

Technology for the prevention of dysgraphia in primary schoolchildren

Zhakanbayeva Bakytgul *, Abai Kazakh National Pedagogical University, Dostyk Avenue 13, Almaty 050010, Kazakhstan <https://orcid.org/0000-0003-2390-0557>

Omirbekova Kutzhan, Abai Kazakh National Pedagogical University, Dostyk Avenue 13, Almaty 050010, Kazakhstan <https://orcid.org/0000-0002-0664-5550>

Akbota Autayeva, Abai Kazakh National Pedagogical University, Dostyk Avenue 13, Almaty 050010, Kazakhstan <https://orcid.org/0000-0003-4736-3004>

Tokashova Gulnaz Zhetkizgenovna, Caspian University of Technology and Engineering named after S. Yessenov, Faculty of Education, Aktau 130000, Kazakhstan <https://orcid.org/0000-0002-8422-7928>

Sabdenova Bagila, Abai Kazakh National Pedagogical University, Dostyk Avenue 13, Almaty 050010, Kazakhstan <https://orcid.org/0000-0002-4153-9307>

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Abstract

Within the scope of the study, it is aimed at developing technology to prevent dysgraphia in primary schoolchildren. The research was applied in the spring semester of 2021–2022. 158 primary school students participated in the study. The study was designed using a quantitative research model. In the study, the group of participants were given 3 weeks of dysgraphia prevention technology and learning training. In order to collect data for the study, the data collection tool developed by the researchers who created the study was used. The research collected by the data collection tool used in the tables and the results of the study in the comments was added to the obtained results, considering prevention technologies to be included in the study group of students with reading disorders of disgraf learned from the very best of the group of participants and they will use this technology. It is seen that the results have been achieved in education.

Keywords: Dysgraphia, primary school students, online technology, education;

* ADDRESS FOR CORRESPONDENCE: Zhakanbayeva Bakytgul, Abai Kazakh National Pedagogical University, Dostyk Avenue 13, Almaty 050010, Kazakhstan

Email address: b.zhakanbayeva@abaiuniversity.edu.kz

1. Introduction

When education is considered in general, it is necessary to have a meaningful and qualified education and training for students in the primary school period. In order for this time period to be meaningful for students, it is thought that it will be more meaningful with the educational environment, family and friends (Urh, Jereb, Šprajc, Jerebic, & Rakovec, 2022). In students who carry educational opportunities that create good qualities that develop around primary school, it can compensate for bad behaviour. Some factors such as the educational level of the family of primary school students, the content of the educational programme, the stability of school attendance and mobility, the importance of the child's education for families and family knowledge about the educational system affect the educational opportunities of the child (Kelkay & Endris, 2020). In addition to all these values, taking action in cooperation is thought to be the most important factor for the realisation of the goal of adapting primary school students to the environment (Valencia-Robles & García-Laborda, 2022). Educators or families who provide education in primary schools, especially during the primary school period, also observe some problems in primary school students. They may appear as behavioural or adaptation problems in which the dysgraphia method arises and is included (Buğday & Sarı, 2022). This can often be related to failures in lessons or exhibiting negative behaviours. Therefore, learning difficulties or school failure is a problem that negatively affects children's mental health and family relationships. Many families turn to specialists due to school and adaptation problems (Sharma, Kaur, & Kaur Mandeep, 2022). Especially dysgraphia is noticed in elementary school classrooms as there are writing and character sequences whose causes are not well understood. In addition, it is also observed that bright children, as manifested in the first months of primary school, can somehow balance these difficulties and hide until the age of 9 or 10 (Papadopoulou et al., 2022). It is important how and from what point of view primary schoolteachers evaluate primary school students involved in the dysgraphia process.

The ability to use educational achievements in daily life and the resulting primary school success is a situation that can directly affect not only the educational life of primary school students, but their entire life. There are many definitions and groupings used to describe children who, although they have sufficient mental capacity, do not go to school with the same level of success as their intelligence (Mekki, ElSafy, Ghannam, & Gad, 2022). These include specific learning disabilities, specific learning disorders, learning disabilities or special learning deficiencies. Hence, the learning difficulties can be defined as a delay, disorder or retardation in the development of one or more of the language acquisition, speech, literacy and math skills caused by a mental, emotional or behavioural disorder (Gardner & Stephens, 2022). The affected school skills and personal performance measures and comprehensive clinical assessment as applied current, as verified by the person's chronological age than expected for school or work under significantly and substantially related to the achievement or extensively may decrease the activities of daily living (Marchese et al., 2022). Dysgraphia begins in the elementary school years; however, the affected elementary school achievements may not fully manifest themselves unless the related causes exceed the person's limited competence. Dysgraphia cannot be explained by intellectual disability, uncorrected visual or hearing acuity, other acquisition skills, technology, complete ignorance of the language used in primary school or lack of educational guidelines (Tee et al., 2022). Stating that educational learning disabilities are not mental disabilities, they can be defined as affecting students' skills in a wide range of areas such as reading, writing, speaking, listening, thinking, language comprehension and mathematics. In these areas, students have problems in choosing, obtaining and expressing information (Özdemir & Önderöz, 2022).

1.1. Related studies

Matsyuk and Yelagina (2020) discussed learning difficulties in reading and writing skills in young students and attempted to investigate the impact on the properties of self; as a result, disgrafi dyslexia and specific studies in which students self-attitude, it is fully consistent with the assumption of the existence of the symptoms of children in this group compared to their peers without violation in reading and writing, showing signs of accepting oneself.

Usenkova and Stoletovs (2021) talk about 12 lessons in primary school-age children to prevent disgrafi and sought to develop an interactive game; in this context, the research as a result of technology developed the game to get disgrafi on children with improvement in the sound and the letter they achieved were able to read the words correctly. In addition, an interactive game attracts children with its colourfulness, clarity, various games and exercises, and they have said in their research that it motivates children.

Hopcan and Tokel (2022) purpose in the work they have done in the year after the use of special education teachers writing a mobile application aimed at imparting knowledge to students with these achievements of disgraf and elicit their opinions; as a result, the students practiced their writing skills and application of technology, to the attention of students to teach and write correctly, according to the traditional burning practices they found more useful in terms of sustain achieved.

As can be seen from the studies mentioned in the relevant research section, it is observed that children with dysgraphia benefit from these habits by gaining meaning with the help of technology. When these studies are considered completely, it is seen that they also benefit from related research. In addition, it is known that each value in research will always be indispensable for a problem situation if it keeps working on events and facts and continues its path in this plane.

1.2. Purpose of the study

This study aimed to create dysgraphia prevention technology in primary schoolchildren, and answers to the following questions were sought for the general purpose of the problem situation:

1. What are the use cases of dysgraphia activities of the participant group participating in the study?
2. How is the online education (asynchronous) time allocation situation of the participant group participating in the study?
3. What is the purpose of the technology usage of the participant group participating in the research?
4. Is there a difference in the state of dysgraphia and technology according to the gender variable of the participant group participating in the study?
5. What are the dysgraphia and technology views of the study participant group before and after the study?

2. Method

It is seen that in the method part of the research, information is given that some of the data are transferred with meticulousness. It is seen that information such as use cases, gender, class, how the application is formed and information about the application are included.

2.1. Research model

This research aimed at some technologies to prevent the formation of dysgraphia and support was taken from the quantitative research model within the research. A quantitative research model is known as a model made in a universe consisting of a large number of people and on the entire universe or a group or sample to be taken from it in order to make a general judgment about it. In addition, this method is used to clarify a situation, evaluate and decipher the relationship between events (Jalala, Latifoğlu, & Uzunboylu, 2020).

2.2. Working group/participants

The research was created in the 2021–2022 spring academic year. The data of the research randomly includes 158 voluntary special education students who continue their studies in Kazakhstan, in which primary school students participate. All primary school students continue with online and distance education.

2.2.1. Gender

In this section, the differences of the participant group included in the study according to their gender are given in Table 1.

Table 1. Distribution of the group of participants participating in the study according to the gender variable

Gender	Boy		Girl	
	F	%	F	%
Variable	82	51.89	76	48.11

The distribution of the participant group included in the study according to the gender variable has been added and the information has been examined and added. In this context, it is seen that 51.89% (82 people) of the participant group participating in the study were male, while 48.11% (76 people) were female. In this section, the findings reflect the actual distribution of special education teachers.

2.2.2. The use times of dysgraphia activities of the participant group participating in the study

In this section, the dysgraphia activities usage times of the participant group participating in the research were investigated regarding the problem situation and the values were digitised and the relevant information is given in Table 2.

Table 2. The use times of dysgraphia activities of the participant group participating in the study

Dysgraphia activities	1–3 hours		4–6 hours		7 hours and above	
	F	%	F	%	F	%
Variable	27	17.09	62	39.24	69	43.67

When Table 2 was examined, the dysgraphia activities of the participant groups related to the problem situation of the study were prepared by the researchers on smart devices and they were expected to use these activities. In this context, 17.09% (27 people) spent 1–3 hours, 39.24% (62

people) spent 4–6 hours and 43.67% (69 persons) spent over 7 hours. In this context, when Table 2 is examined, it is seen that the majority preferred to spend 7 hours and above.

2.2.3. The online training (asynchronous) time allocation of the participant group participating in the research

In this section, we surveyed participants in online education to the group of disgraf and technology education and in the case of induction training time and reserve time for a change in the status, the participating group was asked the relevant circumstances researched and detailed information are given in Table 3.

Table 3. The online training (asynchronous) time allocation of the participant group participating in the research

Taking the time to study online	1–3 hours		4–6 hours		7 and above hours	
	F	%	F	%	F	%
Variable	14	8.86	46	29.11	98	62.03

When Table 3 is examined, surveyed group of participants in relation to online training and technology (induction) time allocation and use cases and records were examined and detailed information is given in Table 3. It is thought that this information will increase the use of dysgraphia and technology dimensions for them. In this context, 8.86% (14 people) allocated 1–3 hours for asynchronous training, 29.11% (46 people) allocated 4–6 hours and 62.03% (98 people) allocated 7 hours and more for asynchronous training. In this context, research and technology regarding disgraf education, induction and training records up to 7 hours or more by majority of the participants was preferred.

2.2.4. Class status

In this section, the class information of the participant group included in the study is examined and detailed information is given in Table 4.

Table 4. Distribution of primary school students according to their age status

Class	Third year		Fourth year	
	F	%	F	%
Variable	71	44.94	87	55.06

When Table 4 is examined, the distribution of the participant group participating in the research according to their class status has been taken into consideration, and the information regarding this section has been added to the table. In this context, it is seen that 44.94% (71 people) are in the third year, while 55.06% (87 people) are in the fourth year. In this section, the findings reflect the actual distribution.

2.3. Data collection tools

In this part of the study, it is seen that information about the data collection tool are given, while the data collection tool has been carefully prepared and added by the people who created the research. The information in the data collection tool section has been examined by experts in the field of dysgraphia and technology and the unsuitable substances have been simplified by removing them

from the research. It is seen that the personal information form called 'Technology with Dysgraphia' measurement tool, which is applied to the participants participating in the study and developed by the researchers, is used. The scope validity of the developed measurement tool has been examined by two experts and two professors who are working on special education and technology education, and unnecessary items have been removed from the measurement tool and simplified and rearranged.

1. Personal information form (demographic data): In the personal information form, information such as gender, class, dysgraphia activities and asynchronous education records usage times are included.

2. Dysgraphia and technology data collection tool: A 5-point Likert-type data collection tool has been prepared for the improvement and development of dysgraphia and technology situations on primary school students in the field of special education who participated in the study. 18 items of the measurement tool consisting of a total of 21 items were used and 3 items were removed from the measurement tool, thanks to the experts' opinions. The opinions of the primary school students from two factorial dimensions, such as the 'Geography' and 'Technology' of the participants participating in the research, were consulted. The Cronbach alpha reliability coefficient of the measurement tool as a whole was calculated as 0.91. The measurement tool was in the range of 'strongly disagree' (1), 'disagree' (2), 'I'm undecided' (3), 'agree' (4) and 'strongly agree' (5). The measurement tool was also collected from primary school students in the form of an online environment.

2.4. Application

In this part of the research, it was aimed and carried out to create an ICT application dimension for primary school students with dysgraphia and technology. First of all, dysgraphia activities were created for primary school students to provide access via smart devices and they were allowed to follow them. Within these activities, and writing skills to create short videos for better letters have been added to the activities of the research group participating in the work as planned and participation in training was provided on the application programme for 3 weeks via Zoom setting information in relation to the education and regulation of the environment by people who are experts in the area of the part and is set before the start of training received help showing relevant changes. It is aimed to show visuals and auxiliary materials to the participant groups related to dysgraphia and technology education, which are the two most important topics of the research. When the training dimension started, the data collection tool was applied to the people participating in the study. This situation was repeated after the training and the data collection tool was applied to the participant groups both before and after the research. The event was organised by distributing the event to the participant groups including special education students for weeks, 40 minutes of each event were processed in a total of 50 minutes in the form of 10 minutes of training questions and answers, and the data collection tool was collected through the online form and questionnaire and coded in the calculation programme environment and transferred to the Statistical Package for the Social Sciences programme.

2.5. Analysis of the data

In this section, statistical data obtained from primary school students were analysed in the Statistics programme using frequency (f), percentage (%), mean (M), standard deviation (SD) and t -test, respectively. The numerical values of the data obtained from the programme are given in tables, accompanied by comments in the findings section.

3. Findings

In this section, the findings related to dysgraphia and technology status on primary school students in the field of special education participating in the research are included and each finding of the research is presented in the form of numerical values and tables and presented in this section with values.

3.1. Technology use purposes of the research participant group

In this section, it is seen that the usage purposes of the technology dimensions that are included in the study and used in education by the participants are included. The usage purposes are examined and the relevant information is given in Table 5.

Table 5. Technology use purposes of the research participant group

Variable	Dimension	F	%
Technology use purposes	Dysgraphia activities	154	97.47
	Other	4	2.53
	Total	158	100

When Table 5 is examined, the purpose of the technology use cases of the participant group participating in the study is investigated and it is seen that the information formed for this purpose are added to the table. It is seen that 2.53% (4 people) chose the other field. In this context, it can be said based on Table 5 that most of the participants prefer to choose and benefit from dysgraphia activities according to the problem situation of the research, and also use it to help special education students who are directed to the problem situation.

3.2. Dysgraphia and technology status of the participant group according to gender variable

In this section, an examination was made according to the gender variable, dysgraphia and technology status within the research and detailed information is given in Table 6.

Table 6. Dysgraphia and technology status of the participant group participating in the research by gender variable

	Gender	N	M	SD	Df	t	p
Dysgraphia and technology situations	Boy	82	4.52	0.18	158	-144	0.230
	Girl	76	4.49	0.24			

When Table 6 is examined, dysgraphia and technology use status of the groups participating in the research are examined according to the gender variable, and it is seen that there is no significant difference according to the gender criterion ($Df [158] = -144, p < 0.05$). When the dysgraphia and technology use situations of the participant groups participating in the research are examined, it is seen that while male students' average score in this area is $M = 4.52$, female primary school students' status in this area had an average score of $M = 4.49$. In this context, in this study, it can be said that there is no difference between the dysgraphia and technology scores of male primary school students and female primary school students. It can also be said in that the scores of male primary school students are high.

3.3. Dysgraphia and technology status views of the participant group participating in the research before and after the study

In this section, the pre-study and opinions of the participant groups participating in the research are applied and it is seen that this information is added to Table 7.

Table 7. Dysgraphia and technology status views of the participant group participating in the research before and after the study (pre-test–post-test)

No	Variable	Pre-test		Post-test		df	t	p
		M	SD	M	SD			
1	I found the dysgraphia teaching effective and understandable	3.2	0.72	4.5	0.6	15	-4.17	0
		1		3	2	8		
2	I found instructional technologies with dysgraphia to be understandable for special education	3.1	0.72	4.5	0.6	15	-4.48	0
		9		1	1	8		
3	It is understandable for students to see dysgraphia in special education for instructional technologies.	3.2	0.87	4.4	0.6	15	-4.42	0
		7		6	8	8		
4	I can better understand dysgraphia and technologies education through distance education	3.1	0.72	4.4	0.6	15	-4.42	0
		8		7	7	8		
5	Thanks to education with dysgraphia, I work harder to teach the lesson more successfully.	3.2	0.67	4.4	0.6	15	-4.19	0
		1		2	4	8		
6	I saw an opportunity to teach opportunities to learn teaching concepts with dysgraphia	3.1	0.72	4.4	0.6	15	-4.58	0
		1		3	3	8		
7	I can express my ideas very easily with the help of technology in education with dysgraphia.	3.1	0.83	4.4	0.6	15	-4.28	0
		5		9	2	8		
8	I watch teaching and distance education videos with dysgraphia over and over again	3.3	0.87	4.5	0.6	15	-3.75	0
		8		2	1	8		
9	I would like to use the teaching training classes with dysgraphia in different courses	3.3	0.72	4.4	0.6	15	-3.71	0
		1		9	7	8		
10	I can connect to dysgraphia teaching and distance education from any smart device I want.	3.2	0.82	4.5	0.5	15	-4.73	0
		1		1	4	8		
11	Dysgraphia teaching and distance learning gives me the opportunity to do it again	3.2	0.81	4.5	0.5	15	-3.61	0
		6		6	2	8		
12	The education I receive in dysgraphia and teaching education classes allows me to improve myself	3.2	0.92	4.5	0.5	15	-4.01	0
		8		2	7	8		
13	With dysgraphia teaching training, my old habits towards the field became different.	3.2	0.72	4.5	0.5	15	-4.29	0
		1		3	7	8		
14	Take more responsibility for teaching dysgraphia to be more successful in	3.2	0.82	4.5	0.5	15	-4.61	0

	education classrooms	6	7	8	8		
15	The use of dysgraphia teaching education with distance education learning method allows me to understand the lesson better.	3.1	0.87	4.4	0.5	15	-4.32
16	I believe that I have a positive bond with my students thanks to this technology education I have received.	3.1	0.72	4.5	0.6	15	-4.38
17	With dysgraphia, I can easily get used to education and any idea.	3.1	0.87	4.5	0.6	15	-4.26
18	It is fun to study in the classes I attended with dysgraphia and technology education.	3.2	0.82	4.5	0.6	15	-5.35
	Overall Average	3.2	0.78	4.5	0.6	15	-4.30
		1	0	1	8		

As seen in Table 7, it is seen that the pre-test and post-test results of the participant group about dysgraphia and technology before and after the study are included ($p < 0.005$). Although there is a significant phenomenon in all statements, it is seen as the most important and beautiful finding in the research that the reading and writing skills of the primary school students participating in the research improved by using dysgraphia technologies, according to the post-test results. In addition to these, one of the most prominent expressions of the participants participating in the research is 'I can express my ideas very easily with the help of technology in teaching and education with dysgraphia', with a pre-test score of $M = 3.15$ and a post-test score of $M = 4.49$. In addition, when the findings of the research are examined, according to the pre-test, one of the most prominent expressions of primary school students is 'I believe that I have a positive connection with my students thanks to this technology education I have received', with a score of $M = 3.14$ and a post-test evaluation score of $M = 4.54$. In addition, among the statements, 'Using dysgraphia teaching education with distance education learning method allows me to understand the lesson better' had a pre-test score of $M = 3.16$ and a post-test score of $M = 4.42$.

Although positive results were seen in each item of the research, among the opinions of the primary school students who participated in the research was 'I saw that there is an opportunity to teach learning concepts with dysgraphia', with a pre-test score of $M = 3.11$ and a post-test score of $M = 4.43$. In addition, among the opinions of the participant groups participating in the research, it is seen that 'I can connect to dysgraphia teaching and distance education from any smart device' had a pre-test score of $M = 3.21$ and a post-test score of $M = 4.51$. In addition, among the opinions of the participant group participating in the research, it is seen that the pre-test score of 'I understand dysgraphia and technologies education better thanks to distance education' is $M = 3.18$, while the post-test average score is $M = 4.47$. Finally, while the dysgraphia and technology pre-test averages of the participant groups participating in the research were $M = 3.21$, the post-test average was $M = 4.50$.

4. Discussion

Dui et al. (2020) aimed to utilise the handwriting features that are typically seen in children with dysgraphia using technology, and they concluded that the application test confirmed that three laws were valid and improved on the tablet surface both when writing words and drawing symbols.

When this value of the research is combined with the results of the study and becomes meaningful, it is seen that the frequency of use of smart device applications with the help of dysgraphia and technology of the primary school students participating in the research is 5 and above, and thus, it is seen that they can easily use dysgraphia and technology in their fields. In this context, it is seen that students with technology dysgraphia want to learn technologies, and it can be said that dysgraphia and technologies used in this research benefit both fields.

Vyatleva, Grigorenko, Pokrovskaya, and Bal (2021) aimed to develop different strategies to examine the aetiology and characteristics of writing disorders in primary schoolchildren studying at general education schools and to teach them to students with various dysgraphia symptoms by applying an interdisciplinary approach to research. It is seen that adding scientific data on the effect of didactogen on the quality of learning supports the formation of writing and dysgraphia with technology in students who have difficulties in assimilating the programme learning material into the Russian language. In this context, when this value is combined with the results of the research, it is seen that the participant groups included in the research can easily participate in applications and live events with technology. In this context, it can be said that technology brings meaning and benefit to every field in the combination of these values.

Amiruddin (2022) aimed to determine the factors that cause dysgraphia in children and to determine the III, which aimed to reveal the services provided to children with dysgraphia in class SD 2 Klepu Semarang; as a result, educational services provide a variety of inclusive education programmes to overcome children with learning difficulties, including the use of supportive media to make children more interested in learning and make children overcome the difficulties of learning to read. They concluded that there is a lack of communication between teachers and parents in coming to school. When this value is combined with the results of the research, it is seen that the results of online education and primary school students' reading and writing skills are strengthened by making better use of dysgraphia and technology by establishing a bond with their teachers. It can be said that this study with technology will benefit future generations.

5. Conclusion

When the results are considered, it is known that the data are digitised and interpreted as the part where it finds meaning; the most important data in a research is the number of participants because the facts and events in the research will gain meaning with the number of participants, and this value also benefits the field of writing. In this context, when the first value in the research is examined, it is seen that 158 primary school students participated in the research and reached the conclusion that they were involved. Another value of the study is that the dysgraphia activities of the participant group related to the problem situation of the study were prepared by the researchers on smart devices and they were expected to use these activities. In this context, when the usage times of these activities are examined, it is seen that the data are used most for 7 hours and above followed by 4–6 hours of usage. Another value of the participating groups participating in the survey of research and technology disgraf prepared for them, in relation to online training (induction) time allocation and use cases, was examined; and as a result, 7 hours and above was preferred and chosen by majority of the participants.

Another value of research groups participating in the study is in line with the purpose of the use cases of technology researched. In light of the information, it was concluded that for this purpose they preferred to take advantage disgraf select and activities to help special education students. According to the gender variable of the research group surveyed, the values of use cases and

technologies disgraf examined showed no significant difference in the outcome; it is seen that, in this study, male primary school students, compared to elementary school students (girl) and the absence of any difference between the scores, scored the highest. The final value of the research and the work of the group participating in the survey, which focused on the time before and after katilic disgraf and opinions about technology pre-test and post-test results are among the pre-test and post-test scores were examined, and the final pre-test according to high risk reached the conclusion that no significant difference is seen in the development of research and technology disgraf by using their reading and writing skills; it is seen as the most important and beautiful result.

Considering the results obtained in line with the values in the research, it is seen that the student group included in the study has learned dysgraphia prevention technologies very well and that the participant group with the reading disorder will use this technology in their education.

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