The impact of educational software on the first reading and writing teaching self-efficacy of prospective classroom teachers: An experimental study

Eğitim yazılımlarının sınıf öğretmen adaylarının ilk okuma ve yazma öğretimi öz yeterliklerine etkisi: Deneysel bir çalışma

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Abstract

This study aimed to determine the effect of a teaching process supported by educational software on the self-efficacy levels of prospective classroom teachers regarding early reading and writing instruction. A single-group pretest-posttest quasi-experimental design was used to conduct the study with 28 prospective classroom teachers. Data were collected using the Self-Efficacy Scale Towards Reading and Writing Teaching. SPSS 24 software was used to analyse the data. The research findings showed that the average pre-test scores of the teacher candidates increased significantly after the application. Additionally, the final test scores obtained from participants were compared with their pre-test scores, revealing a significant improvement. It was therefore determined that integrating educational software into early literacy lessons strengthened teacher candidates' technological pedagogical content knowledge and increased their early literacy self-efficacy levels. Programmes should be organised to encourage teacher candidates to become more familiar with digital tools and use them more often.

Keywords: Educational software, prospective classroom teachers, early literacy instruction, self-efficacy.

Öz

Bu araştırmanın amacı, eğitim yazılımları destekli bir öğretim sürecinin sınıf öğretmeni adaylarının ilk okuma ve yazma öğretimine yönelik öz yeterlilik düzeylerine etkisini incelemektir. Zayıf deneysel desenin kullanıldığı çalışma, bir devlet üniversitesinin eğitim fakültesinin temel eğitim bölümü sınıf eğitimi anabilim dalında öğrenim gören 28 sınıf öğretmeni adayı ile yürütülmüştür. Veri toplamada İlk Okuma ve Yazma Öğretimine Yönelik Öz Yeterlik Ölçeği kullanılmıştır. Veri toplama süreci sekiz hafta sürmüştür. Verilerin analizinde SPSS 24 paket programından yararlanılmıştır. Araştırma bulguları, öğretmen adaylarının ön test puan ortalamasının uygulama sonrasında anlamlı bir artışla yükseldiğini göstermiştir. Ayrıca uygulamada sonunda katılıcılardan elde edilen son test puanları ile ön test puanları karşılaştırılmış ve son test lehine anlamlı farklılık tespit edilmiştir. Sonuç olarak, Web 2.0 araçlarının ilk okuma yazma derslerine entegrasyonunun, öğretmen adaylarının teknolojik pedagojik alan bilgilerini güçlendirdiği ve ilk okuma yazma öz yeterlik düzeylerini artırdığı

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saptanmıştır. Öğretmen adaylarının dijital araçları daha çok tanıması ve kullanmasını teşvik edecek programların düzenlenmesi önerilmektedir.

Anahtar Kelimeler: Eğitim yazılımları, sınıf öğretmeni adayları, ilk okuma yazma öğretimi, öz yeterlilik.

Introduction

In line with the changing conditions of the era, teacher candidates must develop their digital skills and enrich their technological pedagogical knowledge. Studies have shown that teachers experienced difficulties using digital tools and software, particularly during the period of temporary school closures due to the pandemic. In particular, first-grade teachers experienced difficulties in teaching reading and writing, the cornerstones of primary education (Atik & Avcı, 2021; Çavdarlı & Karadağ Yılmaz, 2022; Kargın & Karataş, 2021). Due to the practical nature of early reading and writing instruction, which requires active participation, it is a subject that must continue even during pandemics or natural disasters, as interruptions can negatively affect students' future academic lives. Therefore, teacher candidates must also keep pace with technological transformation.

The initial reading and writing process is one of the most critical stages in developing an individual's academic career and acquiring the skills needed for independent living. The belief held by classroom teachers, who are at the centre of this process, that they can successfully fulfil their teaching duties — that is, their self-efficacy perceptions — is considered one of the most fundamental variables shaping teaching quality and, indirectly, student success (Akyol, 2020; Delican & Adıyaman, 2021; Demirtaş et al., 2011). According to Social Cognitive Theory (Bandura, 1997), self-efficacy is defined as an individual's positive judgement of their ability to perform and apply the necessary actions to fulfil a specific responsibility or task. In this context, 'teacher self-efficacy' refers to an educator's belief that they can facilitate learning even in challenging conditions or with unmotivated students.

Ashton (1984) defines teacher self-efficacy as 'belief in one's ability to influence student performance'. He also states that no other variable is as closely related to student achievement. Research shows that students who perceive this confidence in their teachers demonstrate greater effort in reading and writing activities, and exhibit greater persistence in the face of cognitive challenges (Erbaş, 2021). This belief reflects professional confidence in the act of teaching itself, as well as being a transfer of knowledge. Teachers with high self-efficacy levels tend to use innovative, diverse teaching strategies. They adopt a more passionate professional attitude, are more open to new methods and demonstrate a more pedagogically equipped stance. By developing effective classroom management strategies, they create a supportive learning environment sensitive to students' needs. This situation once again highlights the importance of supporting teachers' self-efficacy beliefs through professional development programmes. Studies in this field clearly demonstrate a strong and linear correlation between teachers' self-efficacy beliefs and students' academic outcomes (Tschannen-Moran & Johnson, 2011; Yıldırım & Demirtaş, 2008).

When teaching reading and writing, it is essential to maintain student interest

during sensitive stages such as combining sounds and forming syllables. Concretisation and gamification should be incorporated into early reading and writing instruction. As they are in the concrete operational stage due to their age and level of development, it is important for them to structure information in a concrete way. Digital tools added to traditional methods today offer significant opportunities for visualising and gamifying this process. However, effectively integrating these tools into the educational environment is directly linked to teachers' self-efficacy perceptions. Indeed, Compeau and Higgins (1995) emphasise that teachers' self-efficacy regarding technology is the fundamental determinant of its use in the classroom. Similarly, within the Technological Pedagogical Content Knowledge (TPACK) framework, teacher trainees are expected to combine their subject knowledge with technological skills (Mishra & Koehler, 2006).

The use of educational software and mobile applications is increasing today. In this context, students and teacher candidates are expected to develop their digital literacy. Modern learning approaches support the use of effective learning processes and applications that capture students' interest (Quimsing & Cruz, 2024). Teacher candidates who encounter gamification and enjoyable activities will be more successful in their teaching and in educating future generations. The Ministry of National Education's (MoNE) 2024 Maarif Model Turkish teaching programme includes important content on this subject. One such recommendation is to use information and communication technologies wherever possible. The programme also includes the use of EBA in lessons, enrichment activities, differentiation practices and interactive whiteboards. The Ministry's publication of a guidebook on educational software is also significant, as it requires the use of modern methods and techniques in learning, and highlights the importance of teachers using digital tools in education (MoNE, 2023).

Studies have examined early reading and writing self-efficacy in samples of prospective (Bay, 2022; Değirmenci Gündoğmuş, 2018; Öztürk & Ertem, 2017; Sidekli & Uzunoğlu, 2023; Yıldırım, Ateş & Çetinkaya, 2016) and classroom (Büyükalan Filiz et al., 2020; İflazoğlu Saban & Ekin, 2020; Kabaş & Yıldız, 2020) teachers. Additionally, the Self-Efficacy Scale for Supporting Early Literacy Skills, designed for pre-service and in-service teachers, is included in the literature (Delican & Ateş, 2022). When these studies are evaluated in general, it becomes apparent that they are studies designed to determine self-efficacy belief levels and develop measurement tools. However, a current experimental study is needed to investigate the impact of activities conducted using educational software and tools in the initial reading and writing instruction course taken by prospective classroom teachers during their education faculty studies on their self-efficacy beliefs.

In line with this rationale, the aim of this study is to answer the following question: 'Does using educational software in lessons affect pre-service elementary teachers' self-efficacy in early reading and writing?' Specifically, the study aims to examine whether using Web 2.0 tools changes pre-service elementary teachers' self-efficacy levels in early reading and writing. Given the attitudes of prospective classroom teachers towards the early reading and writing instruction course they take at the Faculty of Education, and how these attitudes affect their self-efficacy levels, it is anticipated that the results of this study will contribute to the existing literature

on this topic.

Methods

Research design

The research is experimental in nature, involving an experimental monitoring process to determine whether there is any change in the self-efficacy of primary school teacher candidates in early reading and writing. The study also aims to establish how the tools used influence the level of self-efficacy (Fraenkel et al., 2012). This quantitative study was conducted using a pre-test-post-test group-equivalent experimental design. As this study involved an experimental investigation of a single group, a control group was not used. Therefore, a single-group pre-test-post-test quasi-experimental design was used instead. According to the curriculum, the first reading and writing teaching course is taken in the second year of education faculties. The findings and results of the study should be evaluated at this level.

Participants

The study involved 28 teacher candidates enrolled on the Elementary Education programme at Adıyaman University's Faculty of Education during the autumn semester of the 2025/26 academic year. As the study focused on a single group, no selection or matching was conducted. In this context, teacher candidates from one class were included in the study using purposive sampling. In terms of gender, there were 5 male candidates (17.9%) and 23 female candidates (82.1%). Their ages range from 19 to 24 years old ($\bar{X}$= 19.93; Ss= .25, Range= 5).

Data collection tools and procedure

The "Self-Efficacy Scale Towards Reading and Writing Teaching" developed by Delican (2016), was used as the data collection tool in this study. This tool is designed to assess pre-service classroom teachers' beliefs and self-efficacy regarding early literacy instruction. The tool consists of 25 items and three sub-dimensions. Following validity and reliability studies, Confirmatory Factor Analysis was used to examine the validity of the measurement tool, and the three-subdimensional structure was confirmed. Reliability analyses were conducted by calculating Cronbach's alpha internal consistency coefficient, which was found to be .90. Based on these studies, it was concluded that the tool is valid and reliable for measuring pre-service elementary teachers' self-efficacy levels in early reading and writing instruction. The data collection tool uses a 5-point Likert-type rating scale. The highest possible score is 125 and the lowest is 25. As the score increases, so does the pre-service teachers' self-efficacy in early reading and writing; conversely, as the score decreases, so does their perceived efficacy.

Permission to conduct the study was obtained from the Adıyaman University Social and Human Sciences Ethics Committee, and participants were informed about the study. Prospective teachers were given information about the data collection tools and educational software to be used throughout the experimental application phase at the beginning of this phase. The 8-week programme for the experimental intervention

group was structured as follows: The first two weeks focused on the importance of educational software and Web 2.0 tools for early reading and writing instruction, during which the tools were introduced. The following weeks involved developing phonics boards, preparing digital reading cards, sound-letter matching, word hunts, interactive dictation games and assessment activity preparation, as well as conducting smart board integration simulations.

Pre-test data was collected using a measurement tool applied to the experimental group before the programme began. During the eight-week application process, teacher candidates were provided with educational software containing interactive content, such as digital stories, phonics activities, word games and sentence building exercises. The software and tools included Canva, Niays, EBA, Afacan Okuma Yazma Öğreniyorum, Kahoot, Wordwall, LearningApps and Toy Theater. Teacher candidates used these applications during the letter group learning phase. At the end of the process, final test data was collected using the same measurement tool as at the beginning. The applications were carried out at the appropriate time and under the right conditions throughout the entire process, without disrupting the curriculum or the flow of the course.

Data analysis

Data analysis in this study was performed using the SPSS 24 software package. Descriptive statistics were used to analyse the pre-test and post-test mean scores used in the analysis of quasi-experimental studies. However, a dependent samples t-test was used to compare the mean scores of teacher candidates before and after the application process. Prior to conducting these analyses, preliminary analyses were performed in line with the recommendations of Tabachnick and Fidell (2014). These preliminary analyses examined the accuracy of the data, missing and outlier values, and the assumptions of the statistics to be used. Examining the minimum and maximum values and frequency distributions of the data revealed that all values were within the expected ranges. No missing values were found in the dataset. In the experimental section, a dependent samples t-test was used to compare the mean pre-test and post-test reading and writing self-efficacy scores of prospective classroom teachers in a single-group quasi-experimental design. In all analyses, $p < .05$ was accepted as the upper limit of the margin of error.

Findings

This section presents the results of the normality test for the data and the statistics for the pre-test and post-test mean scores, as well as the results of the dependent samples t-test to determine the effect of the experimental intervention. As the sample size was less than 50 (N = 28), the results of the Shapiro–Wilk test were used to determine whether the data on initial reading and writing self-efficacy were suitable for parametric tests.

Table 1. Normality test results for self-efficacy scores

	N	$\bar{X}$	Min. score	Maks. score	Skewness	Kurtosis	Shapiro-Wilk	*p*
Pre-test	28	72.30	48	89	-0.214	-0.450	.942	.124
Post-test	28	104.15	88	121	-0.185	-0.320	.958	.312

Table 1 shows the validity and normality statistics for the data obtained using the self-efficacy measurement tool with prospective classroom teachers on early reading and writing instruction. The validity of the data was determined by examining the minimum and maximum scores, revealing that the results obtained from the 25-item, 5-point, Likert-type scale measurement tool were within the expected value ranges. While participants' pre-test mean scores per item were at the 'Somewhat Agree' level, post-test mean scores administered after the experimental intervention were found to have increased to the 'Strongly Agree' level. According to the analysis results, the p-values for both the pre-test and post-test scores were greater than 0.05 ($p > 0.05$). This indicates that the data showed a normal distribution, supporting the scientific reliability of the study. Furthermore, this proves that parametric tests were appropriate for the analyses. The results of the dependent groups t-test are presented in Table 2.

Table 2. Results of paired sample t-test

	N	X̄	Sd	df	t	p	d
Pre-test	28	72.30	11.45	27	-9.14	.01	1.72
Post-test	28	104.15	8.20				

Table 2 shows the results of the t-test analysis that was conducted to examine the difference in self-efficacy scores for early reading and writing instruction among prospective classroom teachers, before and after the experimental intervention involving educational software. According to the analysis, the mean self-efficacy score of the prospective teachers was found to be X̄ = 72.30 prior to the intervention. The final test, conducted after the intervention, showed a significant increase in mean scores, rising to X̄ = 104.15. Furthermore, it was determined that the experimental application had a significant impact ($t(27) = -9.14$, $p < .05$). Finally, the effect sizes of the obtained data were examined by calculating the Cohen's d coefficient. The applied intervention was found to have a very large effect on the self-efficacy levels of teacher candidates (Cohen's $d = 1.72$).

Conclusion and Discussion

This section compares the findings with those of similar studies and interprets the conclusions drawn from them. Educational software was used in an eight-week experimental process with prospective classroom teachers, and it was found to significantly increase their self-efficacy levels in early reading and writing instruction. This is also indicated by the significant increase in the final test scores administered at the end of the experimental intervention.

Furthermore, examination of the effect size coefficient revealed a high effect, indicating that the educational software increased the teaching competence of teacher candidates. Other studies (Değirmenci & Ertem, 2014; Kesik & Baş, 2021) also suggest that educational software is effective in facilitating learning and increasing interest. This leads us to conclude that educational software is a necessary tool.

While teacher candidates generally responded with 'I partially agree' during the pre-test process, the fact that they responded with 'I completely agree' in the post-test is another result that demonstrates the effectiveness of the application. This is an extremely meaningful result in terms of developing technological pedagogical

content knowledge competencies and self-efficacy in technology-supported early reading and writing instruction.

It also demonstrates the positive contributions of conducting the teaching process both theoretically and practically. Similar results have been obtained in previous studies (Kabaş & Yıldız, 2020; Sidekli & Uzunoğlu, 2023; Şahin & Boylu, 2020), highlighting the importance of identifying high levels of self-efficacy among prospective classroom teachers. Another example of the extent to which technological tools contribute to first-grade education is the finding by Büyükalan Filiz et al. (2020) that there is a relationship between pre-service classroom teachers' initial literacy self-efficacy and their attitudes towards computer-assisted education. In contrast, Değirmenci Gündoğmuş (2018) found that pre-service teachers had moderate initial literacy self-efficacy levels. In light of these results, it can be said that the use of technology-supported educational software in the classroom and in teaching makes positive contributions to self-efficacy and learning of the students and teacher candidates.

The results of this study suggest that teacher trainees have a high level of self-efficacy with regard to early reading and writing. Using a variety of educational software has also enhanced their technological pedagogical content knowledge. Teacher candidates have gained self-efficacy and self-confidence in overcoming challenges such as creating teaching materials and developing engaging content at the start of their careers. Despite the study's weak experimental design, the statistical analyses were meaningful, proving the success of the experimental process. In conclusion, classroom teachers' self-efficacy beliefs regarding early reading and writing instruction are a key factor in their success in teaching these basic skills to students.

Teachers with high self-efficacy ensure that their students become literate and grow up to be successful, self-confident individuals by using effective teaching strategies, creating a positive learning environment and motivating their students. This study is important in determining how the ability of future classroom teachers to use these tools reflects their own perceptions of professional competence. Given the importance placed on new generation digital tools by the Ministry of National Education (MEB), it is crucial to develop the TPAB competencies of teacher candidates.

Declarations

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