



Evaluation of the Effect of the Training Program Developed for Teachers Working with Students with Dysgraphia on Knowledge Competence of Teachers¹

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Abstract

This study aimed to evaluate the effect of teacher training program developed on dysgraphia concerning teachers' knowledge proficiency. The study was organized according to the mixed method. There is no significant difference between the pre-test knowledge competencies of the experimental group teachers and the control group participants, where the training program developed for teachers working with dysgraphia students was applied. There is a significant difference in favor of the experimental group between the post-test knowledge competencies of the participants in the experimental group and the control group, where the training program developed for teachers working with dysgraphia students was applied. There is a significant difference in favor of the experimental group between the retention test scores of the experimental group participants and the control group participants, where the training program developed for teachers working with dysgraphia students was applied. It has been observed that teachers make statements consistent with the literature to a large extent, both when identifying the students with dysgraphia in their classrooms and when explaining the developmental characteristics of students with dysgraphia.

Keywords: Dysgraphia, teacher education program, writing difficulties, curriculum development.

Theoretical Background

Developments in the field of learning disability date back to the 1960s in the world and the 1980s in Turkey. When its historical development is examined, it has been seen that studies focusing on learning disabilities started in the field of medicine and were examined in the context of studies related to visual disorders and brain damage. In the 1960s and later, the use of the term learning disability by Samuel Kirk for the first time and the laws mandating

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support services for children with learning disabilities began to experience significant developments in this area (Çakıroğlu, 2018; p. 6).

The British Dyslexia Association has defined specific learning disability as “a complex neurological picture in which reading, spelling and written language areas and learning functions are affected. It has been stated that one or more of the numbers, notes, motor function, and organizational skills are affected (Reid, 2009).

In the Individuals with Disabilities Education Act (IDEA), a special learning disability is a disorder experienced in one or more of the basic psychological processes related to using language, speaking, writing and understanding, listening, thinking, speaking, reading, writing, spelling. It is defined as a disorder resulting from brain injury, minimal brain dysfunction, dyslexia, or developmental aphasia, which manifests as difficulty in performing mathematical operations and conceptual inadequacy (IDEA, 2004).

In Turkey, in the Special Education Services Regulation issued by the Ministry of National Education (MEB) in 2017, special learning disabilities arise in one or more of the information-gathering processes necessary to understand and use the language in written or oral form include listening, speaking, reading. It is expressed as difficulty in writing, spelling, concentrating, or performing mathematical operations (MEB, 2017).

Approximately 5% of school-age children who benefit from special education services in the USA fall under special learning disabilities. In addition, 20% of all students have writing difficulties (Alharbi, et al.2015, p. 55). According to the DSM-V (Diagnostic and Statistical Manual of Mental Disorders) published in 2013, writing difficulty (dysgraphia) is the condition of writing ability lower than the chronological age, intellectual capacity, and level of education appropriate for the person's level (DSM-V, 2013).

Students with dysgraphia are insufficient in areas related to writing skills such as handwriting, spelling, syntax, and composition, and these inadequacies cause them to be seen as students who cannot meet expectations (Melekoğlu & Çakıroğlu 2015, p. 237). Students with dysgraphia cannot use the writing strategies that their peers can easily use. While students who can write well organize their ideas, evaluate, review and organize their writing before starting to write, it is seen that students with writing difficulties focus their attention on the form rather than the content, spend less time on planning, and make fewer corrections. Thus, the only thing that can be done directly to help students with writing difficulties is systematically teaching them writing processes such as planning, reviewing, and editing. Therefore, by teaching these strategies to students with writing difficulties, writing skills will be transformed into a more concrete, less challenging, and less challenging process for them (Graham & Harris, 2001, p. 23).

Graham, Harris, and Larsen (2001, p. 74) to prevent the writing difficulties of students with dysgraphia and to help them gain writing skills: (1) providing effective writing instruction, (2) arranging instruction according to individual needs, (3) early intervention, (4) believing that

every child can learn to write, (5) identifying and addressing barriers to writing, and (6) using technology.

Teacher training is a crucial issue in special education and at all levels of general education. Studies on determining the field proficiency levels of teachers working in special education in Turkey and increasing this level are limited (Sarı, 2013).

A limited number of studies have been conducted on strategies developed to teach writing skills to students with special learning difficulties, one of the most important causes of school failure in Turkey (Özkardeş, 2013, p. 123). Therefore, this study is important because it is the first experimental study to be conducted by developing a program about dysgraphia in Turkey. Considering that one of the areas in which students with learning difficulties have primary difficulties is “writing difficulty” according to DSM-V (2013), it is thought that the program to be developed is significant because it is aimed at meeting the needs of students with dysgraphia in the field of writing difficulties.

When the relevant literature is examined, studies on the development of students' writing skills (Başar & Alkan, 2020; Dunn, 2013; Dunn, et al. 2020; Harris, et al. 2017; Hopcan, & Tokel, 2021; Rosenblum, et al. 2010). In this study, teachers were directly involved, and a teacher training program for dysgraphia was made. Therefore, determining the students with dysgraphia, preparing programs for them, and evaluating the effect of the teacher education program developed to find basic solutions to this problem on teachers' knowledge proficiency constitute the main subject of this research. In this direction, it is hoped that the study is important and will fill the gap in the field.

Aims and Research Questions

This study aimed to evaluate the effect of the teacher training program developed on dysgraphia on teachers' knowledge proficiency. In the light of this aim, answers to the following questions were sought:

1. Is there a significant difference between the pre-test achievement scores of the teachers in the experimental and control groups working with students with dysgraphia?
2. Is there a significant difference between the post-test achievement scores of the teachers in the experimental and control groups working with students with dysgraphia?
3. Is there a significant difference between the retention test scores of the teachers in the experimental and control groups working with students with dysgraphia?
4. Is there a significant difference between the pre-test, post-test achievement scores of the teachers in the control group working with students with dysgraphia?
5. Is there a significant difference between the pre-test, post-test achievement scores of the teachers in the experimental group working with students with dysgraphia?
6. What are the teachers' views on the developmental characteristics of students with dysgraphia?

7. What are the teachers' views on what is done to improve students' writing skills with dysgraphia?

Methods

Research Model

This study, which examines the evaluation of the training program's effect on teachers working with students with dysgraphia on teachers' knowledge proficiency, was designed according to the mixed research model. The mixed research model is a model in which qualitative and quantitative data sets are used and evaluated with more than one research method (Brannen, 2005).

In the quantitative dimension of the study, in which the effect of the training program developed for teachers working with dysgraphia students was tested, a control group pre-test-post-test trial model was used. However, the study's design was determined as a quasi-experimental study since it was not possible to randomly select the sample and assign it to the groups.

In the qualitative method of the study, the case study method was used. Glesne (2013) stated that a case study expresses or reveals different events or issues in different disciplines.

Study Group for Collecting Qualitative Data

The research study group consists of teachers working in Konya province Selçuklu, Karatay, and Meram districts in the 2020-2021 academic year. Convenience sampling method, one of the purposeful sampling methods, was used in the research.

The easily accessible sampling method is used to select suitable situations or groups based on convenience for the research (Glesne, 2013).

The study group, in which qualitative data were collected, consists of 33 teachers working in 10 primary schools. Interviews were held with the teachers who made up the study group. Table 1 shows the demographic characteristics of the teachers in the study group in which the qualitative dimension of the research was conducted.

Table 1. Demographic Characteristics of the Study Group from which Qualitative Data were Collected in the Study

| General Characteristics of Teachers | | N | % |
|-------------------------------------|---------------|----|-----|
| Gender | Male | 16 | 48 |
| | Female | 17 | 52 |
| Educational Level | Undergraduate | 27 | 82 |
| | Master | 6 | 18 |
| | Doctorate | - | - |
| Total | | 33 | 100 |

As seen in Table 1, 48% (16 individuals) male teachers and 52% (17 individuals) female teachers constitute the study group. The distribution of the study group according to educational status is seen to be 82% (27 individuals) of undergraduate teachers and 18% (6 individuals) of graduate teachers. Considering the gender status of teachers, it is seen that

female teachers are in the majority. When the table is evaluated according to their educational status, it is seen that the teachers with a master's degree are in the minority and there are no teachers with a doctorate.

Study Group for Collecting Quantitative Data

The quantitative dimension of the research was studied with teachers (n=40) who participated in the training for students with dysgraphia working in the city center of Konya. Equivalence of teachers in both groups regarding gender, professional seniority, and age was tried to be ensured. There are 22 female and 18 male teachers in the experimental and control groups. Eleven females and nine males were assigned to group 1, eleven females and nine males were assigned to group 2 by random assignment. Then, these two groups were determined as experimental and control groups by random method. The professional seniority and ages of the teachers within the scope of the research show an equal distribution. In all groups, the researcher carried out the teacher training program.

Data Collection Tools

In this study, the data were collected with "Teacher Interview Form" and "Teacher Achievement Test".

Teacher Interview Form

A semi-structured interview form developed by the researcher was used to determine the opinions of classroom teachers about dysgraphia and to determine their knowledge proficiency about the developmental characteristics of students with dysgraphia.

In the preparation of the Teacher Interview Form, the theoretical explanations can be reached due to the literature review on dysgraphia (DeFries, et al.1987; Gersten, et al. 2001; Korkmazlar 2016) and expert opinions. Based on the data obtained. In this context, the content of the research questions in the interview form is as follows:

1. Identifying a student with dysgraphia,
2. Adequacy of knowledge about the developmental characteristics of students with dysgraphia,
3. The required teacher education program,
4. Subjects in which students with dysgraphia have intense writing difficulties.

The prepared trial form was presented to the opinion of three academicians working at Konya Necmettin Erbakan University who are experienced in special education and qualitative research methods. The eight-question draft form, which was prepared in line with the opinions received, was reduced to five questions. The following procedures were carried out to increase the reliability and validity of the data collected through interviews.

Since the questions in the interview protocol usually have certain meanings in the researcher's mind, sometimes the same questions can be understood differently by other people outside the researcher. This may lead to different responses. For this reason, the

researcher should pilot the interview form before starting the research. A pilot study is necessary for the consistency of both the interview form and the researcher (Türnüklü, 2000). A pilot study was conducted with three teachers to understand whether the expressions in the interview form were understandable. After the necessary corrections were made at the end of these interviews, the form was given its final shape. The final version of the form has been prepared online via google forms.

To ensure reliability in the interviews, the researcher should provide the participants with accurate and real information about the interview. (Glesne, 2013; Türnüklü, 2000). In accordance with these suggestions, the researcher informed the participants about the purpose of the research before starting the interviews. It was stated that the interviews would only be used for research data and would not be shared with any other person or institution. This information was sent to the teachers via telephone message.

Teacher Achievement Test

In the study, the Education Program for Teachers Working with Students with Dysgraphia achievement test was developed and used as a quantitative data collection tool.

It was observed that the item difficulty indices of the achievement test for Teachers Working with Students with Dysgraphia, developed for this research, ranged from .41 to .70. According to these findings, it can be said that the item difficulties of the achievement test for teachers working with students with dysgraphia are moderate.

It was observed that the item discrimination indices of the achievement test varied between .33 and .62. In this respect, it can be said that all items within the scope of the developed test have high discrimination.

The average of the final achievement test developed is 14.80+6.18. The KR-20 reliability coefficient of the test is .89. In this context, it can be said that the Achievement Test for Teachers Working with Students with Dysgraphia has a high level of reliability.

Analysis of Data

The qualitative data obtained in the study were analyzed by the descriptive analysis method. In this direction, the data were first transferred to the computer environment in the analysis process of the interview data during the study. Then, the answers given by the teachers are listed under each question item. The main codes and sub-codes were created by making descriptive analyses on these grouped texts.

The validity and reliability studies for the qualitative dimension of the research are presented below:

1. To increase the internal validity, expert opinion was taken about the subject and method of the research, as well as the interview questions.
2. Another study carried out to increase internal validity is that the analysis of the data was continued until a certain saturation was reached and sufficient time was allocated for this process.

3. To increase the external reliability of the research, the research process and the processes carried out in this process have been tried to be explained in detail.
4. To increase external reliability, direct statements reflecting the views of the participants were also included in the findings.

The following steps were carried out for the analysis of the quantitative data of this study, which was carried out according to the mixed research design:

Whether the pre-test-post-test and retention test scores for Teachers Working with Students with Dysgraphia met the assumptions of normal distribution were analyzed by skewness, kurtosis, histogram, and Shapiro-Wilk test. Skewness, kurtosis coefficients, and Shapiro-Wilk values of their scores show that the achievement test scores of the teachers in the experimental and control groups do not meet the normal distribution assumptions.

Again, the histograms of the pre-test-post-test scores show that the experimental and control groups did not meet the normal distribution assumptions in terms of distribution.

Non-parametric tests are used when the data do not meet the normal distribution assumptions (George & Mallery, 2010). In this context, Mann Whitney U and Wilcoxon tests, which are non-parametric statistical techniques, were used to analyze pre-test-post-test scores for teachers working with students with dysgraphia.

Development of the Training Program

Within the scope of the research, a dysgraphia teacher training program based on needs analysis was developed. The development of the education program was prepared based on the Tyler curriculum development model in education.

The Tyler model consists of four stages. The first of these stages is the stage of determining the goals. At this stage, a comprehensive literature review was made (Cortiella, 2006; Hallahan & Mercer, 2001; Kızılkaya, 2021; Korkmazlar, 2016 p.107; Özçivit Asfuroğlu & Tülin Fidan, 2016; Uysal, 2013). Then, semi-structured interviews were conducted with 33 classroom teachers. For this, while preparing the objectives, both the opinions of the teachers and the literature review were taken into account.

In the light of this information, the targets were prepared. The new Bloom taxonomy was used while preparing the targets and achievements (Ari, 2011; Forehand, 2005; Polat & Turan, 2021).

The second stage is planning the appropriate content in line with the objectives and the preparation of the gains. Accordingly, the content was prepared by adhering to the Basic Concepts of Learning Disabilities, Dysgraphia, and the Education Program Related to Dysgraphia.

The third stage is the issue of how the training program should be prepared. It has been understood that it is difficult to get together with teachers due to the pandemic (Covid-19). Therefore, the prepared training program has been planned by adhering to the straight lecture and question-answer method.

The last stage is the process of obtaining these goals and achievements. Here, a training program was implemented over the video conference program with 20 teachers who voluntarily participated in the research. Considering the harsh conditions, three units were prepared, and the program was limited to six sessions (one hour each).

Findings

Pre-test achievement scores of teachers in experimental and control groups

Data for this sub-problem of the research were collected through the teacher achievement test. Descriptive statistical values were examined on the obtained data. The data of the teachers regarding the pre-test are shown in Table 2.

Table 2. Comparison of Pre-test Scores of Teachers in Experimental and Control Groups Working with Students with Dysgraphia

| Group | N | Mean Rank | Sum of Ranks | Mann Whitney | | | |
|-------|----|-----------|--------------|--------------|---------|-------|------|
| | | | | U | Z | p | |
| Top | 1 | 20 | 21,08 | 421,50 | 188,500 | -,316 | ,752 |
| | 2 | 20 | 19,93 | 398,50 | | | |
| Total | 40 | | | | | | |

Table 2 shows the analysis results performed on the pre-test achievement scores of the teachers working with students with dysgraphia in the experimental and control groups. According to statistical analysis, the Z value of 0,316 was calculated between the pre-test total scores of the two groups. According to this finding, there was no significant difference between the pre-test achievement scores of students with dysgraphia and working teachers in the experimental and control groups at the beginning of the study. It was observed that the teachers in the experimental group and the control group were equivalent to each other in terms of academic achievement for students with dysgraphia.

The post-test achievement scores of the teachers in the experimental and control groups

Data for this sub-problem were collected through the teacher achievement test, and descriptive statistical values were examined on the obtained data. The teachers' data regarding the post-test are shown in Table 3.

Table 3. Comparison of Post-test Scores of Teachers in Experimental and Control Groups Working with Students with Dysgraphia

| Group | N | Mean Rank | Sum of Ranks | Mann Whitney | | | |
|-------|---|-----------|--------------|--------------|--------|--------|------|
| | | | | U | Z | p | |
| Stop | 1 | 20 | 12,00 | 240,00 | 30,000 | -4,645 | ,000 |

| | | | |
|-------|----|-------|--------|
| 2 | 20 | 29,00 | 580,00 |
| Total | 40 | | |

Table 3 shows the analysis results performed on the post-test achievement scores of the teachers working with students with dysgraphia in the experimental and control groups. According to Mann Whitney U test analysis, the Z value of 4.64 was calculated between the post-test success scores of the two groups. According to this finding, there is a significant difference between the post-test achievement scores of students with dysgraphia and teachers working in the experimental and control groups at the end of the research experimental processes. In terms of academic achievement for students with dysgraphia, it was observed that the teachers in the experimental group achieved significantly higher achievement scores than their colleagues in the control group.

Retention test scores of the teachers in the experimental and control groups

The data of the teachers regarding the retention test are shown in Table 4.

Table 4. Comparison of Retention Test Scores of Teachers in Experimental and Control Groups Working with Students with Dysgraphia

| | | N | Mean Rank | Sum of Ranks | Mann Whitney | | |
|-----------|-------|----|-----------|--------------|--------------|--------|------|
| | | | | | U | Z | p |
| Retention | 1 | 20 | 12,75 | 255,00 | 45,000 | -4,213 | ,000 |
| | 2 | 20 | 28,25 | 565,00 | | | |
| | Total | 40 | | | | | |

Table 4 shows the results of the analysis performed on the achievement scores of the retention test for Teachers Working with Students with Dysgraphia in the experimental and control groups. According to Mann Whitney U test analysis, the Z value of 4.21 was calculated between the permanence test success scores of the two groups. According to this finding, at the end of the research experimental procedures, there is a significant difference between the retention test scores of students with dysgraphia and teachers working in the experimental and control groups. In terms of academic achievement in subjects for students with dysgraphia, it was observed that the teachers in the experimental group had significantly higher retention levels than their colleagues in the control group.

Teachers' pre-test-post-test success scores

The data on the pre-test-post-test achievement scores of the teachers in the control group are shown in Table 5.

Table 5. Comparison of the Pre-test-Post-test Scores of the Teachers in the Control Group

| | N | Mean Rank | Sum of Ranks | Wilcoxon Z | P |
|--------------------------|-----------------|-----------|--------------|------------|------|
| Stop- Top Negative Ranks | 2 ^b | 9,50 | 19,00 | 2,90 | 0,04 |
| Positive Ranks | 16 ^c | 9,50 | 152,00 | | |
| Ties | 2 ^d | | | | |
| Total | 20 | | | | |

Table 5 shows the analysis results performed on the pre-test-post-test achievement scores of teachers working with students with dysgraphia in the control group. According to Wilcoxon test analysis, the Z value of 2.90 was calculated between the pre-test-post-test success scores of the participants in the control group. This finding shows a significant difference between the pre-test-post-test achievement scores of the students with dysgraphia and the teachers working in the control group. The participants achieved partially significantly higher achievement scores in the post-test.

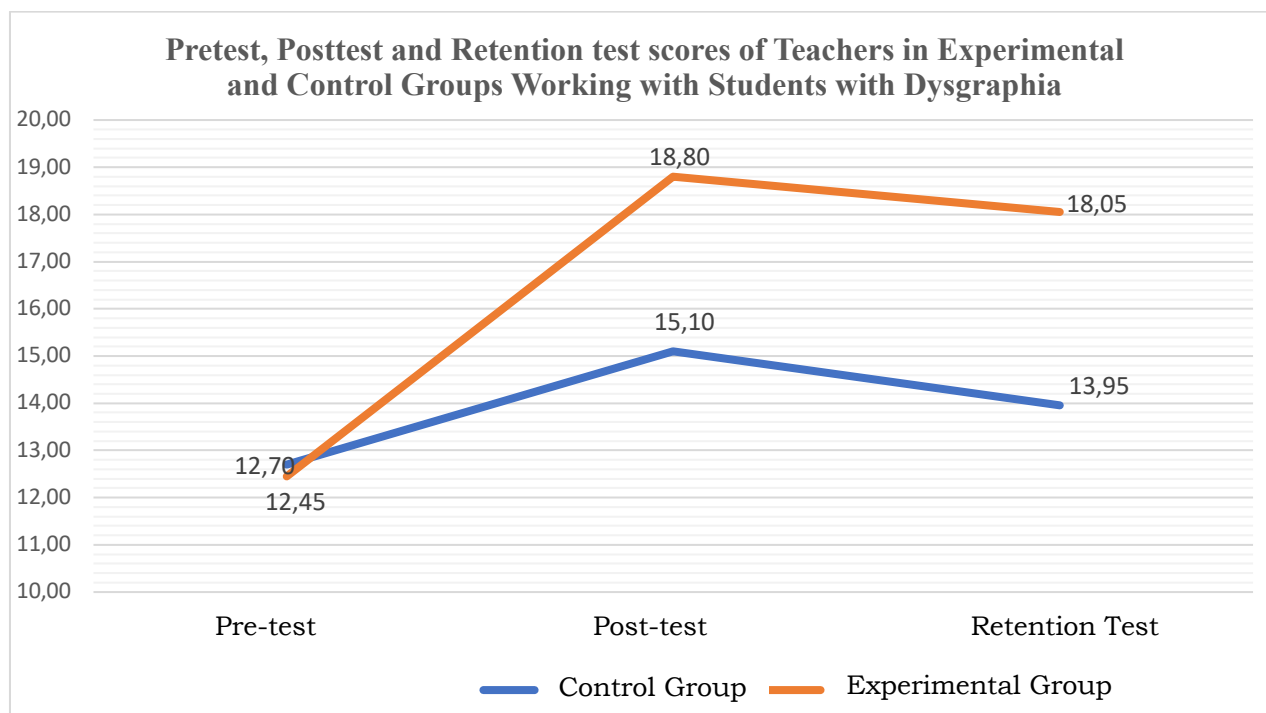
Pre-test-post-test achievement scores of the teachers in the experimental group

The data regarding the pre-test-post-test achievement scores of the teachers in the experimental group are shown in Table 6.

Table 6. Comparison of Pre-test-Post-test Scores of the Teachers in the Experimental Group

| | N | Mean Rank | Sum of Ranks | Wilcoxon Z | P |
|---------------------------|-----------------|-----------|--------------|------------|-------|
| Stop - Top Negative Ranks | 0 ^b | ,00 | ,00 | 3,93 | 0,000 |
| Positive Ranks | 20 ^c | 10,50 | 210,00 | | |
| Ties | 0 ^d | | | | |
| Total | 20 | | | | |

Table 6 shows the analysis results performed on the pre-test-post-test achievement scores of teachers working with students with dysgraphia in the experimental group. According to Wilcoxon test analysis, the Z value of 3.93 was calculated between the pre-test-post-test success scores of the participants in the experimental group. According to this finding, there is a highly significant difference between the pre-test-post-test achievement scores of students with dysgraphia and teachers working in the experimental group. Participants achieved significantly higher achievement scores in the post-test. The graphic representation of the pre-test, post-test, and retention test scores of the teachers in the experimental and control groups working with students with dysgraphia are given below.



Graph 1. Pre-test, Post-test, and Retention Test Scores of Teachers in Experimental and Control Groups Working with Students with Dysgraphia

Identifying Students with Dysgraphia

The first question asked to the teachers in the interview form was, “How would you identify a student with dysgraphia in your class?”. The answers given by the teachers have been shown in Table 7.

Table 7. Opinions on Teachers' Determination of Students with Dysgraphia

| Identifying Students with Dysgraphia | f | % |
|---|----------|----------|
| Checking the font | 15 | 45,5 |
| Observing the student | 6 | 18,2 |
| Doing dictation work | 5 | 15,2 |
| Reading his/her writing | 4 | 12,1 |
| Checking homework | 3 | 9,1 |

It has been determined that the teachers' views on identifying students with dysgraphia are "controlling the writing order, observing the student, having dictation work done, having their writing read and checking their homework". When Table 7 is examined, it is seen that the teachers mostly have the views of "controlling the writing order" (f=15) and the least "checking the homework" (f=3) while identifying the students with dysgraphia.

The statements of teachers supporting this finding are given below:

I can understand what he or she hears correctly and because he or she cannot write with a space between words even though they have learned to read. (Teacher 17)

They are students who have writing difficulties, who have poor writing skills compared to their peers, who get bored quickly, who have difficulty in reading their writing, who do not write by leaving spaces between words, who write letters backward, who do not live in the same line, who do not follow the capital and lower-case rules. (Teacher 5)

If he has difficulty in writing, writes letters incorrectly, writes letters in different sizes when writing on a line, and cannot adjust the spacing between words, I can ask my student for advice from the counselor... (Teacher 32)

Developmental Characteristics of Students with Dysgraphia

Within the scope of the sixth sub-problem of the research, the question "What are your views on your knowledge proficiency about the developmental characteristics of students with dysgraphia?" was also asked. The answers given by the teachers about the developmental characteristics of students with dysgraphia are presented as the main theme and sub-themes. The themes and sub-themes created in line with the teachers' opinions on this subject are presented in Table 8.

Table 8. Teachers' Views on the Developmental Characteristics of Students with Dysgraphia

| Developmental Characteristics of Students | f | % |
|--|----------|----------|
| Language development | 7 | 21,2 |
| Cognitive development | 6 | 18,2 |
| Social development | 6 | 18,2 |
| Emotional development | 6 | 18,2 |
| Physical development | 11 | 33,3 |
| Comparison to peers | 14 | 42,4 |

It is understood that the teachers' views on the developmental characteristics of their students with dysgraphia are in the form of "language development, cognitive development, social development, emotional development, physical development and comparison with their peers". When Table 8 is examined, it is seen that while teachers express their opinions about the developmental characteristics of students with dysgraphia, they mostly have "comparison with their peers" (f=14) and the least they have "cognitive development, social development, emotional development" (f=6) views.

The statements of teachers supporting this finding are given below:

They cannot write in the right direction on the line that their peers can. Letters are not read. They insist on the wrong they know, not what we say. They are physically smaller than their peers in general... (Teacher 3)

There was no difference in physical or social development from other students. However, I saw that they had difficulties in cognitive development, especially incomprehension. (Teacher 33)

Even though students with dysgraphia may seem like others from the outside, they may need close attention as their inner world. (Teacher 32)

While some students may have difficulties and troubles after a while, it may be long-term for some students. (Teacher 12)

Developing the writing skills of students with dysgraphia

Data for this sub-problem were collected through the Teacher Interview Form. In the interviews, the teachers were told "what students with dysgraphia do to improve their writing skills", "the issues that students with dysgraphia need to improve their writing skills" and "the opinions of students with dysgraphia about the sound, syllable, word, number and punctuation mark that students with dysgraphia have intense writing difficulties". has been asked. The opinions of the teachers on the writing skills of students with dysgraphia were presented as the main theme and sub-themes. In the first question, it was investigated what the teachers did to improve the writing skills of students with dysgraphia. The themes and sub-themes created in line with the opinions of the teachers are presented in Table 9.

Developing the Writing Skills of Students with Dysgraphia

The third question directed to the teachers in the interview form was "What do you do to improve the writing skills of students with dysgraphia?" was in the form. The answers given by the teachers are shown in Table 9.

Table 9. Views of Teachers on Improving the Writing Skills of Students with Dysgraphia

| Developing Writing Skills | f | % |
|----------------------------------|----------|----------|
| Memory enhancing exercises | 4 | 12,1 |
| Writing practice | 9 | 27,3 |
| Dictation practice | 11 | 33,3 |
| Reading exercise | 3 | 9,1 |
| Finger exercise | 12 | 36,4 |
| Letter and syllable work | 7 | 21,2 |

It is understood that the teachers' views on improving the writing skills of students with dysgraphia are in the form of "memory improvement exercises, writing exercises, dictation exercises, reading exercises, finger exercises, and letter and syllable exercises". When Table 9 is examined, it is seen that while the teachers expressed their ideas about improving the writing skills of the students with dysgraphia, they made "finger exercise" (f=12) the most and "reading exercise" (f=3) the least.

The statements of teachers supporting this finding are given below:

As in dyslexia, I work to improve memory, such as playing memory cards games. Doing one-on-one writing exercises with these children, prolonging their focus time, working on developing small muscle groups, keeping in touch with the family, and continuing similar studies at home. (Teacher 7)

Exercising your fingers as much as possible and writing a lot. (Teacher 18)

I also do writing studies, check it more carefully, and try to fix it instantly. (Teacher 23)

Teacher Training Program Needed

Within the scope of the fifth sub-problem of the research, the question "What are your views on the subjects you would need if you were to participate in a teacher training program on improving the writing skills of students with dysgraphia?" was also asked. The answers given by the teachers about the subjects they need to improve the writing skills of students with dysgraphia are presented in the form of main themes and sub-themes. The themes and sub-themes created in line with the teachers' opinions on this subject are presented in Table 10.

Table 10. Teacher Training Program Needed to Develop the Writing Skills of Students with Dysgraphia

| Needed Training Program | f | % |
|--|----------|----------|
| In-service training seminars | 5 | 15,2 |
| Teaching methods and techniques | 12 | 36,4 |
| Seminars on understanding students with dysgraphia | 6 | 18,2 |
| Material preparation seminars | 7 | 21,2 |
| Individualized education plan | 2 | 6,1 |
| Preparation seminars | 8 | 24,2 |
| Exercise training seminars | 3 | 9,1 |

Teachers' views on the subjects that students with dysgraphia need to improve their writing skills; It is understood to be in the form of in-service training seminars, teaching methods and techniques, understanding students with dysgraphia, material preparation seminars, individualized training program preparation seminars, exercise training seminars, and diagnostic programs. When Table 10 is examined, it is seen that while the teachers stated that they needed to improve the writing skills of the students with dysgraphia, the subject they needed the most was "teaching methods and techniques" (f=12) and the subject they needed the least was "individualized education program preparation seminars" (f=2).

The statements of teachers supporting this finding are given below:

Certainly, in-service training should be given training such as dyslexia and dysgraphia. (Teacher 1)

First of all, how are the symptoms understood in the student; then how to guide students and families correctly and how to help students, I think that education about this will be beneficial. (Teacher 33)

I would like to be informed about preparing materials, learning the perspectives of teachers working with students with dysgraphia, and training to work with students specifically. (Teacher 16)

Every teacher must participate in IEP (individualized education program) training. I would like to be supported cognitively, emotionally, and academically. (Teacher 13)

Issues that Students with Dysgraphia Have Difficulty in Writing

Within the scope of the fifth sub-problem of the research, the question "What are your views on the sound, syllable, word, number, and punctuation mark that students with dysgraphia have intense writing difficulties?" was also asked. The answers given by the teachers about the issues that students with dysgraphia have difficulty in writing are presented as main

themes and sub-themes. The themes and sub-themes created in line with the teachers' opinions on this subject are presented in Table 11.

Table 11. Issues that Students with Dysgraphia Have Intensive Writing Difficulties

| Problem Areas | f | % |
|----------------------|----------|----------|
| Sound | 10 | 30,3 |
| Word | 13 | 39,4 |
| Syllable | 7 | 21,2 |
| Figure | 11 | 33,3 |
| Punctuation | 7 | 21,2 |

By the teachers about the issues that dysgraphia students have intense writing difficulties; It is expressed as “sound, word, syllable, number and punctuation marks”. When Table 11 is examined, it is seen that among the issues in which the students with dysgraphia have intense writing difficulties, "words" (f = 13) are the subjects with the least writing difficulties, and "numbers and punctuation marks" (f = 7) are the issues with the least writing difficulties.

The statements of teachers supporting this finding are given as follows:

They have great difficulty in writing unfamiliar words and phrases. (Teacher 21)

The wrong or incomplete spelling of b, d, y, ğ, m, n sounds, the wrong separation of syllables, writing adjacent words, syllable, and sound reduction, adding sound, adding new meaning to words, inability to use punctuation marks, not using punctuation marks correctly and fingering. They have problems with issues such as counting. This situation continues until the 4th grade. (Teacher 26)

Letters and numbers such as e, d, b, v, f, g, s, z, 3,5,9 are the most common mistakes. I think that there is a problem with letters and numbers associating with each other and students not being able to digest these letters and numbers fully. (Teacher 10)

Wrong pencil holding, excessive use of erasers, different letters, writing some letters and numbers backward. (Teacher 4)

Discussion

In this part of the study, the results obtained based on the findings for the solution of each problem are given. Evaluations were made by using the findings of the existing studies on the subject. In addition, it is discussed in this section whether the qualitative and quantitative findings of the study support each other.

In this study, the effect of the training program developed for teachers working with students with dysgraphia on teachers' knowledge proficiency was examined with a mixed research model. It was seen that the training program developed for teachers working with students with dysgraphia in the quantitative dimension, which was carried out with the control group pre-test-post-test experimental design of the research, was significantly effective on the knowledge proficiency of the teachers. As a result of implementing the six-week training program, the teachers in the experimental group, in which the experimental procedures were

performed, achieved significantly higher post-test success averages than their colleagues in the control group, where no training was performed. Children usually achieve a skillful handwriting performance in the first three years of primary school. With this skill, they can automatically write a legible product in accordance with the expected time demands of the primary school classroom schedule. Yet previous research has revealed that many children do not yet write automatically by this age. These children are either diagnosed with dysgraphia or allowed to deal with ongoing difficulties with handwriting (Biotteau et al, 2019; Rosenblum, 2018). According to Kurdoğluna (2001), many problem groups such as attention deficit, motor coordination, visual and auditory perception, problems in the organization, and problem-solving can be seen in children with dysgraphia.

According to Chung, Patel, and Nizami (2020), the primary intervention for dysgraphia and related learning disorders occurs in the educational setting. Interventions generally include (I) enriching the core education curriculum with supportive or ancillary resources without changing the student's educational content; (II) the school-teacher adapts the student's goals and objectives and provides services and changes to reduce the impact of special needs; and (III) the teacher provides specific and professional practices for the student's dysgraphia problems. As the manifestations of dysgraphia and other learning disorders change with changing academic demands and cognitive development, teacher management of these processes is vital. As Graham and Harris (2003) stated, the school system and teachers should evaluate the student's academic needs with dysgraphia and provide the necessary support in the educational setting. For this reason, it will be beneficial for the development of students with dysgraphia to be aware of their characteristics and differences, motivate them to the education process, and focus on their education. In addition, according to Doğan (2012), teachers need to recognize the child with dysgraphia, accept the idea that he has different learning styles from other children, and employ a specially prepared individualized education program and different assessment strategies for these children. For these purposes, within the scope of the training program developed for teachers working with students with dysgraphia in the experimental group, 'educational diagnosis of the child in terms of dysgraphia', 'Educational planning regarding the orientation and special education needs of children', 'Guidance practices related to the developmental problems of children with dysgraphia', 'in-class children' and providing the necessary support systems outside the classroom', 'inclusion practices with their normally developing peers', 'intervention processes involving various sensory, physical and academic strategies based on writing for students with dysgraphia' were tried to be taught to the teachers in the experimental group theoretically and practically. In addition, within the scope of this program, ergonomic factors such as the sitting style of children with dysgraphia, the position of the paper, the way of holding the pencil; Factors for legibility such as shapes, sizes, and ratios of letters to each other, the inclination of writing, spacing used in writing, and line tracking; calculating the number of letters the student writes in one minute; Practical activities were carried out on basic topics

such as spelling parameters and punctuation marks that make the expression of the text more understandable. All these experimental procedures enabled the teachers in the experimental group to achieve significantly higher achievement and knowledge proficiency than their colleagues in the control group. Smits-Engelsman et al.'s (2018) review of 30 studies (covering 25 datasets) published between 2012 and 2017 shows that relatively short-term interventions for students with dysgraphia are effective. The key role in all these interventions is the teachers. According to Sharma (2020), children experience learning difficulties that arise with difficulty in handwriting, spelling, logical argumentation, and writing at the same time. In this context, teachers should have basic competencies in problems affecting children's ability to write, produce language, numbers, symbols, and letters or write in different situations. According to Berninger, Wolf, and Beverly (2009), children with dysgraphic-based problems can be seen between 7 and 15% in normal classes, especially basic education. The teachers involved in the education of these children must be prepared for dysgraphic problems and be competent in performing IEP applications for such students without disturbing their normal teaching patterns.

Previous researchers in this field have pointed out teachers' lack of knowledge and practice in identifying students with basic dysgraphia and using pedagogical approaches appropriate for students' disabilities (Ediger, 2002; Meese, 2001). According to Richards (1999), teachers stated that they are mostly unaware of the signs and symptoms of dysgraphia and ignore a child's sloppy handwriting. In addition, teachers cannot identify which parts of the writing process are the most difficult for the child. Many students with dysgraphia have high academic achievements in other subjects also makes it difficult to detect this situation. Crouch and Jakubecy (2007) stated that applications for dysgraphia are difficult and require patience. To assist students with dysgraphia, teachers need to employ effective teaching strategies based on students' characteristics. The education program implemented in the research tried to increase teachers' awareness of their students with basic dysgraphia and improve teachers' knowledge, understanding, perception, and responsibilities to address dysgraphia issues. The post-test results showed that teachers contributed to increase their basic knowledge competencies in dysgraphia and that teachers could ultimately make significant contributions to students suffering from dysgraphia by applying a differentiated developmental teaching-learning process.

Another finding of this study is that the teachers in the experimental group, where the experimental procedures were performed, achieved significantly higher retention test success than their colleagues in the control group, where no training was performed. The teachers in the experimental group, who were given a training program for children with dysgraphia in the experimental group, achieved higher learning retention from the permanence test applied 15 days after the post-test. According to Merrill (2002), teachers must manage multiple practices and activities. In this context, students need to decide which context they will or will not use a particular method according to their characteristics. Such decision-making

processes will be possible with high-quality teaching programs and the competence gained in this subject (Merrill, 2002; Mishra & Koehler, 2009). In this context, teachers need to gain competence according to the special needs of students. In this direction, to prepare students with dysgraphia to achieve the achievements of the courses effectively, these structures should be transformed into practices in an interactive way, as well as the content, pedagogical practices, and technical skills of teacher education programs. Teachers in the experimental group, in which teacher training programs for students with dysgraphia were applied, gained competencies on how to integrate dysgraphia with the education process as a result of experimental procedures. This situation has ensured that their learning permanence on this subject is high. In addition, within the scope of the experimental program, teachers gained pedagogical-special education competence on the knowledge they have about the course content, dysgraphia, and how to teach these two elements. Numerous repetitions and exercises are included in the experimental practices and teachers' use of the most effective teaching and coping with dysgraphia problems. All these situations led the teachers in the experimental group to reach a high level of permanence. One of the most effective approaches to improving students' writing skills with dysgraphia is self-regulating strategy development (Graham & Perin, 2007; Hebert et al., 2018; Rogers & Graham, 2008). It has been shown that both teachers have self-regulation skills in this regard, and transferring this skill to students is effective for students with dysgraphia at all grade levels. The teacher training program applied in the experimental group of the research improved the self-regulation skills of the participants in dysgraphia. In this context, teachers had effective opportunities to teach students how to use the executive functions targeted by the intervention, including self-regulation skills, goal setting, self-talk, and self-monitoring. On the one hand, the activities that developed self-regulation skills in the experimental group provided high permanence for the participating teachers.

According to the National Center for Learning Disability (Ambika, et al. 2019; Cortiella, 2006), teachers are an important link for children and parents who can provide interventions among children with learning disabilities and help them overcome their difficulties. Similarly, a multinational study of teachers from nine countries showed that professional dysgraphia education predicts adequate knowledge in most countries (Moldavsky & Sayal, 2013). He recommends educational program intervention to improve teachers' knowledge of ADHD and thus their practice with children with ADHD (Ali Munshi, 2014; Barkley, 2014; Scitutto et al., 2016). Trained teachers can help identify learning difficulties in students and provide direct interventions. A structured curriculum on dysgraphia for teachers increases awareness of learning difficulties in school and effectiveness among primary school teachers on basic skills. As a result, the planned curriculum effectively increased the awareness and knowledge competence of primary school teachers about learning disability dysgraphia. The conceptual framework revealed a significant change in core knowledge competence in the current study. This was made possible by the planned teacher training program on dysgraphia. These are

the post-test and retention test scores that appear at a high level in favor of the experimental group, which proves the effectiveness of the planned curriculum.

The qualitative findings of the study were collected through the teacher interview form. Accordingly, the first question of the research was "What are the teachers' views on the developmental characteristics of students with dysgraphia?" was expressed as. Adhering to this question of the research, teachers' opinions were also received about "identifying a student with dysgraphia in the classroom" and "development characteristics of students with dysgraphia".

While the teachers expressed their opinions about identifying the students with dysgraphia, they said that they paid attention to the writing order of the students, observed the students, had them do dictation work, had the students read their writings, and checked the homework. When these findings are examined, it has been seen that the teachers detect the existing problems by observing the general conditions of the students within the scope of their daily lessons.

The relevant literature also supports this finding of the study. Dysgraphia includes various factors related to spelling difficulties, visual-motor difficulties, or both that may hinder the writing process, the development of writing, and the writing process. Educators, clinicians, researchers, teachers, and parents can recognize this through healthy observation and work together to improve the potentially devastating consequences of dysgraphia (McBride & Cheah, 2021). Many students struggle with their writing skills, and the important thing is that this situation is determined by a careful teacher (Dunn, 2013).

Again, within the scope of the question, teachers' views on the developmental characteristics of students with dysgraphia were also questioned. Accordingly, teachers describe the developmental characteristics of students with dysgraphia; language development, cognitive development, social development, emotional development, physical development, and comparison with their peers. When the developmental characteristics of students with dysgraphia are examined, it is seen that in the related literature, the subject is discussed in the form of language, cognitive, social, emotional, and physical development (Özçivit Asfuroğlu & Tülin Fidan, 2016; Integra, 2009).

Language development in students with dyslexia is later than that of their peers in the development process. The main problem of people with dyslexia is that they have difficulty in understanding that spoken language and written language (words) consist of phonemes (Özçivit Asfuroğlu & Tülin Fidan, 2016). Non-verbal learning difficulties significantly affect people's social development and communication (Korkmazlar, 2003).

Handwriting difficulties or dysgraphia have a profound impact on children's psychosocial development, and yet it appears that 10-30% of school-age children have difficulties with this skill. At the same time, this situation causes physical and psychological fatigue and problems in motor development in individuals (Kushki, et al. 2011).

Another sub-problem of the study is that the question, "What do teachers do to improve the writing skills of students with dysgraphia?" was asked. Within the scope of this question, the opinions of the teachers about "what students with dysgraphia do to improve their writing skills" were asked, "the issues that students with dysgraphia need to improve their writing skills" and "the sounds, syllables, words, numbers, and punctuation marks that dysgraphia students have intense writing difficulties" has also been questioned.

First of all, teachers' opinions were asked about what students with dysgraphia do to improve their writing skills. Accordingly, the teachers expressed their views as memory-enhancing exercises, writing exercises, dictation exercises, reading exercises, finger exercises, and letter and syllable exercises. Studies have shown that this finding is compatible with the literature. Berninger and Chanquoy (2012) stated that reading and writing should be included in the content areas of other courses in the curriculum, especially science and social sciences. Kushki, et al. (2011) examined changes in writing speed, grip strengths on pencil grips, and normal forces on the writing surface during a 10-minute writing task in a large group of 4th-grade children with and without dysgraphia. Accordingly, it was observed that horizontal stroke speed, grip strength, and normal strength increased in time in all children.

Secondly, teachers' views on the subjects or curriculum that students with dysgraphia need to improve their writing skills were questioned. Accordingly, teachers; stated that they need in-service training seminars, teaching methods and techniques, understanding seminars for students with dysgraphia, material preparation seminars, individualized education program preparation seminars, exercise training seminars, and diagnostic programs. This finding is consistent with the quantitative findings of the study. After the teacher training program, the post-test scores of the teachers were found to be significant in favor of the experimental group. Therefore, it can be said that a good and efficient teacher training program raises awareness among teachers about understanding students with dysgraphia and finding a solution.

In her research, Seema Menon (2016) found that teachers who were not subjected to any program had moderate awareness of dysgraphia in particular and learning disability in general. This finding supports the finding of the research. Again, Cimera (2007) states that very few parents (and educators) truly understand what learning difficulties are. Many have stated that they believe it to be a condition of mild intellectual disability.

Finally, within the scope of the fifth sub-problem, teachers' views on the subjects that students with dysgraphia have intense writing difficulties were questioned. Accordingly, teachers, students with dysgraphia stated that they had serious sounds, words, syllables, numbers, and punctuation marks. Studies have shown that teachers' views are consistent with related research (Rubin & Henderson, 2007; Thiel, et al. 2016). Thiel, Sage, and Conroy (2016), who noticed this situation and conducted research on it, found that spelling therapies effectively improved one-word writing.

Conflict of interests

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