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Investigation of the Effect of Online (Web-Based) Formative Assessment Applications on Students' Academic Achievement*

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Abstract

The purpose of this research is to examine the effects of providing resources for learning disabilities by the system and providing feedback regarding learning disabilities by the teacher within the scope of an online (web-based) formative evaluation application for 10th grade secondary school students in mathematics course quadratic equations on students' success. In the research, a quasi-experimental design was used. Pre-test - post-test achievement tests and follow-up tests were used. The research was conducted in the 2022-2023 academic year with a total of 302 students selected from 4 schools and 12 branches in Göksun and Andırın districts using the stratified, random cluster sampling method. Data were examined by one-way analysis of variance (ANOVA) and analysis of covariance (ANCOVA). According to the research results, it was determined that there was no statistically significant difference between the pre-test averages of the groups, but a statistically significant difference emerged in the post-test. Providing resources for learning disabilities by the system applied to the Experiment-2 group and Cognitive Diagnostic Modeling (CDM) for learning disabilities by the teacher. Providing detailed feedback according to the system, providing resources for learning disabilities by the system applied to the Experiment-1 group, and normal teaching applied to the Control group; It was determined that the system applied to the Experiment-1 group provided resources for learning disabilities and was more effective than the normal teaching applied to the control group. In addition, according to the results of the experimental process, Experiment-2 showed a higher level of improvement than Experiment-1 and Experiment-1 between the pre-post test averages of the Control group.

Keywords: Online Formative Assessment, Cognitive Diagnostic Model, Academic Achievement

Introduction

Although evaluation has no standard use, it can be done in many different ways, in many different contexts, and for many different purposes. However, in general terms, assessment can be defined as the process of collecting information about student achievements (Phye, 1997). According to Black and Wiliam (2006), the first and most important purpose of evaluation in education is to support learning (Cited by Yan & Cheng, 2015). Formative assessment, on the other hand, contains features that will meet the needs of teachers, as it provides valuable information to both students and teachers (Cauley & McMillan, 2010).

The main purpose of formative assessment is to provide feedback that can be used to increase the student's content knowledge, skills, and understanding. Strategies for obtaining meaningful feedback; The router should be response-specific, targeted, continuous, and delivered immediately (Shute, 2008).

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Preparing a formative assessment application is a laborious and time-consuming task. In addition, extra time is needed outside the curriculum to give immediate feedback to the student after the assessment. Whereas, feedback for web-based formatting is usually embedded in the system. Evaluation for web-based formatting can be defined as evaluation practices in which the processes of evaluation and feedback to the learner are carried out through information and communication technologies. It is seen that there are many studies in which positive results are obtained for the learning process of the learner with formative assessment applications integrated into web-based learning environments (Brewer, 2004; Buchanan, 2000; Gardner, Sheridan, & White, 2002; Henly, 2003; Justham & Timmons, 2005; Khan, Davies, and Gupta, 2001; Peat and Franklin, 2002; Velan, Kumar, Dziegielewski, & Wakefield, 2002). Web-based assessment makes it possible to evaluate independently of time and place. In addition, all interactions of the learner can be recorded and then this information can be directed to the learner (Bayrak & Yurdugül, 2015). Evaluation tools for web-based formatting can be designed and used in order to eliminate time and space problems, contribute to the learning processes of learners, and provide immediate feedback to the learner (Cukusic et al., 2014).

Tekin (2010) determined that formative assessment has positive effects on success, attitude and remembering what has been learned in mathematics lessons. Formative assessment, which provides students with the opportunity to evaluate themselves and monitor their individual development, also contributes to the development of students' metacognitive awareness (Jones, 2007).

Formative assessment helps to achieve individual and specific goals in the mathematics learning and teaching process (Ginsburg, 2009). The use of formative assessment in mathematics teaching contributes positively to the success of students (Tempelaar et al., 2012; Tekin, 2010). In addition, formative assessment positively affects students' attitudes towards mathematics and the permanence of the knowledge they have acquired (Tekin, 2010).

Pierce and Ball (2009) recommend the use of technology in structuring mathematics-related assessment processes. By using technology in formative assessment in mathematics lessons, instant and individual feedback can be given to students (Stacey and Wiliam, 2013). Since formative assessment is a time-consuming practice for teachers and requires extracurricular work (Tekin & Özdemir, 2014), the use of technology in this process is important.

With this research, a different way is proposed to determine student knowledge and skills. It may be possible to identify the learning deficiencies in students and obtain profiles regarding the subjects in which students are weak and strong. In the literature review, it was seen that formative evaluation studies have been carried out historically in the past (İnaltun 2018; Tor and Bektaş 2023). It has been determined that online measurement and evaluation studies have been carried out later, and in recent years, online formative evaluation studies have been carried out. Arslan and Yetkin (2020) stated the studies conducted in a content analysis study on the use of online evaluation systems in education.

If we look at the studies carried out in recent years; In his study, Alır (2015) determined that he examined secondary school students' acceptance structures of the web-based formative evaluation system and their interactions with the feedback in the system. In 2016, Cabı examined student perceptions on e-assessment in distance education. It was observed that Demir (2017) discussed the effects of feedback given through computer-assisted formative assessment on the transfer of learning. Again, Başokçu et al. (2018), in their project study, realized the effectiveness of the cognitive memory-based monitoring model in order to increase Turkey's mathematics success in international large-scale exams. It was determined that another researcher, Hotaman (2020), conducted a study on the importance of formative assessment in terms of the success of online education.

In addition, in this study, online (web-based) formative assessment application and monitoring tests were prepared according to Cognitive Diagnostic Modeling, and after the monitoring tests, teachers provided detailed feedback according to Cognitive Diagnostic Modeling. In Cognitive Diagnostic Modeling, instead of the total scores and questions in the test, each individual taking the test is measured regarding their possession of each feature/qualities and sub-features/qualities that are tried to

be measured in the questions, and the opportunity to give feedback based on this measurement is provided. For this reason, tests developed with Cognitive Diagnostic Models also serve to determine the educational needs of each student and provide feedback (Cheng and Chang, 2007).

By looking at the studies conducted, it has been determined that the research on students' weak and strong knowledge levels and skill levels is quite limited and very few studies have been conducted in Turkey. In addition, it has been determined that such a study has never been conducted to determine learning deficiencies in the field of mathematics in order to monitor the development of success by providing detailed feedback according to Cognitive Diagnostic Modeling through online (web-based) formative assessment application. For this reason, it is thought that the results of this study will make important contributions to the literature. In the light of the information to be obtained by this method, an alternative assessment application will be presented for teachers. With the formative evaluation application, students will not be evaluated only according to level or result, but an evaluation that is not intended for grading will be made during the process. Teachers' information and technology literacy will increase, and there will be an opportunity to monitor the development of students' success and identify students' learning deficiencies by providing feedback through online (web-based) formative assessment application.

In this study, Student/Teacher Support System (ÖDS) and Education Information Network (EBA) platforms created by the Ministry of National Education (MEB) were used. It is thought that the implementation of our study in a national infrastructure created by the Ministry of National Education (MEB) will provide easy applicability throughout the country, will not impose a lot of burden on practitioners, will be economical in terms of implementation, will be easily accessible, and will be a useful infrastructure application due to all these situations. In addition, implementing this study in a national infrastructure created by the Ministry of National Education (MEB) will provide a more reliable application infrastructure.

It is thought that our study can contribute to policymakers in making decisions about the teaching process and curriculum and provide important information to researchers in their studies.

The purpose of this research is to examine the effects of providing resources for learning disabilities by the system and providing feedback regarding learning disabilities by the teacher within the scope of an online (web-based) formative evaluation application for 10th grade secondary school students in mathematics course quadratic equations on students' success.

In this research, the answers to the following sub-problems will be sought:

1. How are the proficiency levels of the experimental and control group students in the field of Second Degree Equations learning before the experiment?

2. How are the proficiency levels of the experimental and control group students in the field of Second Degree Equations learning after the experiment?

3. Is there a difference between the pre-test and post-test results of the experimental and control group students in the field of Second Order Equations learning?

Methods

The research was conducted using a semi-experimental design. Semi-experimental designs are usually the best type of design that can be used in field studies where a person wants to make causal inferences. In the process of applying the semi-experimental design, the process of determining the groups is important. It is necessary to try to equalize the groups in which the research will be conducted as much as possible in terms of the variables subject to the research (Christensen, Johnson, & Turner, 2015).

Information about the research design and data collection process is presented in Table 1.

Table 1

Research Design and Data Collection Process

Group	Pre-Test	Experimental Procedure	Final Test
Experiment-2	İDDT	Within the scope of the formative assessment application, the system provides resources for learning disabilities with a total score, detailed feedback by the teacher on learning disabilities according to CDM	İDDT
Experiment-1	İDDT	Within the scope of the formative assessment application, the system provides resources for learning disabilities with the total score.	İDDT
Control	İDDT	No action will be taken	İDDT

İDDT: Second Degree Equations

Table 1.as can be seen in the research, the experimental process of the research will be conducted through three groups in the form of Experiment-1, Experiment-2 and control group. The experimental groups were divided into two different groups within the research. Before the experimental procedure, the "Second Degree Equations Test (IDDT)" was applied as a preliminary test. The experiment-1 group consists of 104 students; Experiment-2 consists of 102 students; and the control group consists of 96 students. As a result of the monitoring tests applied to the Experiment-1 students, the total score obtained by the system within the scope of the formative assessment application was indicated and resources for learning disabilities were presented. On the other hand, Experiment-2 students were given detailed feedback from the teacher for learning disabilities in accordance with the CDM, as well as the system's overall score as part of the formative assessment application as a result of the monitoring tests applied. According to the CDM, detailed feedback was made according to the characteristics and sub-characteristics that students wanted to acquire in the Mathematics course on Second-Degree Equations.

Only pre- and post-tests were applied to the control group students. Experiment-1 and Experiment-2 were created by the teacher to determine the effect of giving feedback according to CDM; the control group was formed to determine the effect of both monitoring tests and feedback. The "Second Degree Equations Test (IDDT)" was applied to all groups as the final test at the end of the experimental process.

Working Group

In the research, using the stratified, random cluster sampling method, a total of 302 students selected from 4 schools in Göksun and Andırın districts and 3 branches from each school and 12 branches were determined as the sample of the research. According to the design, the determined sample was divided into Experiment-1, Experiment-2 and Control groups in each school. Experiment-1 group consisted of 102 students from 4 branches of 4 schools; Experiment-2, from a total of 104 students in 4 branches of 4 schools; The control group consisted of 96 students in 4 branches of 4 schools.

Application Process

The research was carried out in a Science High School, two Anatolian High Schools and an Anatolian Imam Hatip High School located in Göksun and Andırın districts of Kahramanmaraş province. A total of four Mathematics teachers, one from each of the schools mentioned in the research, worked. During the experimental process of the research, three follow-up tests were applied to the 10th Grade

Experiment-1 and Experiment-2 groups on the subject of Second Degree Equations in the Mathematics course for an average of 6 weeks. A pilot application of the test was carried out before each follow-up test application. In order to prepare the monitoring tests, they were created from the question pool in ÖDS (Student-Teacher Support System) affiliated with the Ministry of National Education, based on the achievements in the secondary school mathematics course curriculum, and opinions were received from mathematics teachers working at the school and experts in the fields of measurement and evaluation for the content validity of the questions. An achievement test was created by randomly selecting questions from the pool to measure each achievement.

The prepared follow-up tests were sent to the relevant groups via ÖDS (Student-Teacher Support System) at 2-week intervals, according to the subject achievements. IDAT (Quadratic Equations test) was used as pretest and posttest at the beginning and end of the application. Figure 1 shows the screen where students can enter the ÖDS system.

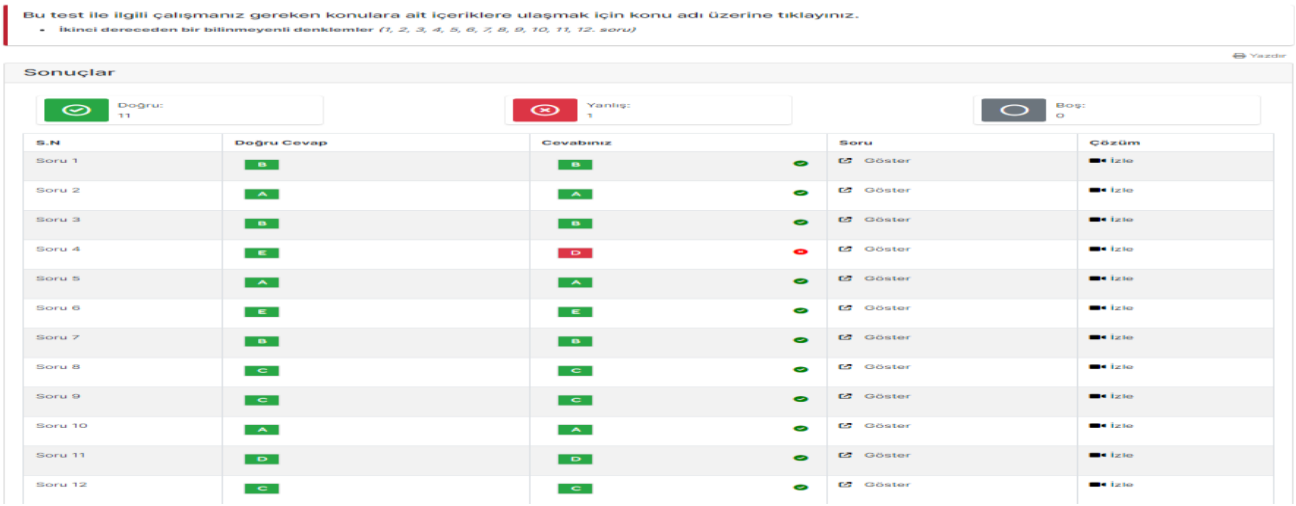
Figure 1

STUDENT/TEACHER SUPPORT SYSTEM (ÖDS) Login Screen

During the implementation process, after a lesson was taught approximately every two weeks and the relevant achievement was given, the monitoring test was uploaded to the ÖDS system and the necessary sharing and information was provided for the students to access the questions. Students logged into the system using their computers, tablets or smartphones. Then, the students solved the follow-up tests whenever and wherever they wanted. An example of a screen showing the total scores students received after their answers and the resources for their learning disabilities is shown in Figure 2.

Figure 2

ÖDS Assignment Result Screen



At the end of the application, the follow-up test results for the Experiment-2 group were examined one by one through the ÖDS system. For each student's learning disabilities, detailed feedback and assignments were made by the teacher according to CTM (Cognitive Diagnostic Modeling) over the EBA system, which is also a different application. According to CDM, detailed feedback was given according to the characteristics and sub-features that students wanted to gain in the Mathematics lesson Second Degree Equations. These feedbacks were given to the same students by the same teachers after three follow-up tests with two-week intervals. Experiment-1 and Experiment-2 group students were advised to watch the lesson videos suggested by the system before each viewing test, but their viewing status could not be followed. It was thought that making a force on this subject would create forcing results for both the practice teachers and the students of the experimental groups. An example of a screen showing the message sent by the teacher via the EBA system is presented in Figure 3.

Figure 3

EBA Message Screen

Data Collection Tools

As a data collection tool, the "Second Degree Equations Test (IDDT)" was applied as a pre-test and post-test before and after the experimental process.

Second Degree Equations Test (IDDT)

The Second Degree Equations Test "IDDT" was used to measure the pre- and post-application knowledge levels of the students in the experimental and control groups about second degree equations. In order to develop the test, a question pool was created based on the achievements in the secondary mathematics curriculum for the validity of the questions, opinions were obtained from mathematics teachers working in schools and experts in the field of educational programs and teaching. The questions from the pool were randomly generated to measure each win. The pilot application of the test was carried out before the application of the Second Degree Equations Test. Item analysis was performed after the pilot application. As a result of the analyses carried out after the pilot application and in accordance with the expert opinion, an 18-question Second-Order Equations Test was created. The KR-20 value of the test is 0.89. According to this result, IDDT is reliable.

Analysis of the Data

Before the statistical analyses, it will be tested whether the quantitative data meet the prerequisites of the analyses. In this context, loss value analyses, normality test and homogeneity of variances were checked.

In the study, whether the differences between the pre-test score averages of the groups were significant was examined by one-way analysis of variance (ANOVA).

Covariance analysis (ANCOVA) is one of the most frequently used analyses in experimental designs using pre-post test. In this analysis, in which the pre-test scores are taken as covariates, the differences between the groups are calculated by checking the pre-test scores Decently. According to the fact that the pretest scores did not differ between the groups in the research design, they were examined by covariance analysis of the experimental process.

Results

Pre-Test Variance Analyses for the Proficiency Levels of Research Groups in the Field of Second Degree Equations Learning Before the Experiment

The results of the analyses conducted to decipher whether there is a significant difference between the group averages of the pre-test scores of the students in the research groups are given in Table 2 and Table 3:

Table 2

Descriptive Statistics of the Pre-Test Total Scores

Group	N	$\bar{x}$	s	Skewness
Control	96	4.00	1.66	.33
Experiment1(System)	102	4.06	1.79	.22
Experiment2(Feedback)	104	3.92	1.58	.13
Total	302	4.01	1.67	.24

When Table 2 is examined, it is seen that the total pre-test scores of the research groups are between the deciency coefficients of -1.1 for all groups. These results mean that not all groups showed excessive deviations from the normal distribution (Leech, Barrett, & Morgan, 2007). However, the Levene statistic shows that the variances of the groups are homogeneous (.525, p>0.05). This indicates that the data set meets the assumptions of ANOVA analysis.
Table 2 shows the differences between the pre-test score averages of the research groups when examined .06, .08 and .it is seen that it is 14. One-way analysis of variance (ANOVA) was applied to determine whether these differences were significant. The results of the analysis are given in Table 3.

Table 3
ANOVA Analysis of the Pre-Test Scores of the Groups

	Sum of Squares	sd	Mean Square	F	P
Between Groups	.96	2	.48	.17	.85
Within Groups	845.03	299	2.83		
Total	845.98	301			

When Table 3 is examined, no significant difference was found between the pre-test scores of the research groups (F(2-301) = .17, p>.05). These findings show that the pre-test scores of the research groups are equal.

Post-Test Analysis of Variance for the Proficiency Levels of the Research Groups in the Field of Learning Second Order Equations after the Experiment

The results of the analyses carried out to reveal whether there is a significant difference between the group averages regarding the post-test scores of the students in the research groups are given in Tables 4 and 5:

Table 4

Descriptive Statistics of Post-Test Total Scores

Group	N	x̄	s	Skewness
Control	96	8.44	3.40	.72
Experiment1(System)	102	10.16	3.33	.57
Experiment2(Feedback)	104	12.11	4.04	.92
Total	302	10.28	3.90	.16

When Table 4 is examined, it is seen that the total pre-test scores of the research groups are between the deciency coefficients of -1.1 for all groups. These results mean that not all groups showed excessive deviations from the normal distribution (Leech, Barrett, & Morgan, 2007). However, the Levene statistic (.09, p>0.05) shows that the variances of the groups are homogeneous. This indicates that the data set meets the assumptions of ANOVA analysis.

When Table 4 is examined, it is seen that the differences between the decal-test score averages of the research groups are 1,719, 1,949 and 3,668. One-way analysis of variance (ANOVA) was applied to determine whether these differences were significant. The results of the analysis are given in Table 5.

Table 5

ANOVA Analysis of the Post-Test Scores of the Group

	Sum of Squares	sd	Mean Square	F	P	η2	Groups Difference
Between Groups	674.13	2	338.06	25.85	.00	.15	Exp-2-Exp-1;
Within Groups	3898.95	299	13.04				Exp-2-Control;
Total	4573.08	301					Exp-1-Control

When Table 5 is examined, there is a statistically significant difference between the post-test scores of the research groups (F(2-301)= 25.85, p>0.05). The significance of the difference in the group effect (η2 = .12), it can be stated that it is of medium effect size. The differences between the groups were examined by the Bonferroni tes According to the results of the Bonferroni test, the mean of the final test of Experiment-2 group (M=12.11, s=4.04) is statistically higher than the mean of Experiment-1 (M=10.16, s=3.33) and the Control group of final tests (M=8.44, s=3.40). In the same way, it was found that there was a statistically significant difference between the post-test averages of the Experimental-1 group and the control group in favor of the Experimental-1 group.

3. Covariance Analysis of the Experimental Process

Another analysis that is frequently used in experimental patterns using pre-post test is covariance analysis (ANCOVA). In this analysis, in which the pre-test scores are taken as covariates, the differences between the groups are calculated by checking the pre-test scores decently. Although it was seen that the preliminary test scores did not differ between the groups in the research pattern, it was found that the experimental process should be examined again by covariance analysis taking into account the sample size. ANCOVA results for final test scores are given in Table 6.

Table 6

ANCOVA Analysis of the Final Test Scores

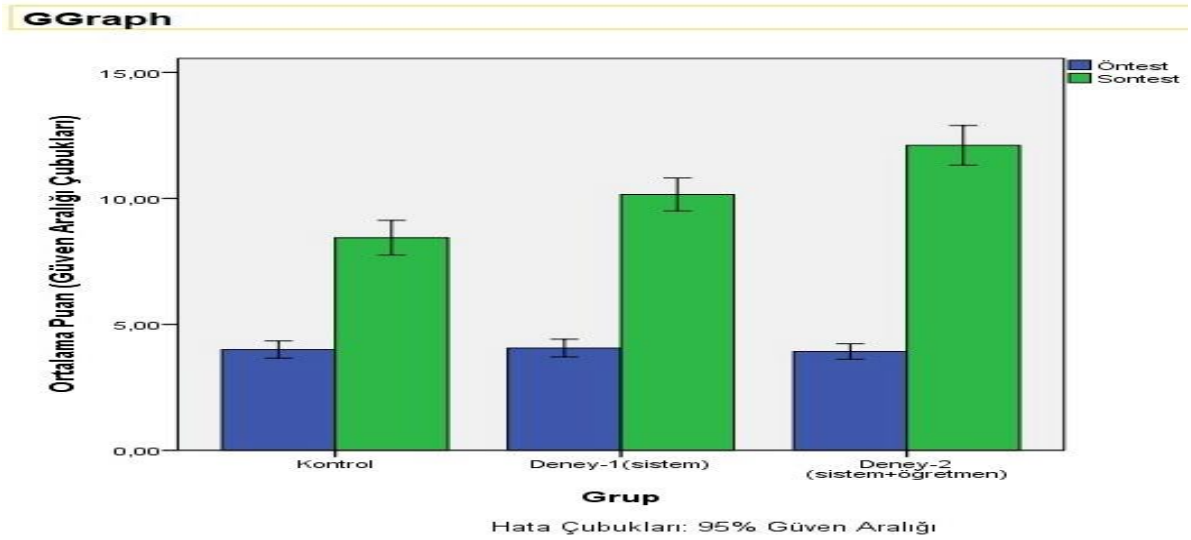
	Sum of Squares	sd	Mean Square	F	P	η2	Groups Difference
Pre-Test	2080.42	1	2080.42	340.92	.00	.534	Exp-2- Exp -1;
Group	724.29	2	362.14	59.34	.00	.285	Exp -2-Control; Exp -1-
Error	1818.53	298	6.10				Control
Total	36497.00	302					

According to the analysis results in Table 6, when the differences between the pre-test scores of the groups were controlled, it was found that the differences between the post-test scores of the groups were significant. (F(2,302) = 59.34, p=.00). The Deciency between which groups the difference was significant was examined by the Bonferroni test. According to the analysis results, it was found that there was a significant difference in favor of Experiment-2 Deciency between Experiment-2

(M=12.22) and Experiment-1 (M=10.05) and Control (M=8.43) groups. At the same time, the average of the Experimental-1 group is also statistically significantly higher than the control group.
The change in marginal averages is given in Figure 4.

Figure 4

Marginal Group Averages



When Figure 4 is examined, the change in the averages of the groups between the pre and post test is. The difference between the pre- and post-test in each group was found to be statistically significant. However, considering the common effect, it is observed that the average final test score of the Experiment-2 group increased statistically at a higher level than both groups, and the Experimental-1 group increased statistically higher than the Control group.

Discussion and Conclusion

The purpose of this research is to examine the effects of providing resources for learning disabilities by the system and providing feedback regarding learning disabilities by the teacher within the scope of the online (web-based) formative assessment application of secondary school 10th grade students in mathematics course quadratic equations on the students' success.
According to the results obtained, it was determined that there was no statistically significant difference between the pre-test averages of the groups, but a statistically significant difference emerged in the post-test. The post-test average of the Experiment-2 group was higher than the post-test average of the Experiment-1 and Control groups; The post-test mean of the Experiment-1 group also showed a statistically significant difference from the post-test mean of the control group. In addition, according to the results of the experimental process, Experiment-2 showed a higher level of improvement than Experiment-1 and Experiment-1 showed a higher level of improvement between the pre-post test averages than the Control group.
According to the results of the research, the system applied to the Experiment-2 group provided resources for learning deficiencies and the teacher provided feedback regarding learning deficiencies,

the system applied to the Experiment-1 group provided resources for learning deficiencies, and the normal education applied to the Control group; It has been determined that the system applied to the Experiment-1 group and the provision of resources for learning disabilities are more effective than the normal education applied to the Control group.

When the literature related to the study is examined, results that support our research results are seen.

Baleni (2015) stated in his study that effective online formative assessment can foster student and assessment-centered focus through formative feedback and enrich student engagement with valuable learning experiences. Ongoing reliable assessment tasks and interactive formative feedback have been identified as important features to deal with intimidations towards rationality and reliability in the online formative assessment environment.

Başokçu et al. (2018) in their project study, no difference was observed between the pre-test averages between the Experiment-1 group, which was given detailed feedback, and the Experiment-2 group, which was given feedback only on the total score, and between Experiment-2 and the Control group, which was not given any feedback, while the final significant differences were detected in the test averages.

In the study of Hotaman (2020), it was evaluated that formative assessment, which can provide students with the necessary rapid feedback during online courses, will become important for success. Hotaman's study is parallel with our research result, showing that the Experiment-2 group, receiving feedback from both the system and the teacher, and the Experiment-1 group, receiving feedback from the system alone, were more effective than the Control group, which received no feedback.

In their study, Karadağ and Özgür (2021) stated that more feedback should be given to learners regarding the learning and evaluation process. Additionally, Demir (2017) stated in his study that the average scores of students who received detailed feedback increased more than other groups. Both Karadağ and Özgür (2021) and Demir (2017) found that the Experiment-2 group, receiving feedback from both the system and the teacher, performed better than the Experiment-1 group, which received feedback from the system alone.

Pekcan and Toraman (2022) stated in their study that measurement and evaluation in distance education is useful in detecting learning deficiencies and increasing the quality of learning. The result stated by Pekcan and Toraman (2022) supports the conclusion that we obtained as a result of our research that the average of the groups in which online formative evaluation was applied is more effective than the average of the group in which online formative evaluation was not applied and student success is higher.

Hannah, James and Williams (2014); Shirley and Irving (2015); Reeves, Gunter and Lacey (2017); Faber, Luyten and Visscher (2017); In their study, Pemberton (2018) concluded that technology-supported formative assessment practices in mathematics education have a positive effect on student success. All these results are parallel to the result we obtained form our research that online formative assessment application increases students mathematics achievement.

The following recommendations are made according to the experiences gained during the study and the results of the study.

In this study, the Student/Teacher Support System (ÖDS) system created by the Ministry of National Education (MEB) was used. Since the teacher does not have a link to send messages to students in the ÖDS system, the Education Information Network (EBA) created by the Ministry of National Education (MEB) was used. According to the results of our study, the provision of resources for learning disabilities by the system applied to the Experiment-2 group and the feedback provided by the teacher for the learning disabilities differed statistically significantly from the system applied to the Experiment-1 group and the normal teaching applied to the control group showed a higher level of

improvement among the pre-post test averages. Considering this result, it will be a more useful system if a message link is added to the ÖDS (Student/Teacher Support System) by the Ministry of National Education (MEB).

Again, in the studies carried out during the study process, a sufficient amount of question and solution videos were found for the subject studied in the ÖDS system. However, in the examination of other courses and topics, it has been determined that some courses and topics do not have enough questions and solution videos. It is recommended to increase the questions and solution videos of all the lessons and subjects in the ÖDS system in a sufficient amount in order to contribute more to the scientific studies to be made and to the students. According to the results of our study, the Experiment-2 group, which was given detailed feedback and assignment according to CDM (Cognitive Diagnostic Modeling) through the EBA system by the teacher for the learning disabilities of each student, differed significantly from the other groups and showed a high level of improvement from the other groups. . In addition, it has been determined that the online (web-based) formative assessment application also increases the academic success of the students. Considering these results, it is recommended that our teachers use online (web-based) formative assessment applications and, in particular, provide detailed feedback and assignments according to CDM (Cognitive Diagnostic Modeling).

As a result of our study, it was determined that the online (web-based) formative assessment application increased the academic success of the students. It can be interpreted that the source of the change in this result is the process-based, non-grading, online (web-based) formative assessment application that has no time and place limitations, as well as detailed feedback on more specific sub-features under the outcome, not just based on the outcome. Considering the result of our study, it is thought that increasing the studies on online applications and using CDM in giving feedback will serve to make clearer sentences on this subject.

Declarations

Author Contribution: Şeref Akpınar: Conceptualization, methodology, analysis, writing & editing, visualization. Bayram Çetin: Conceptualization, methodology, writing-review & editing, supervision.

Conflict of Interest: No potential conflict of interest was declared by the authors.

Ethical Approval: The study was ethically approved by Gazi University Rectorate Ethics Commission (decision number: 2023-110, 09/02/2023).

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