

Research results article

Received: **29.02.2020**

Accepted: **15.08.2020**

Published: **12.12.2020**

Sources of financing: **Kazimierz Wielki University research funding**

DOI: **10.5604/01.3001.0014.5712**

Authors' Contribution:

(A) **Study Design**

(B) Data Collection

(C) **Statistical Analysis**

(D) **Data Interpretation**

(E) **Manuscript Preparation**

(F) **Literature Search**

Izabela Plieth-Kalinowska*

izabel.kalinowska@gmail.com

ART TECHNIQUES USED BY TEACHER OF EARLY SCHOOL EDUCATION AS A FACTOR DETERMINING THE LEVEL OF HANDWRITING QUALITY OF FIRST GRADE STUDENTS

TECHNIKI PLASTYCZNE STOSOWANE PRZEZ NAUCZYCIELI EDUKACJI Wczesnoszkolnej JAKO CZYNNIK DETERMINUJĄCY POZIOM JAKOŚCI PISMA UCZNIÓW KLAS PIERWSZYCH

Abstract: In the context of a child's intellectual, emotional and social development, writing skills (along with speaking) form the absolute basis. They allow the child to better interpret, but also to formulate concepts, feelings and thoughts, and thus to acquire key competences quicker. The more worrying are then reports showing low quality of writing of students at

* ORCID: 0000-0003-2021-5757. Kazimierz Wielki University, ul. Jana Karola Chodkiewicza 30, 85-064 Bydgoszcz, phone number: +48 52 34 19 374, sekretariat.kolegium2@ukw.edu.pl

the initial stage of education. It is necessary to take actions aimed at developing motor skills using both conventional and unconventional methods. One of such options in integrated education are the art techniques. This study examines how the use of these techniques translates into better writing skills in early education.

Keywords: writing quality of first grade students, graphomotorics, art techniques

Streszczenie: W kontekście rozwoju intelektualnego, emocjonalnego i społecznego dziecka umiejętność pisania (obok mówienia) stanowi absolutną podstawę. Pozwala ona dziecku lepiej interpretować, ale również i formułować pojęcia, uczucia i myśli, a co za tym idzie, szybciej przyswajać podstawowe kompetencje. Martwiące zatem są wyniki badań pokazujące, że poziom jakości pisma uczniów na początkowym etapie nauki jest niski. Niezbędne jest podjęcie działań nakierowanych na rozwój motoryki, zarówno za użyciem metod konwencjonalnych, jak i niekonwencjonalnych. Jedną z takich możliwości w zintegrowanej edukacji są techniki plastyczne. W niniejszej pracy zbadano, jak zastosowanie tych technik przekłada się na poprawę jakości pisma w edukacji wczesnoszkolnej.

Słowa kluczowe: jakość pisma uczniów klas pierwszych, grafomotoryka, techniki plastyczne

INTRODUCTION

Writing is “a graphic, symbolic representation of speech and thoughts” (Dinger, 1972, p. 24). The ability to write alongside speaking is fundamental to a child’s intellectual, emotional and social development. The ability to formulate and interpret concepts, thoughts, feelings, facts and opinions in speech and writing enables the formation of further key competences.

In the era of widespread computerization and the development of technology, handwriting is being replaced by word processors, and the principles of calligraphy are frequently ignored in both initial teaching and further education. Most of the failures related to the illegible, incorrect or finally unsightly appearance of children’s notebooks are attributed to developmental dysfunctions, which are more and more common among students, and much less frequently to improper preparation of a child for writing.

THEORETICAL BACKGROUND

Australian research on how children acquire handwriting skills shows that three planes can be identified, which concentrate subsequent areas of experience related to the development of this skill. The first is the “World of Writing” which brings together three planes – watching, thoughts from nowhere and flowing. The second is “Self-perception” which includes hiding and revealing, control and quality. The third area is “Writing at school”, which combines the standards, requirements and principles of

good writing. These areas indicate a binary experience in which the child's consciousness jumps between the imagination ("World of Writing") and the task set before them ("Writing at school"), and both determine "Self-perception". The environment and how an individual responds to it can limit writing engagement and quality (Healey, 2019).

American researchers came to similar conclusions. They found that before children develop handwriting skills, they must go through several common stages, including drawing, letter formation, random letters, word transcription, and progressive spelling (Diffily, 2001).

Other empirical reports point to developmental deficits that hinder the process of acquiring the habit of writing. Due to underdeveloped visual perception, one may notice problems with writing such as slow pace, inaccuracy (e.g. correcting the same line repeatedly, omitting a fragment of a letter, mirroring it, writing it upside down, etc.) and different ways of writing the same characters due to their structure (Tse et al., 2014; Leung et al., 2014; Hong et al., 2020).

Research in the field of graphomotorics of Polish seven-year-olds, in which the correctness of the handwriting of first-grade students was defined as "graphic, spelling, grammatical and stylistic correctness" (Kwaśniewska, 2011) revealed that the condition of children's notebooks indicates almost 2% of students who cannot write, and almost half of them committed numerous errors within all four categories of correct writing (Kwaśniewska, 2000); a correlation was noticed between the level of a child's manual skills and the level and pace of writing (Domagała, Mirecka, 2013); not only the technical condition of students' handwriting at the level of early childhood education is terrifying, but also the pedagogical activities of modern teachers in the field of learning calligraphy are not very effective, there is a direct relationship between poor motor development and inappropriate or insufficient perceptual-motor stimulation of students (Rokita, Spionek, Domagała, Mirecka, after: Grzesiak, Naskręt et al, 2014).

Disturbing scientific messages, showing the low quality of students' handwriting at the initial stage of learning, indicate an urgent need for activities aimed at the multilateral stimulation of children's motoric skills with the participation and use of conventional and unconventional teaching methods. A good and effective methodological proposal for teachers who care about the optimal development of their students is the wide use of various art techniques in integrated education.

The writing activity can be considered in three developmental areas: psychological, physiological and motor. It concerns auditory, visual and motor analysis and synthesis. Having an auditory image of the equivalent of a letter in the form of a sound, the student perceives it as part of a word and imagines the way of drawing it (Czelakowska, 2009). It subordinates the movements of sight and hearing control (Jakubowicz-Bryx, 2015). We understand the level of psychosomatic development

of a child at which he/she is able to undertake activities related to writing as maturity to learn to write (Kwaśniewska, 2000).

In the first grade, students already become familiar with the shape and manner of writing small and capital letters. Throughout the year, they improve the ability to put them in words, paying attention to correct reproduction and combination (Zadęcka-Cekiera, 2017). Along with mastering the technique of drawing letters and their connections, they understand the structure and logical meaning of written words and sentences (Kwaśniewska, 2000).

The motor side of writing skills consists in coordinating the movements of the hand – arm, forearm, wrist and fingers. It cannot be achieved without the ability to focus on the movements one is making.

All these activities require awareness of the position of the body in space, centralization of the torso, appropriate muscle tone, agility in terms of gross motor skills, stabilization of joints directly and indirectly related to the writing activity, the ability to manipulate and manually control the writing tool, the ability to directionally control the writing, the ability to cross the midline body and its bilateral coordination (John, 2013).

Graphical analysis of the writing activity demonstrated by a first-grade student is based on the following criteria:

- legibility – illustrates a letter with a specific shape, faithfully reproducing the form of the letters or an example of the original, built by maintaining the cohesiveness of the letters and their appropriate proportions, thanks to which it is easy to read the written words;
- writing technique – includes the correct writing technique, that is, the way of holding the writing tool, correct body posture while writing, the correct order and direction of writing, as well as the optimal pace so that the written letters, words or patterns are correct in terms of graphics and quality;
- aesthetics – concerns flawless, legible, transparent writing, devoid of unnecessary ornaments, deletions and corrections that affect the aesthetic impression of the child's work being viewed (Wróbel, 1985).

When discussing the basic criteria of correct handwriting, one should also take into account graphic errors defined as each departure from a strictly defined norm that regulates spelling, grammatical and stylistic correctness. They can be classified as follows (Wróbel, 1985):

- design errors – refer to a violation of the exemplary shape of a letter, its inaccurate reproduction, lack of cohesiveness of individual elements and loss of proportional structure (failure to complete the shape of the letter, disproportionate arrangement of elements in the letter structure, line distortion);
- misconnection of letters – they arise as a result of incorrect joining of characters in words, or the complete omission of such combinations; their

occurrence directly affects the loss of legibility of the handwriting and contributes to the slowing down of the pace of writing, which in turn violates the principle of writing;

- proportionality errors – arise as a result of improper condensation of letters in words, their uneven arrangement in terms of height and failure to observe the established word spaces;
- non-uniform leaning errors – occur when the principle of uniform leaning of characters is violated, the sudden change of the direction of their drawing is violated, which makes the script unsteady, unreliable, imprecise.

Success in mastering the difficult art of writing is the result of a multi-faceted and harmonious activity, an inseparable part of which is artistic activity. Fine arts and calligraphy interpenetrate each other, which results in a qualitatively correct and aesthetic writing. This thesis is confirmed by the views of M. Dmochowska, who, when analyzing the children's decorative creativity, noticed that in the manipulative forms used by children, in drawing and painting, as well as in the later tendency to geometricize or try to use a flexible form by the child, equivalents can be found in drawing upper-case letters and patterns of the ABC book (Dmochowska, 1979). She also notes that the initial forms of children's scribble correspond to characters. Children's scribble (angular and wavy, rhythmic zigzags, spiral lines) is characterized by the same freedom, momentum, and even fluency as in automated adult writing (Dmochowska, 1971).

Introducing broadly understood art activity based on regular and thoughtful use of various art techniques is an interesting and highly therapeutic alternative to preparing students of initial classes to learn to write.

Artistic creativity can support broadly understood development, because it improves hand dexterity, trains eye-hand coordination, prepares for learning to write, supports social and emotional development, teaches perseverance, coping with obstacles, triggers creativity (Tymichova, 2018).

Among the proposals of art exercises that improve children's graph-motoric skills in the process of learning to write, the following categories can be identified (Franczyk, Krajewska, 2005):

- drawing techniques – drawing with a pencil, crayon, charcoal, brush, chalk, pen, stick;
- painting techniques – painting with pencil and candle crayons, finishing paints, poster paints, glue paints, watercolors, printing inks, colored inks, on wet crumpled paper, glue paint mixed with sawdust, on canvas; batik; freely applying a thread or string, and then gluing the arranged pattern;
- other techniques – drawing with a pencil and covering the pattern with plasticine; tear-outs from newspapers, colored paper, tissue paper; cutout of colored paper, waste paper; reflecting the pattern with tulle or gauze;

frottage; collage; monotype; linocut; plasterboard; printing with potato stamps; painting on a grain base; mosaic from pieces of fine paper; cut-out paper from cut strips of paper; punch paper cutout;

- modeling – shaping a block – clay, plasticine, modeling clay, salt mass molding; molding from newspapers, staniol, plastic mass.

METHODOLOGY

Experimental research was carried out among students of the two first-grades in the 2015–2016 school year at the John Paul II Primary School No. 2 in Koronowo (Frąckowiak, 2016). The subject of the research were handwriting samples of 7-year-old children in the experimental and control groups. Their aim was to test the effectiveness of the applied art techniques in terms of graph-motoric improvement in 7-year-old children. The main problem around which the research oscillated was the question: What is the impact of the frequency of using art techniques on the level of graph-motoric skills in 7-year-old children?

In the research conducted with the technique of two homogeneous parallel groups*, a tool was used, developed on the basis of Domagała and Mirecka's *Grapho-motor Performance Profile* (2010) and the classification of graphic errors by Wróbel (1985). The result of the analysis of modern diagnostic tools was the original test for examining the quality level of 7-year-old children. The diagnostic tools were used to recognize the abilities and limitations of students in the field of handwriting and at the same time still applicable rules of calligraphy taking into account the criteria of graphic correctness were also used. It consisted of 4 diagnostic tests, the order of which was dictated by the principle of grading the difficulty:

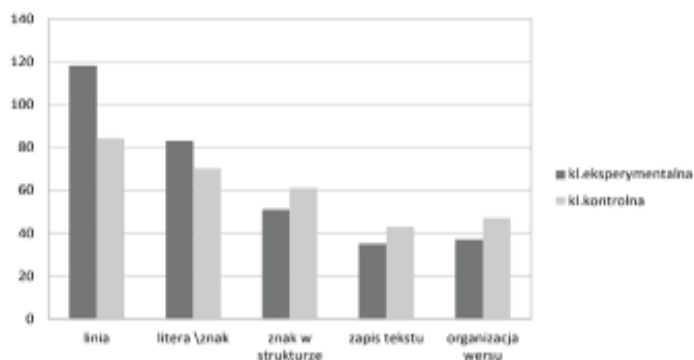
- test 1 – reproduction of letter-like patterns on an A4 sheet without ruling (lines);
- test 2 – reproduction of letter-like patterns on an A4 sheet with ruling.
- test 3 – writing the text on an A4 sheet without ruling;
- test 4 – writing the text on an A4 sheet with ruling.

The duration of the experiment was 3 months and included a total of 17 additional classes during which 12 different art techniques were used.

* There are no students with specific learning difficulties in each of the studied groups; classes are held in a similar way, and teachers use the same didactic materials; art classes are held in each group regularly, according to the timetable, at least once a week for about 45 minutes and include techniques such as: painting, drawing, tearing, pasting, salt sculpting, cutting and engraving in soap and other techniques suggested by the teacher.

RESULTS

The summary of the overall results in all categories for both groups before the start of the experiment relates to the results obtained by the students in the 4 tests. A slight differentiation of levels is presented in the chart:



Linia – line letter

Litera/znak – character

Znak w strukturze – character in structure

Zapis tekstu – text representation

Organizacja wersu – verse organization

Kl. eksperymentalna – experimental group

Kl. kontrolna – control group

Figure 1. List of the quality levels of the handwriting of the studied students based on the number of graphic errors made before starting the experiment

Source: Frąckowiak (2016).

In the line category, which includes both the pressure of the writing tool (mark) on the paper and its stability, the higher level is the handwriting of control group students who use the line relatively correctly and confidently. Students from the experimental group had a lesser mastery of the technique and precision of drawing lines, which is manifested mainly by trembling traces and uncertain drawing of circles, dashes and sticks, and frequent retouching of curves and unevenness. The samples obtained in the first research test illustrate the problems most often faced by students in each of the studied groups. The attached scans of children's creations from the first stage of the research marked A1, B1, C1, D1, E1, F1, G1, H1 were assigned to the same students in the final research test, in which they were marked with symbols A2, B2, C2, etc.

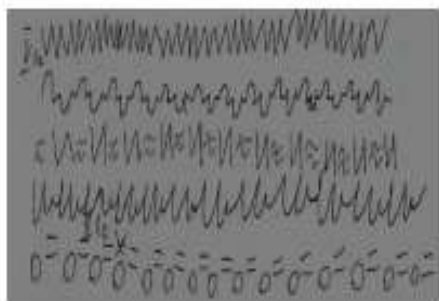


Figure 2. Handwriting sample of student from control group

Source: Frąckowiak (2016)

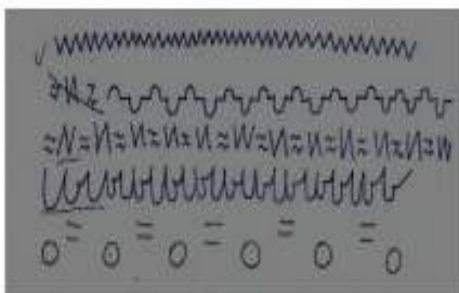


Figure 3. Handwriting sample of student from experimental group B1

Source: Frąckowiak (2016)

In the letter\ letter-like character category the differences concern mainly the form of writing. Experimental group students had a problem with it. The samples of their handwriting revealed errors related to the presence of repeated elements or vice versa omitted, sometimes distorted letters and characters. The control group did not reveal a large number of errors related to the form or proportions within letters or characters.

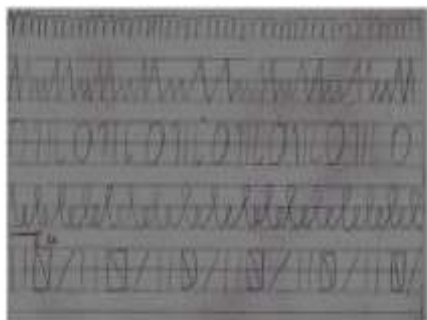


Figure 4. Handwriting sample of student from control group C1

Source: Frąckowiak (2016)

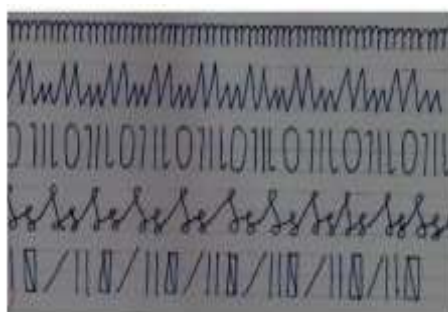


Figure 5. Handwriting sample of student from experimental group D1

Source: Frąckowiak (2016)

The next category on the chart concerns a character in a pattern structure or a letter in a word structure and includes the size and lean of the letters. In this respect, students from the control group had significant problems. The vast majority of this research group revealed changes in leaning and a wobbling handwriting in their records. It included both direction and case.

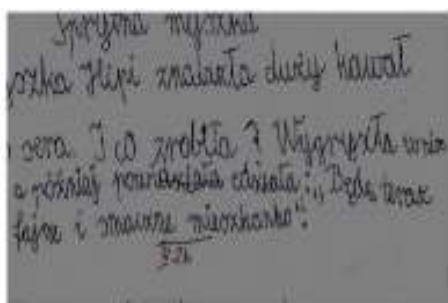


Figure 6. Handwriting sample of student from control group E1

Source: Frąckowiak (2016)

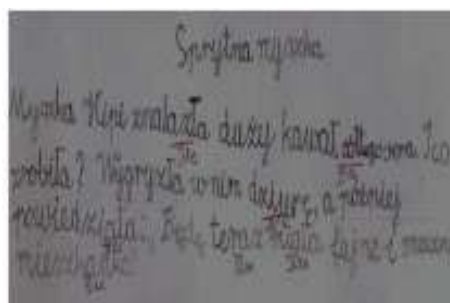


Figure 7. Handwriting sample of student from experimental group F1

Source: Frąckowiak (2016)

The fourth variant was related to text representation or a pattern. Research analysis revealed a slight qualitative advantage of the handwriting in the experimental group. Its students did better than their control classmates in correct handwriting direction and size. In the category of verse organization, the control group obtained weaker results. Word crowds often appeared in the samples. Both groups of children had significant problems with keeping the handwriting in line. The line of the verse was alternately rising or falling. This proves the incomplete maturity of fine motor skills and poor mechanization of movements. They should be systematically exercised and stimulated.

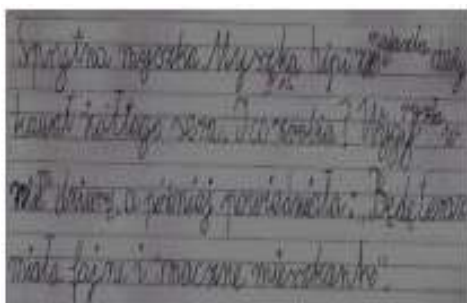


Figure 8. Handwriting sample of student from control group G1

Source: Frąckowiak (2016)

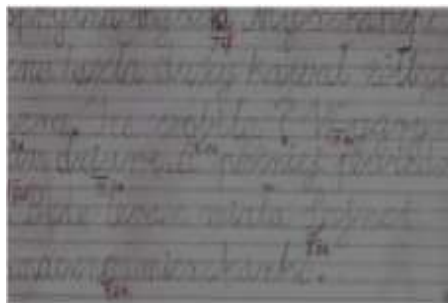


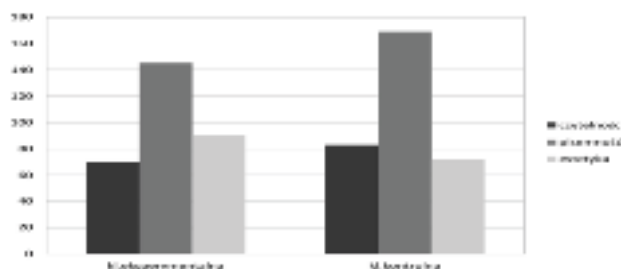
Figure 9. Handwriting sample of student from experimental group H1

Source: Frąckowiak (2016)

The preliminary study showed that the groups were similar in terms of relatively equal levels of the overall graphic image of the writing. It also revealed differences in individual criteria of correct writing (legibility, writing technique and aesthetics). After analyzing the charts prepared on the basis of samples obtained in the pretest, it can be noticed that there are slight differences in the level of handwriting quality in both groups. A particularly distinctive feature that proves the homogeneity of the studied groups is the common sphere of deficits in the field of readability.

The occurrence of numerous errors seems to have a uniform source, which can be seen, among others, in improper reproduction, copying or remembering by children

of graphic images of letters and characters, or in an insufficient and incorrect form of manipulative and graphic exercises.



Czytelność – legibility

Pisemność – writing technique

Estetyka – aesthetics

Kl. eksperymentalna – experimental group

Kl. kontrolna – control group

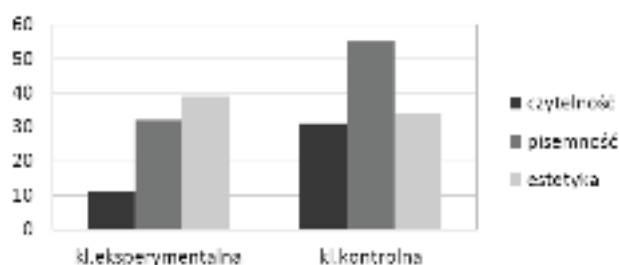
Figure 10. Distribution of levels of the graphic image of the handwriting of both groups in the context of the correctness criteria obtained in the pretest

Source: Frąckowiak (2016).

The above data indicate a slight qualitative advantage of the handwriting of the experimental group students in terms of legibility and writing technique. At the same time, they show a relatively better result of students from the control group, obtained by them on the basis of the analysis of the aesthetics of the handwriting.

The next stage was the introduction of a factor differentiating both research groups in the form of additional art classes in the experimental group. The factor directly influencing the graphic level of students' handwriting was the use of innovative and modified art techniques, based mainly on tearing, cutting, rubbing with fingers, stamping and many other activities activating small motor skills. Another important factor was the inclusion of several minutes of manual exercises in the daily rhythm of classes, consisting in rolling balls and rolls of tissue paper. Eventually, they were used for the artwork that was the culmination of the practice part of the experiment. Reuse of diagnostic tools was carried out according to the same procedures as in the pre-test. The analysis of the obtained samples showed significant differences in the graphic levels of the writing, and also illustrated the scale of deficits within individual categories.

The most important category allowing to verify the assumption regarding the correlation between environmental factors and the graphic quality of the writing turned out to be aesthetics. In the first diagnostic test the control group showed a moderate level of handwriting in this respect, and in the control test it increased slightly. It also did not contribute much in the experimental group. It can therefore be assumed that the level of the aesthetics of the handwriting depends on other factors than the frequency of art exercises.



Czytelność – legibility

Pisemność – writing technique

Estetyka – aesthetics

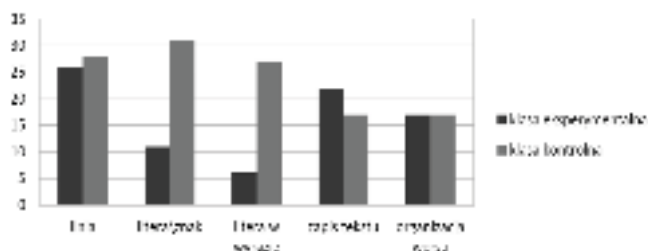
Kl. Eksperymentalna – experimental group

Kl. kontrolna – control group

Figure 11. Distribution of levels of the graphic image of the handwriting of both groups in terms of validation criteria after the end of the experiment

Source: Frąckowiak (2016)

The comparison of the overall scores in all categories for both groups after the end of the experiment shows an overall improvement in the quality of handwriting of all children participating in the study. The number of mistakes made has significantly decreased. In some categories it fell by almost half. The experimental group improved its legibility and writing techniques, while the control group performed better in handwriting aesthetics.



Linia – line

Litera/znak – letter/character

Litera w wyrazie – letter in word

Zapis tekstu – text representation

Organizacja wiersu – verse organization

Klasa eksperymentalna – experimental group

Klasa kontrolna – control group

Figure 12. Comparison of quality levels of the handwriting of the surveyed students based on the number of graphic errors made after the end of the experiment

Source: Frąckowiak (2016)

The chart presented above shows changes in the number of errors made by students from particular research groups. The slight advantage of the experimental group in the line category results from less frequent errors made by children regarding the stability of the drawn line and the pressure of the writing tool on the page. A significant difference can be noticed in the letter category as well as in terms of letter-like characters. The experimental group turned out to be the leading one. Its students had no problems with the form or proportions within the letter, thanks to which the record in most of the works was legible and transparent. On the other hand, in the control group the students quite often modified or distorted the letters. They also sometimes omitted or repeated the structural elements of the calligraphed characters.

Another category, concerning the plotting of letters and characters in words or patterns, revealed deficits in the control group in terms of unsteady handwriting, plotting letters of variable size, and the fairly frequent occurrence of atrophic characters. The representation was illegible. The samples of the work of the control group students were burdened with more errors in connecting letters. There were also complete failures in their connection, or vice versa there were collages in the form of “glued” characters.

The advantage of the experimental group over the control group is confirmed by the provisions of the text below. One can see in them regularity of the handwriting, correct case of letters and their correct, one-sided slope. On the other hand, the handwriting of the control group students is characterized by excessive leaning to the right, changing the direction of their drawing, and a tendency to macrography.

In terms of the last variable, both groups achieved similar results. An equal level of handwriting in terms of verse organization was found. However, the number of errors made clearly indicates difficulties with writing within lines. All the students surveyed did not manage to keep the line in the same sequence. A tendency to increase the notation as well as irregular arrangement of words in the text was noticed in them. The examples below are proof of this.

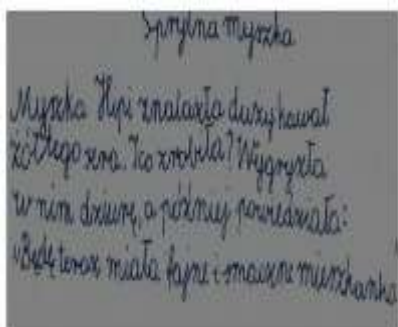


Figure 13. Handwriting sample of student from control group E2

Source: Frąckowiak (2016)

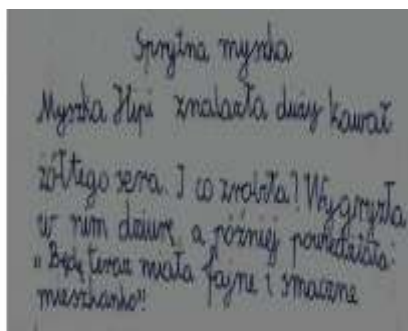


Figure 13. Handwriting sample of student from control group E2

Source: Frąckowiak (2016)

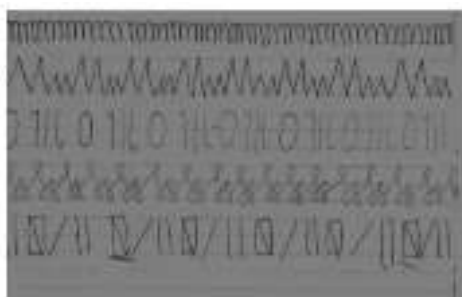


Figure 15. Handwriting sample of student from control group C2

Source: Frąckowiak (2016)

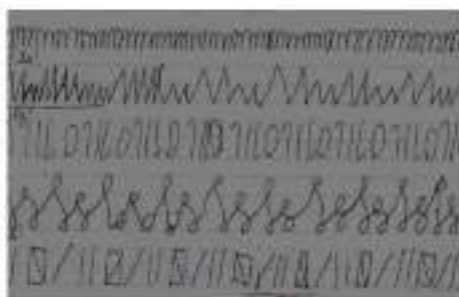


Figure 16. Handwriting sample of student from experimental group D2

Source: Frąckowiak (2016)

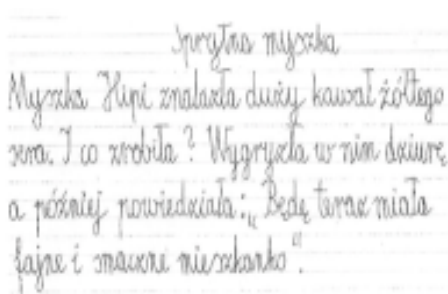


Figure 17. Handwriting sample of student from control group G2

Source: Frąckowiak (2016)

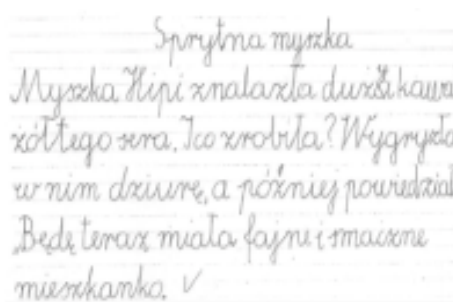


Figure 18. Handwriting sample of student from experimental group H2

Source: Frąckowiak (2016)

The samples presented above reflect the general increase in the quality level of the students' graph-motoric products at the final stage of the experiment. This proves the progressiveness in the motoric development of first-grade students, the course of which depends on a variety of stimulating factors. An unquestionable catalyst that accelerates the development of motoric functions responsible for writing are properly selected art techniques. The proof is the qualitatively improved records made by the children of the experimental group. In this group, the quality of handwriting in terms of legibility and writing technique has increased.

DISCUSSION AND CONCLUSION

Based on the conducted research, it can be concluded that the frequency of using selected art techniques is not spectacularly important for improving the aesthetics of handwriting. It is conditioned by additional dependencies, the basis of which was not revealed in the conducted experiment. Taking into account the aforementioned research observations of B. Healey, it can be assumed that also in the case of Polish students, the aesthetic side of the handwriting depends on their reaction to the

environment and consequently the level of involvement in the activity performed. Therefore, teacher's attention should be paid to the search for such motivational techniques that will encourage students to reflect systematically on the sensual effect of their calligraphy activities.

The children in the experimental group improved their graph-motoric skills, which resulted in a more accurate and precise handwriting presented in the final samples. The increase in the level of their writing in terms of legibility and writing techniques, i.e. relating typically to the mechanical functions of this activity, proves the positive and even driving the graph-motoric development of 7-year-old children, influenced by manual activity. The broadly understood art activity in work with students at the early school stage should therefore be strengthened and promoted among teachers of primary education. The variety of methods, forms and didactic means that emerge gives them unlimited possibilities in developing elementary school writing skills in children. It is worth considering increasing the hourly dimension of art activity in initial teaching, which of course should be supported by appropriate provisions in the core curriculum.

Another important postulate is to encourage teachers themselves to improve their skills in diagnosing the development of individual functions involved in the writing process, and in particular to detect any irregularities and adapt individual support programs to the child's needs. It is possible only in conjunction with empathic abilities, thanks to which a charismatic educator establishes desirable and beneficial teacher-student relationships. Vigilance, intellectual and emotional involvement, care, professionalism, etc. should characterize a teacher who cares about the proper development of the student (Kwaśniewska, 2011).

Parents should also be involved in pedagogical activities to support the development of the student. Their knowledge about the child and the techniques used in relation to him/her, as well as the methods of rewarding for the actions taken, should become elements of common arrangements and decisions. Cooperation between home and school in the organization of the teaching-learning process gives the mentee a greater chance of achieving success.

REFERENCES

- Bogdanowicz, M. (2002). *Ryzyko dysleksji: problem i diagnozowanie*. Gdańsk.
- Brejnak, W. (2003). *Dysleksja: nie jesteś sam*. Warszawa.
- Cieszyńska-Rożek, J. (2010). Zaburzenia linearnego porządkowania, czyli dysleksja. In: J. Cieszyńska, Z. Orłowska-Popek, M. Krendo (eds.), *Nowe podejście w diagnozie i terapii logopedycznej. Metoda krakowska*. Kraków.
- Czelakowska, D. (2009). *Metodyka edukacji polonistycznej dzieci w wieku wczesnoszkolnym*. Kraków.

- Diffily, D. (2001). From Scribbles To Stories: Supporting Writing Development. *Texas Child Care*, 25 (1).
- Diringier, D. (1972). *Alfabet czyli klucz do dziejów ludzkości*. Warszawa.
- Domagała, A., Mirecka, U. (2010). *Profil sprawności grafomotorycznych*. Gdańsk.
- Dmochowska, M. (1971). *Droga dziecka do nauki pisania*. Warszawa.
- Dmochowska, M. (1979). *Zanim dziecko zacznie pisać*. Warszawa.
- Domagała, A., Mirecka, U. (2010). *Grafomotoryka u dzieci w wieku 7–13 lat*. Lublin.
- Franczyk, A., Krajewska, K. (2005). *Skarbiec nauczyciela-terapeuty*. Kraków.
- Frąckowiak, M. (2016). *Częstotliwość stosowania wybranych technik plastycznych jako czynnik determinujący poziom jakości pisma uczniów klas pierwszych*. (Praca dyplomowa), Bydgoszcz: UKW.
- Grzesiak, J., Naskręt, M., Bronikowski, M. (2014). *Znaczenie koordynacji ruchów ręki w kształtowaniu umiejętności grafomotorycznych u dzieci w wieku 6–7 lat*. Wrocław.
- Healey, B. (2019). How children experience creative writing in the classroom. *Australian Journal of Language & Literacy*, 42 (3). Access: https://www.researchgate.net/publication/328418599_How_children_experience_creative_writing_in_the_classroom
- Hong, Q., Jiang, B., Xu, Q, Zhang, L., Ou, J., Zhang, Q, Li, N. et al. (2020). Reliability and validity of Handwriting Test for Preschool Children (HT-PRE): A new tool to assess the handwriting ability of preschool children aged 5–6 years old in Mainland China. *PLoS ONE*, 15(3). DOI: 10.1371/journal.pone.0229786. Access: <https://pubmed.ncbi.nlm.nih.gov/32119715/>
- Jakubowicz-Bryx, A. (2015). *Świadomość pisma u dzieci 5-letnich*. Bydgoszcz.
- Kwaśniewska, M. (2011). Uwarunkowania poprawności pisma uczniów klas początkowych *Studia Pedagogiczne. Problemy Społeczne, Edukacyjne i Artystyczne*, 20. Access: http://bazhum.muzhp.pl/media/files/Studia_Pedagogiczne_Problemy_Spoleczne_Edukacyjne_i_Artystyczne/Studia_Pedagogiczne_Problemy_Spoleczne_Edukacyjne_i_Artystyczne-r2011-t20-s209-231.pdf
- Kwaśniewska, M. (2000). *Graficzna i ortograficzna poprawność pisma uczniów w edukacji wczesnoszkolnej*. Kielce.
- Leung, M.M., Lam, C.S., Lam, S.S., Pao, N.W., Li-Tsang, C.W. (2014). Visual profile of children with handwriting difficulties in Hong Kong Chinese. *Research in Developmental Disability*, 35 (1). DOI: 10.1016/j.ridd.2013.10.013 Access: <https://www.sciencedirect.com/science/article/abs/pii/S0891422213004502?via%3Dihub>
- St. John, S. (2013). Factoring in Fine Motor: How Improving Fine Motor Abilities Impacts Reading and Writing. *Illinois Reading Council Journal*, 41 (4).
- Tse, L.F., Thanapalan, K.C., Chan, C.C. (2014). Visual-perceptual-kinesthetic

inputs on influencing writing performances in children with handwriting difficulties. *Research in Developmental Disability*, 35 (2). DOI: 10.1016/j. Access: <https://pubmed.ncbi.nlm.nih.gov/24333804/>

Tymichova, H. (2018). *Zbiór różnorodnych i ciekawych ćwiczeń grafomotorycznych wraz z komentarzem metodycznym*.

Wróbel, T. (1985). *Pismo i pisanie w nauczaniu początkowym*. Warszawa.

Zadęcka-Cekiera, A. (2017). Umiejętności graficzne uczniów klas III szkoły podstawowej. *Pedagogika Wczesnoszkolna i Przedszkolna*, 2/1 (10/1). Access: <http://www.czasopismoippis.up.krakow.pl/wp-content/uploads/2015/01/Anna-ZAD%C4%98C-KA-CEKIERA.pdf>