been found as most common attitude markers in Donesch-Ježo's (2013) analysis of English papers in medicine. Koutsantoni (2004) notes that *significant* and *important* are common evaluative adjectives in electronic and electrical engineering papers.

Finally, in line with Giannoni's (2010a) observations, *significant*, is the evaluator which is an inseparable part of rhetoric of academia and not only does it express facts, concepts and

phenomena, but also influences reader's understanding and provides the presence of disciplinary cultures.

6.3. Lexico-grammatical patterns of the top-frequency adjectives

This section presents which lexico-grammatical patterns are the most prominent in the ELC for the ten top-frequency adjectives as well as for the five-top frequency adjectives across the seven disciplines.

6.3.1. Lexico-grammatical patterns in the ELC

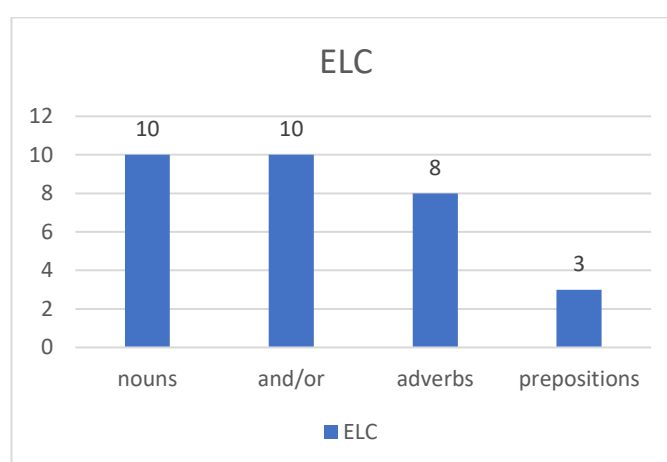


Figure 157. Lexico-grammatical patterns across the ELC

As observed in Chapter 5, two patterns, *adjective + noun* and *and/or*, are equally productive in the ELC (Fig. 157). Each of the ten adjectives enters those constructions. As many as 8 of 20 adjectives can be modified by adverbs. Finally, *adjective + preposition* is a relatively rare structure and is represented merely by 3 adjectives in the ELC.

6.3.2. Lexico-grammatical patterns across disciplines

It is clear from observations in Chapter 5 that among the lexico-grammatical constructions the most salient and frequent pattern is a nominal phrase in which adjective performs the function of the premodifier of the head noun. Each of the 35 top-frequency adjectives across the seven disciplines performs this function. With regard to *BIOTECHNOLOGY*, as presented in Fig. 158, it can be clearly seen that the second most frequent pattern is *and/or*. The structure *adverb + adjective* is represented by 3 adjectives. The least frequent pattern is *adjective + preposition*.

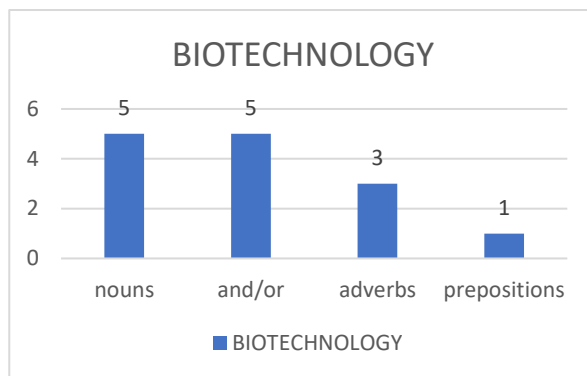


Figure 158. Lexico-grammatical patterns in *BIOTECHNOLOGY*

In *ECOLOGY*, its second most common structure is adjective phrase, in which adjectives are modified by adverbs. This is represented by all the 5 adjectives. Almost all adjectives, i.e., 4 of 5, enter *and/or* construction. The last pattern, *adjective + preposition*, is represented by only two adjectives (Fig. 159).

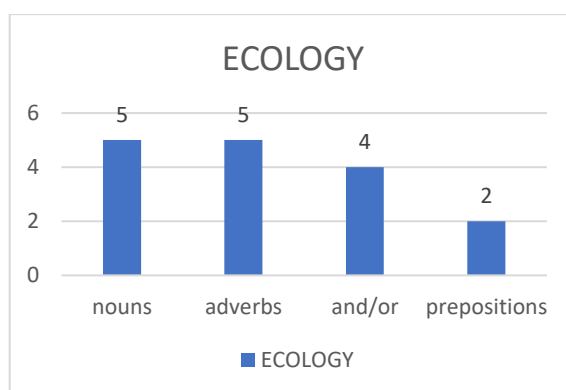


Figure 159. Lexico-grammatical patterns in *ECOLOGY*

In *LINGUISTICS*, the top-frequency adjectives enter fewer lexico-grammatical patterns than in *BIOTECHNOLOGY* and *ECOLOGY*. As Fig. 160 provides, it can be seen that the five adjectives enter the *adjective + noun* as well as *and/or* patterns, but only one adjective occurs in *adverb + adjective* construction. The top-frequency adjectives do not enter *adjective + preposition* structure.

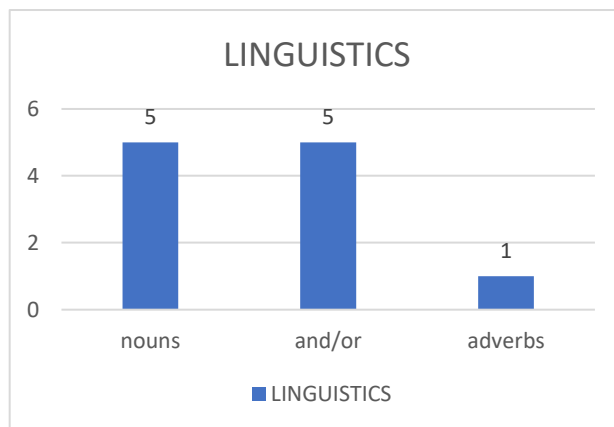


Figure 160. Lexico-grammatical patterns in *LINGUISTICS*

As regards the top-frequency adjectives in *MATERIAL SCIENCE*, we can observe that they enter the patterns *adjective + noun* and *and/or*. Four adjectives are modified by adverbs (Fig. 161).

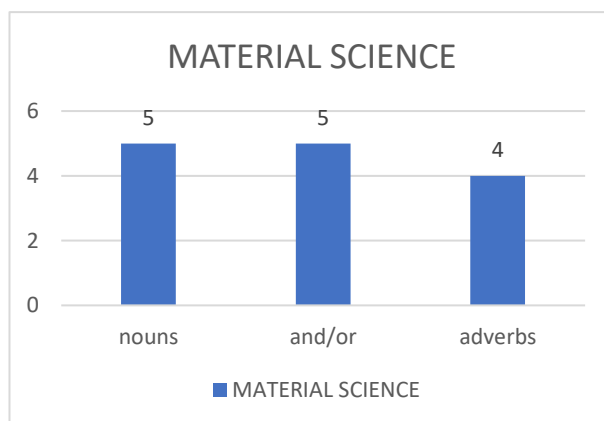


Figure 161. Lexico-grammatical patterns in *MATERIAL SCIENCE*

In *MEDICINE* sub-corpus adjectives enter more lexicogrammatical constructions than in *MATERIAL SCIENCE*. 5 adjectives premodify nouns and 4 adjectives collocate with adverbs. *Adjective + preposition* construction is represented by 3 adjectives. Only two adjectives enter the structure *and/or* (Fig. 162).

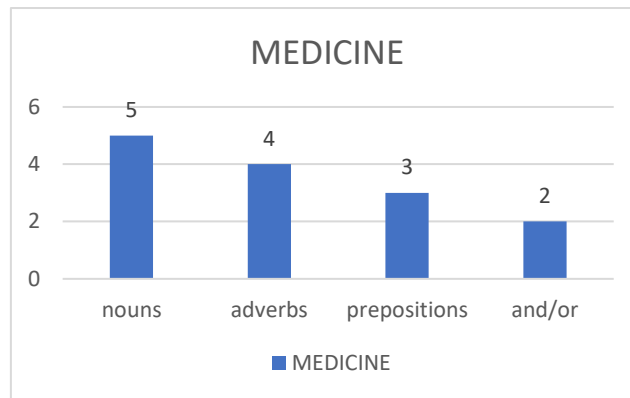


Figure 162. Lexico-grammatical patterns in *MEDICINE*

In *MATHEMATICS*, apart from *adjective + noun* pattern, the construction that prevails is *and/or* (5 adjectives). *Adverb + adjective* and *adjective + preposition* are uncommon constructions in this discipline (Fig. 163).

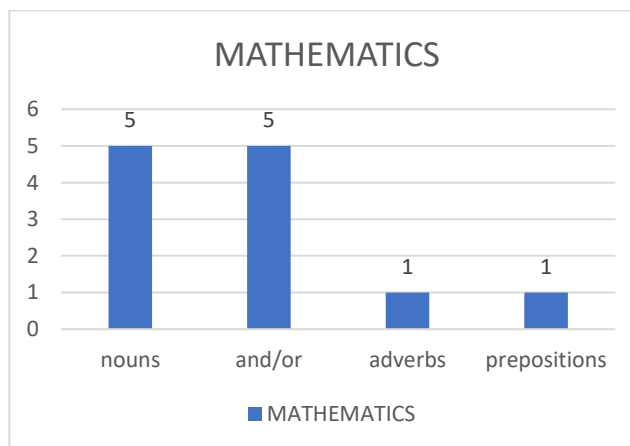


Figure 163. Lexico-grammatical patterns in *MATHEMATICS*

Regarding the structures in the last discipline, *POLITICAL SCIENCE*, *adjective + noun* is as productive as *and/or*. The top-frequency adjectives collocate with adverbs very rarely (Fig. 164).

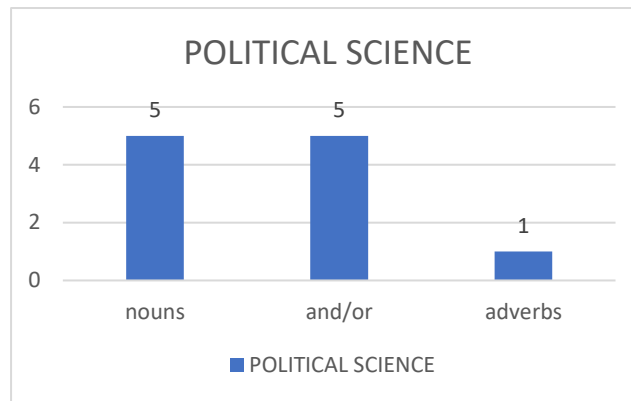


Figure 164. Lexico-grammatical patterns in *POLITICAL SCIENCE*

The lexico-grammatical structures across the entire corpus and the seven disciplines present similar behaviour in terms of the type of pattern. The aforementioned adjectives do not enter discipline-specific lexico-grammatical constructions. It would be interesting to note that Biber and Gray (2016:78-82) maintain that academic prose has characteristic phrasal and grammatical features. Among nouns and noun phrases (NPs) category, it can be seen that 60% of NPs in academic writing have a modifier (Biber and Gray, 2016:79). We can notice that noun phrases and phrasal modifiers prevail over other structures, e.g. verbs and dependent clauses, in grammatical discourse style of the late twentieth century (Biber and Gray, 2016:249). Among the adjective class, we can observe a common use of attributive adjectives. Berghammer (2006:42) and Parkinson (2000:371) point out that scientific writing, especially in medicine, has extended nominalisations which are expressed as multiterm words, e.g. *small middle meatal polyps*, *chronic obstructive pulmonary disease*. With regard to predicative adjectives, particular instances of them are much more common in academic writing than in other genres, e.g. *different*, *important*, *possible*, *necessary*. Biber and Gray (2016:81) add that particular adverbs are characteristic of academic prose, e.g. *often*, *significantly*, *more*, *relatively*, which was also observed in our study. We should agree with Biber and Gray that academic prose is viewed as structurally compressed, but its grammatical complexity is phrasal rather than clausal.

6.3.3. The attributive vs. predicative function of adjectives

As the analysis in Chapter 5 demonstrates, there is a much greater use of the attributive function of adjectives than predicative one. This is observed for the ten top-frequency adjectives in the entire corpus as well as for each of the five top-frequency adjectives across the seven disciplines. The predicative pattern tends to comprise up to 35% of all constructions with a particular adjective. This confirms Biber et al.'s (2002:201), Soler's (2002), Giannoni's (2010a)

and Matesić and Memisević's (2016) observations that attributive form of adjectives is much more frequent than predicative one in academic prose. At the same time it is worth emphasizing that attributive adjectives are more frequently used in academic prose than in other written register, e.g., newspaper prose (Biber and Gray, 2016:109-110).

As far as the structure *verb + predicative adjective* is concerned, the verb *to be* was the most common. Other verbs, e.g. *remain, look* were sporadically used with predicative adjectives in the ELC. The findings are in agreement with the results obtained by Soler (2002), Kanoksilapatham (2003), Tutin (2010) and Kitjaroenpaiboon and Getkham (2016).

6.4. Lexical bundles

As presented in Chapter 5, all top frequency adjectives in the ELC and seven sub-corpora enter 4-word lexical bundles. Four adjectives: *high (BIOTECHNOLOGY)*, *social (LINGUISTICS)*, *constant* and *linear (MATHEMATICS)* were not found in any 5-word bundles. It can also be noticed that some adjectives enter only several 5-word bundles.

As the data in Chapter 5 point out, the ratio of 4- to 5-word bundles in the entire ELC is 0.00062% to 0.00025%. As could be expected, the tendency for more frequent use of 4-word bundles than 5-word ones is retained in the seven sub-corpora as well (Table 126).

| Sub-corpus | 4-word bundles (pmw) | 5-word bundles (pmw) |
|------------|----------------------|----------------------|
| BIO | 576.72 | 306.61 |
| ECO | 804.40 | 506.31 |
| LING | 398.72 | 201.76 |
| MATER | 644.31 | 382.97 |
| MED | 1057.02 | 678.28 |
| MATHS | 970.93 | 446.04 |
| POLIT | 606.02 | 306.88 |

Table 126. The frequency of 4- and 5-word bundles across the seven sub-corpora

As the analysis in Chapter 5 has revealed, the most common structural patterns of 4-word lexical bundles for the entire ELC are: *prepositional phrase* (3D, pmw=169.69), *verb phrase with non-passive verb* (1D, pmw=120.60) and *noun phrase with of-phrase fragment* (3A, pmw=99.11). The most productive patterns for 5-word grams are: *verb phrase with non-passive verb* (1D, pmw=59.53), *prepositional phrase* (3D, pmw=51.86) and *verb phrase* (1B, pmw=43.57).

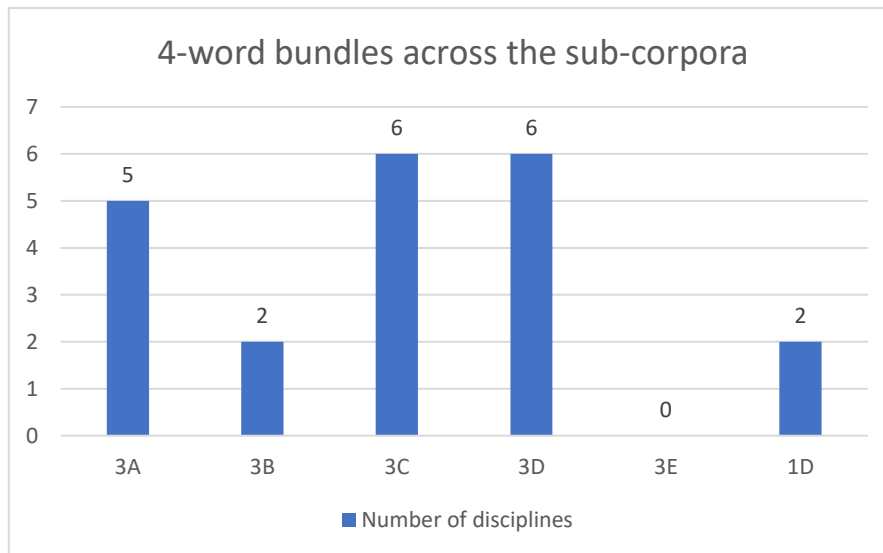


Figure 165. The distribution of 4-word lexical bundles across the seven sub-corpora

The data in Chapter 5 revealed the most frequent structural types in each of the seven sub-corpora. It would be interesting to see the number of disciplines in which the most frequent types of bundles occur (Fig. 165). With regard to 4-word lexical bundles, the most common are: 3C, *other noun phrase*, as well as 3D, *prepositional phrase*, since they occur in six sub-corpora. They are followed by type 3A, *NP + of-phrase*, which occurs in five disciplines. Type 3B, *NP + other post-modifier*, and 1D, *verb phrase (with non-passive verb)*, are found in 2 sub-corpora. The last type, 3E, *comparative structure*, was not found in any of the sub-corpora.

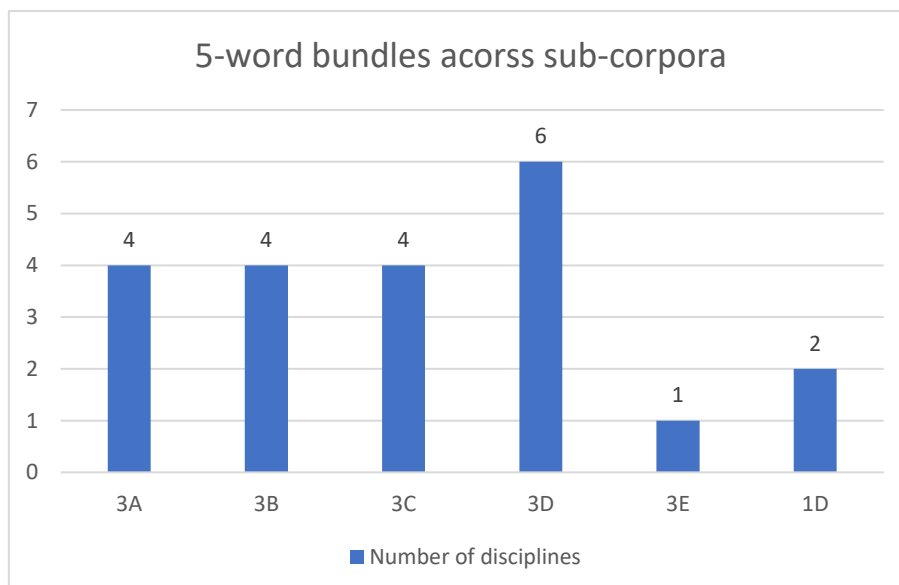


Figure 166. The distribution of 5-word lexical bundles across the seven sub-corpora

As far as 5-word lexical bundles are concerned, 3D, *prepositional phrase*, was found in as many as six disciplines (Fig. 166). The following types: 3A, *noun phrase with of-phrase*, 3B,

noun phrase with other post-modifier, and 3C, *other noun phrase*, were equally productive since they occur in four sub-corpora. In the case of 1D, *verb phrase (with non-passive verb)*, it was represented in two disciplines. The least common structural pattern of lexical bundles is 3E, *comparative expressions*.

Tables 127 and 128 display structural types of 4- and 5-word lexical bundles in the sub-corpus in which they were most productive.

| Type of structure | pmw | Discipline |
|-------------------|--------|---------------------|
| 3A | 414.50 | MATHEMATICS |
| 3B | 179.73 | ECOLOGY |
| 3C | 207.01 | MATERIAL SCIENCE |
| 3D | 271.70 | MATERIAL SCIENCE |
| 3E | - | - |
| 1D | 213.47 | MEDICINE |

Table 127. The most common structural types of 4-word lexical bundles in particular discipline

| Type of structure | pmw | Discipline |
|-------------------|--------|---------------------|
| 3A | 173.46 | MATHEMATICS |
| 3B | 138.08 | ECOLOGY |
| 3C | 70.14 | ECOLOGY |
| 3D | 150.08 | MATERIAL SICENCE |
| 3E | 42.80 | MATHEMATICS |
| 1D | 168.95 | MATHEMIATCS |

Table 128. The most common structural types of 5-word lexical bundles in particular discipline

As indicated by Cardinali (2015), lexical bundles are characteristic features of academic prose style, but Cortes (2004) observes that they can be used in different ways across disciplines and their distribution is a characteristic feature of particular genre and a disciplinary marker (Hyland, 2012). 4-word bundles are frequent in academic texts and function as a clue in interaction with readers (Hyland, 2008b). As noted by Biber (2006), the expressions such as: *as a result of*, *as can be seen* “signal competent participation in an academic register”. As

observed by Łyda (2013) and Hyland (2008c), if a bundle is longer its frequency decreases. In Łyda's (2013) study on medical RAs, 4-word lexical bundles occur much more frequently than 5-word ones. Łyda (2013) indicates that the most frequent 4- and 5-word bundles contain common adjectives, e.g. *in the present study we, plays an important role in, an important role in, in the present study*. As the instances present, 5-word bundles contain 4-word grams. The findings of Łyda's research are similar to the analysis of lexical bundles in the ELC.

Among the presented bundles, we can find bundles with common adjectives which occur across different disciplines as well as discipline-specific bundles which occur in particular disciplines. It is caused by the fact that experts use specific collocations in a particular genre (Charles, 2006) and they reveal disciplinary preferences (Hyland, 2008b). With regard to Hyland's (2008b) study, we can see that some lexical bundles in research papers in biology contain adjectives that are classified as common in our corpus, e.g. *it is possible that, similar to that of, an important role, the total number of*. With reference to the study of Introductions in medicine RAs, it presented a distinction between bundles with common adjectives and discipline-specific ones (Jalali and Moini, 2014). The instances of the former are: *aim of the present, is the most common, a central role*, and of the latter are: *in the oral cavity, the central nervous system*. Among lexical bundles in linguistics and pharmaceutical research texts (Ren, 2021), we can find common adjectives, e.g. *at the same time, the total number of, a large number of* (linguistics), *a significant increase in, a final concentration of, an important role in* (pharmacy). The same tendency to use similar bundles in several disciplines was noticed by Yin and Li (2021). In their study, 4-word lexical bundles are shared across two disciplines, finance and accounting, e.g. *are more likely to, is consistent with the*. Hyland and Tse (2009) observe 4-word bundles with common core adjectives which are repeated across four disciplines: biology, electrical engineering, applied linguistics and business studies, e.g. *in the present study, at the same time, a wide range of, it is important to*.

6.5. Concluding remarks

The analysis of academic RAs has focused on the top-frequency adjectives in the entire ELC as well as across the seven sub-corpora. With regard to the distribution of adjectives across disciplines, the highest number of them was found in *ECOLOGY* and *POLITICAL SCIENCE* (0.9%). The lowest share of the top-frequency adjectives was observed in *MATHEMATICS* (0.4%). Of the 35 adjectives that were analysed, 63% account for common adjectives, which are shared at least in three disciplines: *high, different, low, total, large, significant, particular,*

same, constant. 37% of the top-frequency adjectives are characteristic of particular discipline, e.g. *fatty* (BIOTECHNOLOGY), *linguistic* (LINGUISTICS), *clinical* (MEDICINE), *convex* (MATHEMATICS), *economic* (POLITICAL SCIENCE).

The top-frequency adjectives in the ELC and seven sub-corpora were also tested in terms of their gradability. 29% of adjectives have a full set of properties in the sense of Quirk et al. (1985) and Huddleston and Pullum (2002), and, therefore, are classified as gradable adjectives. 67% of the representatives are used as non-gradable in our corpus, since they exhibit only the attributive function and, some of them, are rarely used predicatively and collocate with few adverbs. The only adjective which is classified as partially gradable is *different*. It has almost a full set of properties, but it does not occur in the comparative pattern.

Our attention was also drawn to the semantic classification of adjectives in the sense of Biber et al. (2002). The first group in this categorisation contains descriptors, which are adjectives that signify size: *high, low, large* and *small*. The second group, classifiers, restricts a referent of a noun, e.g. *different, significant, academic, convex*. There are far more classifiers than descriptors in the ELC.

The study has also concentrated on the lexico-grammatical patterns of the top frequency adjectives. All ten top adjectives in the ELC enter *adjective + noun* and *and/or* patterns. 8 of 10 adjectives are directly premodified by adverbs. In the case of the seven sub-corpora we observe that all 35 adjectives were found in *adjective + noun* structure. 31 of 35 adjectives enter *and/or* construction. 19 adjectives are premodified by adverbs. As far as the attributive function of adjectives is concerned, it is far more frequent in the entire ELC than the predicative one.

The last issue which has been disclosed in our analysis are lexical bundles which contain the top-frequency adjectives. The study indicated the most frequent structural types of lexical bundles in accordance with Biber et al.'s classification (2004:380-381). *Prepositional phrase* (3D, pmw=169.69) is the most common type of 4-word grams in the ELC, while *verb phrase with non-passive verb* (1D, pmw=59.53) is the most productive type of 5-word bundles. As far as the seven sub-corpora are concerned, we notice that *other noun phrase* (3C) and *prepositional phrase* (3D) are the most frequent types of 4-word bundles, since they occur in 6 disciplines. Among the 5-word grams, the most productive is *prepositional phrase* (3D), which is present in 6 disciplines.

The findings of our study are related to communicative practices within written academic discourse, i.e. RA, which are performed following "predictable regularities" (Giannoni, 2010a:37; Hymes, 1974). The study highlights particular schemata of linguistic features that are used in academic prose.

Conclusions

The results that we obtained in Chapter 5 have shown the most frequent adjectives in the entire ELC as well as across the seven sub-corpora: biotechnology, ecology, linguistics, material science, medicine, mathematics and political science. The study aimed at presenting the distribution of the top-frequency adjectives, their semantic types and lexico-grammatical patterns they enter. The analysis has revealed several characteristics of adjective behaviour in research articles. I hope that the study has provided answers to the research questions formulated in Chapter 4.

Research question 1 (henceforth RQ) – *What are the ten most frequent adjectives in the ELC?* – involved the identification of the ten most frequent adjectives in the entire corpus, which comprised as many as 693 RAs. The adjectives are *high, different, low, political, large, same, significant, important, small, and similar*. As far as the second RQ is concerned, it concentrated on the five top frequency adjectives for each of the seven sub-corpora (*What are the five most frequent adjectives across the seven disciplines?*). These adjectives are listed in Table 129.

| BIO | ECO | LING | MATER | MED | MATHS | POLIT |
|-----------|-------------|------------|--------------|-------------|----------|-----------|
| high | high | academic | high | high | finite | political |
| different | low | linguistic | different | clinical | convex | public |
| low | different | different | low | significant | same | economic |
| fatty | large | social | large | low | constant | different |
| total | significant | particular | experimental | different | linear | social |

Table 129. The top-frequency adjectives in the seven sub-corpora

The answers to RQ 1 and RQ 2 served as a point of departure for further investigation concerning the distribution of the top-frequency adjectives, which led us to RQ 3 - *What is the distribution of the most frequent adjectives across the seven disciplines?* In terms of the distribution of adjectives across the seven sub-corpora, we can notice the highest share of them, i.e., 0.9%, in two sub-corpora, namely, *ECOLOGY* and *POLITICAL SCIENCE* (Fig, 167). The lowest number of the top-frequency adjectives is observed in *MATHEMATICS*, i.e., 0.4%. The distribution of adjectives in the remaining four disciplines, *BIOTECHNOLOGY*, *LINGUISTICS*, *MEDICINE* and *MATERIAL SCIENCE* fluctuates between 0.6 and 0.8%. Figure 167 allows us to see the distribution of adjectives in decreasing order. What follows from the data is that adjectives are unequally distributed across the sub-corpora.

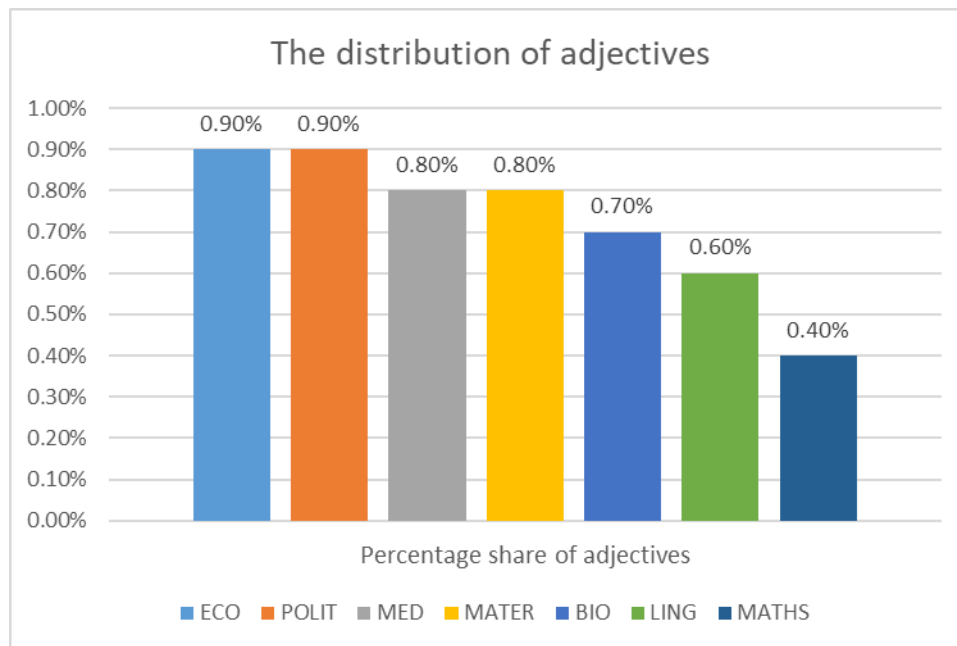


Figure 167. The distribution of adjectives across the sub-corpora

RQ 4 - *What adjectives are shared by the disciplines and what adjectives are discipline-specific?* - serves as an introduction to a semantic analysis and classification of the most frequent adjectives. The results presented in Chapter 5 indicate that there are 35 top frequency adjectives across the seven disciplines, which are listed in Table 129. Each of the five adjectives in a particular sub-corpus was cross-checked for its presence in the remaining six disciplines. The analysis enabled us to subdivide the adjectives into 2 groups. The first group contains 63% of adjectives that are common at least in three disciplines. To the second group belong 37% adjectives that are frequently used only in particular discipline, but in the remaining disciplines their frequency is much lower. The division of the adjectives into common and discipline-specific is as follows:

- common adjectives – *high, different, low, total, large, significant, particular, same, constant;*
- discipline-specific adjectives – *fatty, academic, linguistic, experimental, clinical, finite, convex, linear, political, public, economic, social.*

Another attempt to disclose the semantics of these adjectives was made through RQ 5 – *Do classifiers prevail over descriptors in the corpus?* At this point, it is important to recall the definition of descriptors and classifiers. As explained by Biber et al. (2002), the function of descriptors is to describe certain features, e.g., size, age, colour. Descriptors are gradable adjectives. Classifiers, unlike descriptors, are non-gradable and they restrict the referent of the

noun. Classifiers are subdivided into three categories. Relational classifiers, the first category, limit a noun's referent. Affiliative classifiers indicate nationality, while topical classifiers, the third group, refer to the subject or type of a noun. As can be seen in Table 130, it is clear that in the ELC classifiers prevail over descriptors. Affiliative classifiers were not found in the ELC.

| Descriptors | Classifiers | |
|-------------|-------------|--------------|
| | Relational | Topical |
| high | different | social |
| low | significant | academic |
| large | particular | linguistic |
| small | total | political |
| | same | public |
| | finite | economic |
| | constant | linear |
| | important | clinical |
| | similar | experimental |
| | | fatty |
| | | convex |

Table 130. Descriptors and classifiers in the ELC

The sixth RQ – *What lexico-grammatical constructions do the most common adjectives enter?* – should be analysed with RQ 7 - *What lexico-grammatical constructions are most commonly used? Are these structures shared across disciplines?* With regard to the ten top frequency adjectives in the ELC, it can be seen in Fig. 168 that two patterns, that is to say, nominal phrase, in which the function of the adjective is to modify a head noun, and *and/or* construction are represented by all ten top-frequency adjectives. The third construction, adjective phrase, in which adjective is modified by adverb, is also well-represented, since 8 of 10 adjectives enter it. The fourth pattern, *adjective + preposition*, is rarely used in the corpus, since only three adjectives directly collocate with prepositions.

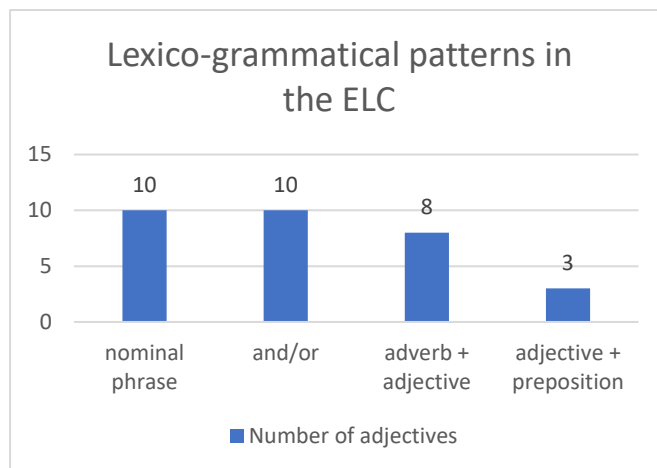


Figure 168. Lexico-grammatical patterns in the ELC

With regard to the seven sub-corpora it can be observed in Chapter 5 that all 35 adjectives enter nominal phrase in which their main function is to modify the head noun. 31 of 35 adjectives enter the *and/or* pattern. This is followed by the adjective phrase pattern in which adjective is modified by adverbs, which is the case of 19 of 35 adjectives. The last structure to discuss, *adjective + preposition*, is the least frequently used one, since only 7 of 35 adjectives enter it (Fig. 169).

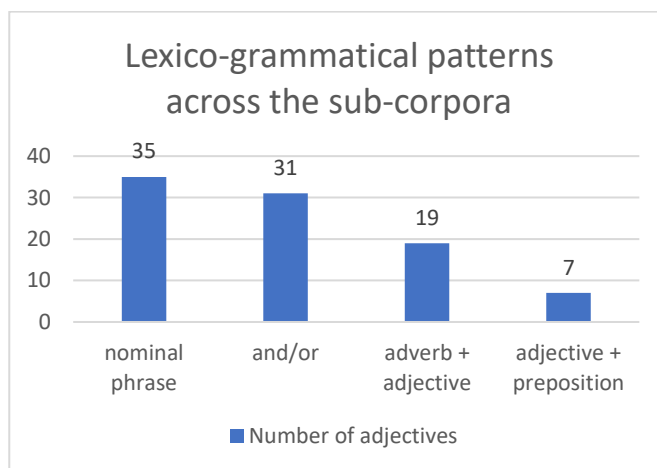


Figure 169. Lexico-grammatical patterns across the sub-corpora

In the eighth RQ it was asked whether attributive adjectives are more frequently used than predicative in the ELC. The analysis in Chapter 5 has revealed that each adjective of the top frequency ones both in the entire ELC and across the seven sub-corpora performs the attributive function more frequently than the predicative one. The predicative pattern constitutes up to 35% of all patterns with a particular adjective. In the case of *political* in the ELC, it is

found only in the attributive structures, while *same* is represented by merely three instances of the predicative structures. In the case of the seven sub-corpora, the adjectives that do not enter the predicative pattern are presented in Table 131.

| BIO | ECO | LING | MATER | MED | MATHS | POLIT |
|-------|-----|-------------------|--------------|----------|---------------|---------------|
| fatty | - | academic | experimental | clinical | same | political |
| total | | linguistic | | | <u>linear</u> | <u>public</u> |
| | | <u>social</u> | | | | economic |
| | | <u>particular</u> | | | | social |

Table 131. Adjectives that do not enter the predicative pattern in the seven sub-corpora

With reference to observations in Table 131, the underlined adjectives enter the predicative pattern very rarely, which fluctuates from 1% to 3% of all constructions.

RQ 9 is the last one to disclose the behaviour of adjectives – *What lexical bundles do the most common adjectives enter?* The analysis in Chapter 5 has revealed that top-frequency adjectives enter 4- and 5-word lexical bundles. For all ELC, the most common structural types of 4-word bundles, according to Biber et al.’s (2004) typology, were: 3D, *prepositional phrase* (pmw=169.69), 1D, *verb phrase (with non-passive verb)*, (pmw=120.60), and 3A, *noun phrase with of-phrase* (pmw=99.11). With reference to 5-word bundles, the most frequent type was 1D, *verb phrase (with non-passive verb)*, (pmw=59.53), which is followed by 3D, *prepositional phrase* (pmw=51.86) and 1B, *pronoun + verb phrase* (pmw=43.57). In relation to the lexical bundles across the seven sub-corpora, the most productive structural types, 3C (*other noun phrase*) and 3D (*prepositional phrase*), of 4-word bundles were found in as many as six disciplines. Regarding the 5-word lexical bundles, *prepositional phrase* (3D) occurred in six disciplines and was the most common used type. This was followed by 3A (*noun phrase with of-phrase*), 3B (*noun phrase with other post-modifier*) and 3C (*other noun phrase*), each of which occurred in four sub-corpora.

I hope that the findings of this study provided a clear picture of characteristic and systematic features of adjectives behaviour in academic written discourse. It can be seen that RAs across the seven disciplines use common adjectives as well as discipline-specific ones. The presence of the top-frequency adjectives is discipline-dependent and is related to the subject discussed within a particular field of study.

Regarding the identified lexico-grammatical patterns that top-frequency adjectives enter, we can see that they are recurrent across the corpus. In short, high-frequency gradable and partially gradable adjectives enter four patterns: *adjective + noun*, *adverb + adjective*,

adjective + preposition and *and/or* construction. As far as non-gradable adjectives are concerned, their two characteristic structures are: *adjective + noun* and *and/or* pattern. Several of non-gradable adjectives collocate with few adverbs, e.g. *convex*, *social*, or prepositions, e.g. *constant*, *same*. The top-frequency adjectives tend to enter attributive rather than predicative structure. Top-frequency adjectives are also found in 4- and 5-word lexical bundles. The findings obtained in this study stay in line with Payne, Huddleston and Pullum's (2010) observation that the main function of adjective is modifying nouns. The majority of the top-frequency adjectives as well as lexico-grammatical patterns are shared in the ELC as well as across the seven disciplines. The findings of this study corroborate the concept of a genre which refers to communicative practices that are performed following regularities, norms and schemata (Giannoni, 2010a:37-38).

Although the methodology for this study proved to serve well to obtain research aims, it should be noted that it has its limitations, which need to be taken into consideration. The analysis is limited to the picture of the top-frequency adjectives (ten adjectives for the ELC and five adjectives for each discipline) in seven disciplines and the observations are undertaken with regard to the entire research article. The corpus comprises 693 journal articles which were published in the years 2006-2016, which, looking from time perspective, may seem old. If we had focused on newer RAs and a greater number of the top-frequency adjectives the findings of our analysis may be different.

One issue that in my view could be explored further is the comparison of the distribution of adjectives and lexico-grammatical patterns in different segments of RA, e.g., the comparison of Introductions and Results sections. It may be of interest to investigate whether there is a relationship between adjectives and journal article's segments, for example if adjectives of size tend to appear more frequently in Results than in other sections of RA. To obtain this, it would be necessary to expand a sample of a larger number of academic texts and broaden the scope of disciplines.

Notwithstanding the above remarks concerning methodological limitations, I hope that the present thesis may be a contribution to the research on adjectives in academic written discourse. It may also serve as a comparison and a reference point for further studies on adjectival tendencies especially in a newer sample of academic journals and a broader scope of disciplines. Additionally, the ELC may be used as a reasonable framework for studying academic English as well as a source for creating materials for didactic purposes in the same field.

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Summary

The present dissertation is devoted to the lexical category of adjective in written academic discourse. The study is corpus-based in design and examines adjectives in research articles and their lexico-grammatical patterns.

The study is divided into two parts. It begins with Introduction, and closes with Conclusions, References and Summary in the English and Polish language.

In Introduction the author states that academic discourse is related to disciplinary fields of academia which have norms, nomenclature and traditions that need to be respected in scientific writing.

The first Chapter explains the notion of academic discourse and terms related to it. It describes written genres, research article and its segments, and research article abstract. Chapter Two presents the outline of studies on the macrostructure and rhetorical strategies of research article. It also focuses on the lexical categories that were investigated within this genre. Chapter Three is devoted to adjective. It opens with the presentation of categories of parts of speech. Its second part elaborates on semantic classifications of adjectives. Chapter Four introduces the English Language Corpus (the ELC) and presents the methodology of the study. Chapter Five presents a detailed examination of the top-frequency adjectives with their lexico-grammatical constructions in the entire corpus and in the seven sub-corpora.

To achieve the aim of the thesis the author addressed the following research questions:

- What are the ten most frequent adjectives in the ELC?
- What are the five most frequent adjectives for each of the seven disciplines?
- What is the distribution of the most frequent adjectives across the seven disciplines?
- What adjectives are shared by the disciplines and what are discipline-specific?
- Do classifiers prevail over descriptors in the corpus?
- What lexico-grammatical constructions do the most common adjectives enter?
- What lexico-grammatical constructions are most commonly used? Are these structures shared across disciplines?
- Are attributive adjectives more frequently used than predicative in the ELC?
- What lexical bundles do the most common adjectives enter?

The first and second research questions served as a point of departure to further investigation of adjectives.

The answer to the third question allowed to present the distribution of adjectives in the seven sub-corpora. The highest percentage ratio of the number of adjectives to the total number of words was found in *ECOLOGY* and *POLITICAL SCIENCE*, i.e., 0.9%., and the lowest value was observed in *MATHEMATICS*, i.e., 0.4%. The distribution of adjectives in the seven disciplines is not equal.

The answer to the fourth research question indicates that of the 35 top-frequency adjectives 63% are common and 37% are discipline-specific. The findings corroborate Biber and Gray's (2016) and Lei and Liu's (2016) observations that academic papers share adjectives which occur regardless of the disciplinary field as well as use adjectives specific of a particular discipline.

The fifth research question concentrates on the semantic classification of the adjectives in the sense of Biber et al. (2002). The top-frequency adjectives are subdivided into descriptors and classifiers. Only four adjectives belong to the group of descriptors (which describe size) in the ELC. The group of classifiers, contains nine relational adjectives, whose function is to limit a noun's referent, and eleven topical classifiers, which denote type of the noun. The findings stay on a par with Biber et al.'s (2002) study that classifiers predominate descriptors in academic papers.

The sixth and seventh research questions focus on lexico-grammatical patterns that the top-frequency adjectives enter. The most common lexico-grammatical structures in the ELC are *adjective + noun* and *and/or*, which each of the ten adjectives enter. 8 of 10 adjectives are found in *adverb + adjective* structure. All 35 top-frequency adjectives in the seven sub-corpora enter the pattern *adjective + noun*. This is followed by *and/or* (31 of 35 adjectives) and *adverb + adjective* (19 of 35 adjectives). The top-frequency adjectives are found in the same lexico-grammatical patterns and do not create any structures which are characteristic only of a particular discipline.

The eighth question concentrates on the attributive and predicative adjectives in the entire ELC as well as in the seven sub-corpora. Each of the top-frequency adjectives enters the attributive pattern much more frequently than the predicative one. The predicative structure comprises up to 35% of all patterns with a particular adjective in the ELC.

The ninth research question concerns the most common structural types of 4- and 5-word lexical bundles that contain the top-frequency adjectives. In the entire ELC, *prepositional phrase* (type 3D according to Biber et al.'s 2002 framework) is the most common type of 4-word bundles. *Verb phrase with non-passive verb* (type 1D) is most commonly used type of 5-word grams. With regard to the lexical bundles across the seven sub-corpora the most common

4-word grams are *other noun phrase* (type 3C) and *prepositional phrase* (type 3D), since they occurred in as many as six disciplines. Among 5-word bundles, *prepositional phrase* (type 3D) is most productive, since it co-occurred in six sub-corpora.

The present thesis may serve as a reference point for further studies on adjectives in research articles and other genres. It can be used as a source in preparing materials for didactic purposes and as a framework in the process of studying academic English.

Streszczenie

Niniejsza rozprawa doktorska została poświęcona kategorii leksykalnej przymiotnika w angielskim pisanym dyskursie akademickim. Praca jest oparta na korpusie i w ramach niej badane są przymiotniki w artykułach naukowych oraz ich konstrukcje leksykalno-gramatyczne.

Praca została podzielona na część teoretyczną i praktyczną. Jej początek stanowi Wprowadzenie, natomiast koniec - Wnioski, Bibliografia i Streszczenie w języku angielskim i polskim.

We Wprowadzeniu autorka ukazuje, że dyskurs akademicki jest powiązany z dyscyplinami środowiska akademickiego posiadającymi własne normy, nomenklaturę i tradycję, które zasługują na poszanowanie w pisaniu tekstów naukowych.

Pierwszy rozdział wyjaśnia pojęcie dyskursu akademickiego i terminy z nim związane. Rozdział ten opisuje artykuł naukowy i jego segmenty, jak również streszczenie artykułu naukowego. Rozdział drugi przedstawia zarys badań nad makrostrukturą i strategiami retorycznymi prac naukowych. W rozdziale skupiono się również na kategoriach leksykalnych badanych w ramach danego gatunku. Rozdział trzeci poświęcony jest przymiotnikowi. Rozdział rozpoczyna się prezentacją kategorii części mowy. W drugiej części rozdziału omówione są klasyfikacje semantyczne przymiotników. Rozdział czwarty wprowadza Korpus języka angielskiego (the English Language Corpus, the ELC) i przedstawia metodologię badań. Rozdział piąty przedstawia szczegółowe badania najczęściej występujących przymiotników wraz z ich strukturami leksyko-gramatycznymi w całym korpusie oraz w siedmiu podkorpusach.

W celu osiągnięcia założeń badawczych rozprawy, autorka postawiła następujące pytania:

- Jakie przymiotniki występują najczęściej w ELC?
- Jakie przymiotniki występują najczęściej w każdej z siedmiu dyscyplin?
- Jaka jest dystrybucja najczęstszych przymiotników na przestrzeni tychże siedmiu dyscyplin?
- Jakie przymiotniki występują w różnych dyscyplinach, a jakie są charakterystyczne dla danej dyscypliny?
- Czy wyrażenia klasyfikujące przeważają nad wyrażeniami opisującymi w korpusie?
- W jakich strukturach leksyko-gramatycznych najczęściej występują przymiotniki?

- Jakie struktury leksyko-gramatyczne są najczęściej stosowane? Czy struktury te występują na przestrzeni różnych dyscyplin?
- Czy przymiotniki atrybutywne są stosowane częściej niż przymiotniki predykatywne w ELC?
- W jakich ciągach leksykalnych najczęściej występują przymiotniki?

Pierwsze i drugie pytanie badawcze służyły jako punkt wyjścia do dalszych badań nad przymiotnikami.

Odpowiedź na trzecie pytanie umożliwiła przedstawienie dystrybucji przymiotników w siedmiu podkorpusach. Największy odsetek liczby przymiotników w całkowitej liczbie słów wystąpił w *EKOLOGII* oraz *POLITOLOGII* (0,9%), natomiast najniższy odsetek zaobserwowano w *MATEMATYCE* (0,4%). Dystrybucja przymiotników na przestrzeni siedmiu dyscyplin nie jest równomierna.

Odpowiedź na czwarte pytanie wskazuje, że z 35 najczęstszych przymiotników 63% stanowi przymiotniki powszechne oraz 37% przymiotników charakterystycznych dla danej dyscypliny. Ustalenia potwierdzają obserwacje Bibera i Graya (2016) oraz Lei i Liu (2016), według których w pracach akademickich znaleźć można przymiotniki występujące bez względu na dyscyplinę naukową, oraz w których pojawiają się przymiotniki charakterystyczne dla danej dyscypliny.

Piąte pytanie badawcze skupia się na klasyfikacji semantycznej przymiotników przedstawionej przez Bibera i innych (2002). Najczęstsze przymiotniki zostały dodatkowo podzielone na wyrażenia opisujące i wyrażenia klasyfikujące. W ELC tylko cztery przymiotniki należą do grupy wyrażen opisujących. Grupa wyrażen klasyfikujących zawiera dziewięć przymiotników relacyjnych, których funkcją jest zawężanie znaczenia rzeczownika, oraz jedenaście przymiotników tematycznych, które określają typ rzeczownika. Ustalenia są zgodne z badaniem Bibera i innych (2002), według którego wyrażenia klasyfikujące przeważają nad wyrażeniami opisującymi w pracach akademickich.

Pytania szóste i siódme skupione są na strukturach leksyko-gramatycznych, w których występują najczęstsze przymiotniki. Najczęściej występującymi strukturami leksyko-gramatycznymi w ELC są *przymiotnik + rzeczownik* oraz *i/lub*. Każdy z dziesięciu najczęstszych przymiotników w ELC wchodzi w skład tych struktur. Osiem z dziesięciu przymiotników można znaleźć w strukturze *przysłówek + przymiotnik*. Wszystkie 35 najczęstszych przymiotników w siedmiu podkorpusach występuje w konstrukcji *przymiotnik + rzeczownik*. W dalszej kolejności znajdziemy *i/lub* (31 z 35 przymiotników) oraz *przysłówek +*

przymiotnik (19 z 35 przymiotników). Najczęstsze przymiotniki można znaleźć w tych samych strukturach leksyko-gramatycznych i nie tworzą one żadnych struktur, które są charakterystyczne dla konkretnej dyscypliny.

Ósme pytanie dotyczy przymiotników atrybutywnych i predykatywnych w całym ELC i w siedmiu podkorpusach. Każdy z najczęstszych przymiotników w korpusie o wiele częściej występuje w formie atrybutywnej niż w predykatywnej. Struktura predykatywna stanowi do 35% wszystkich form zawierających konkretny przymiotnik w ELC.

Dziewiąte pytanie badawcze dotyczy najczęstszych typów strukturalnych ciągów leksykalnych składających się z 4 i 5 wyrazów, które zawierają najczęstsze przymiotniki. *Wyrażenie przyimkowe* (typ 3D według klasyfikacji Bibera i innych z 2002 roku) jest najczęstszym typem ciągów składających się z 4 wyrazów w całym ELC. *Orzeczenie z czasownikiem w stronie czynnej* (typ 1D) jest najczęstszym typem ciągów leksykalnych składających się z 5 wyrazów. W odniesieniu do ciągów leksykalnych na przestrzeni wszystkich siedmiu podkorpusów, najczęstszymi ciągami leksykalnymi składającymi się z 4 słów są *inne wyrażenia rzeczownikowe* (typ 3C) i *wyrażenie przyimkowe* (typ 3D), ponieważ występowały one w aż sześciu dyscyplinach. Wśród ciągów leksykalnych składających się z 5 słów, *wyrażenie przyimkowe* (typ 3D) jest najczęściej używane, ponieważ występowało w sześciu podkorpusach.

Niniejsza rozprawa może stanowić punkt odniesienia dla dalszych badań nad przymiotnikami w artykułach naukowych i innych gatunkach. Praca może również stanowić źródło przy przygotowaniach materiałów dydaktycznych oraz może okazać się pomocna w nauce akademickiego języka angielskiego.

Appendix 1

Załącznik do rozporządzenia Ministra Nauki i Szkolnictwa Wyższego z dnia 8 sierpnia 2011 r. (poz. 1065)

WYKAZ OBSZARÓW WIEDZY, DZIEDZIN NAUKI I SZTUKI ORAZ DYSCYPLIN NAUKOWYCH I ARTYSTYCZNYCH

| LP. | OBSZARY WIEDZY | DZIEDZINY NAUKI/DZIEDZINY SZTUKI | DYSCYPLINY NAUKOWE/DYSCYPLINY ARTYSTYCZNE |
|-----|-----------------------------|----------------------------------|--|
| 1 | 2 | 3 | 4 |
| 1 | obszar nauk humanistycznych | dziedzina nauk humanistycznych | <ol style="list-style-type: none"> 1) archeologia 2) bibliologia i informatologia 3) etnologia 4) filozofia 5) historia 6) historia sztuki 7) językoznawstwo 8) kulturoznawstwo 9) literaturoznawstwo 10) nauki o rodzinie 11) nauki o sztuce 12) nauki o zarządzaniu 13) religioznawstwo |
| | | dziedzina nauk teologicznych | |
| 2 | obszar nauk społecznych | dziedzina nauk społecznych | <ol style="list-style-type: none"> 1) nauki o bezpieczeństwie 2) nauki o obronności 3) nauki o mediach 4) nauki o polityce 5) nauki o polityce publicznej 6) nauki o poznaniu i komunikacji społecznej 7) pedagogika 8) psychologia 9) socjologia |
| | | dziedzina nauk ekonomicznych | <ol style="list-style-type: none"> 1) ekonomia 2) finanse 3) nauki zarządzaniu |

| | | | |
|---|----------------------------|-------------------------------|---|
| | | | 4) towaroznawstwo |
| | | dziedzina nauk prawnych | 1) nauki o administracji 2) prawo 3) prawo kanoniczne |
| 3 | obszar nauk ścisłych | dziedzina nauk matematycznych | 1) matematyka 2) informatyka |
| | | dziedzina nauk fizycznych | 1) astronomia 2) biofizyka 3) fizyka 4) geofizyka |
| | | dziedzina nauk chemicznych | 1) biochemia 2) biotechnologia 3) chemia 4) ochrona środowiska 5) technologia chemiczna |
| 4 | obszar nauk przyrodniczych | dziedzina nauk biologicznych | 1) biochemia 2) biofizyka 3) biologia 4) biotechnologia 5) ekologia 6) mikrobiologia 7) ochrona środowiska |
| | | dziedzina nauk o Ziemi | 1) geofizyka 2) geografia 3) geologia 4) oceanologia |
| 5 | obszar nauk technicznych | dziedzina nauk technicznych | 1) architektura i urbanistyka 2) automatyka i robotyka 3) biocybernetyka i inżynieria biomedyczna 4) biotechnologia 5) budowa i eksploatacja maszyn 6) budownictwo 7) elektronika 8) elektrotechnika 9) energetyka 10) geodezja i kartografia 11) górnictwo i geologia inżynierska 12) informatyka |

| | | | |
|---|--|-------------------------------------|--|
| | | | <ul style="list-style-type: none"> 13) inżynieria chemiczna 14) inżynieria materiałowa 15) inżynieria produkcji 16) inżynieria środowiska 17) mechanika 18) metalurgia 19) technologia chemiczna 20) telekomunikacja 21) transport 22) włókiennictwo |
| 6 | | dziedzina nauk rolniczych | <ul style="list-style-type: none"> 1) argonomia 2) biotechnologia 3) inżynieria rolnicza 4) ochrona i kształtowanie środowiska 5) ogrodnictwo 6) rybactwo 7) technologia żywności i żywienia 8) zootechnika |
| | | dziedzina nauk leśnych | <ul style="list-style-type: none"> 1) drzewnictwo 2) leśnictwo |
| | | dziedzina nauk weterynaryjnych | |
| 7 | obszar nauk medycznych i nauk o zdrowiu oraz nauk o kulturze fizycznej | dziedzina nauk medycznych | <ul style="list-style-type: none"> 1) biologia medyczna 2) medycyna 3) stomatologia |
| | | dziedzina nauk farmaceutycznych | |
| | | dziedzina nauk o zdrowiu | |
| | | dziedzina nauk o kulturze fizycznej | |
| 8 | obszar sztuki | dziedzina sztuk filmowych | |
| | | dziedzina sztuk muzycznych | <ul style="list-style-type: none"> 1) dyrygentura 2) instrumentalistyka 3) kompozycja i teoria muzyki 4) reżyseria dźwięku |

| | | | |
|--|--|---------------------------------|--|
| | | | 5) rytmika i taniec 6) wokalistyka |
| | | dziedzina sztuk plastycznych | 1) sztuki piękne 2) sztuki projektowa 3) konserwacja i restauracja dzieł sztuki |
| | | dziedzina sztuk teatralnych | |

Appendix 2 – List of Journals in the ELC

BIOTECHNOLOGY

Biotechnology and Bioengineering, Wiley Periodicals, Inc., Wiley Online Library

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Biotechnology Journal, Wiley-VCH Verlag GmbH & Co, Wiley Online Library

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Biotechnology Progress, American Institute of Chemical Engineers, Wiley Online Library

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Chemical Technology and Biotechnology, Society of Chemical Industry, Wiley Online Library

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Engineering in Life Sciences, Wiley-VCH Verlag GmbH & Co., Wiley Online Library

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

European Journal of Lipid Science and Technology, Wiley-VCH Verlag GmbH & Co., Wiley Online Library

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

European Journal of Pharmaceutics and Biopharmaceutics, Elsevier B.V.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Journal of Bioscience and Bioengineering, Elsevier, B.V.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Journal of Biotechnology, Elsevier, B.V.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

ECOLOGY

Acta Ecologica Sinica, Elsevier, B.V.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

African Journal of Ecology, Blackwell Publishing Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Agricultural and Forest Entomology, The Royal Entomological Society, Wiley Online Library

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Austral Ecology, Ecological Society of Australia, Wiley Online Library

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Ecology of Freshwater Fish, John Wiley & Sons Ltd

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Journal of Ecology, British Ecological Society, Wiley Online Library

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Marine and Freshwater Ecosystems, John Wiley & Sons Ltd

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Marine Ecology, Blackwell Verlag GmbH

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Molecular Ecology Resources, Blackwell Publishing Ltd

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

LINGUISTICS

Assessing Writing, Elsevier Inc.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

English for Specific Purposes, Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

IBERICA, Asociacion Europea de Lenguas para Fines Especificos

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Journal of English for Academic Purposes, Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Journal of Pragmatics, Elsevier, B.V.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Journal of Second Language Writing, Elsevier Inc.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Language & Communication, Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

LINGUA, Elsevier B.V.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Linguistics and Education, Elsevier Inc.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

MATERIAL SCIENCE

Biomaterials, Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Cement and Concrete Research, Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Composite structures, Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Construction and Building Materials, Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Cryogenics, Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Dental Materials, Academy of Dental Materials. Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Geotextiles and Geomembranes, Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Journal of Constructional Steel Research, Elsevier Ltd.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Materials Characterization, Elsevier Inc.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

MEDICINE

Allergology International, Japanese Society of Allergology, Elsevier B. V.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

American Journal of Hematology, Wiley Periodicals, Inc.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Asian Journal of Surgery, Elsevier Taiwan LLC.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Brazilian Journal of Otorhinolaryngology, Elsevier Editora Ltda.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

CLINICAL LUNG CANCER, Elsevier Inc.

2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006

Hong Kong Physiotherapy Journal, Hong Kong Physiotherapy Association. Elsevier (Singapore) Pte Ltd.

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