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INVESTIGATION OF THE EFFECT OF DIGITAL STORY ACTIVITIES ON STUDENT ATTITUDES IN TERMS OF VARIOUS MODERATOR VARIABLES: A META-ANALYSIS STUDY

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Abstract

Being a product of student-centered education, the use of digital storytelling which puts students in the center of education processes by stimulating their many receptors has recently come into prominence as a method on which a high amount of scientific research has been conducted. In this study, it was aimed to synthesize the results obtained from experimental studies in which the effect of digital story method on students' attitudes was investigated. Respective studies were accessed by using the keywords “digital story, digital storytelling, and attitude” in the databases of ULAKBIM TR Index, ERIC, Web of Science, EBSCOhost, Google Academics, and YOK Dissertation. The study, in which the analyzes were made with the CMA software, was carried out according to the random effects model. As a result of the analysis, the average effect size was calculated as +0.69. This result shows that digital story applications have a moderately positive impact on students' attitudes. The results of the analysis were examined according to the moderator variables. While the variables course type and type of publication do not make a significant difference on the effect sizes of the studies, the teaching level variable caused a significant difference. The study is critical because it is a synthesis of experimental studies examining the impact of digital stories on students' attitudes.

Keywords: Digital story, digital storytelling, attitude, meta-analysis.

1. Introduction

1.1. Digital Story and Attitude

The story and storytelling have been used in various environments and ways to provide information transfer among people throughout history. In other words, even though digital story takes place in our lives as a new concept, the concepts of story and storytelling are the concepts we have known since ancient times. Stories that have been used for a long time have been moved to the computer medium, forming the foundations of digital story. Resulting from the combination of traditional storytelling with multimedia elements, digital storytelling is composed of a few minutes of stories that combine elements such as text, music, graphics,

voiceover, and video to provide information transfer on subjects such as personal stories, and historical events (Banazewski, 2005; Jakes & Brennan, 2005; Meadows, 2003; Mellon, 1999; Robin, 2006).

Digital story with increased areas of use in different disciplines recently is generally described as short, individual and multimedia stories that share information using multimedia tools or resources (Meadows, 2003; Yüksel, 2011).

Technology is necessary and indispensable to make easy, regularize, make sense to human life. (Alyılmaz, 1997). Today's technology gives students the opportunity to create their own stories, and when it is considered in terms of educational activities, it can positively affect the student's affective skills. The digital story method allows students to form their own stories and interact with them, instead of only being listeners, but also differs from traditional storytelling by using information and communication technologies (Chung, 2007; Dörner *et al.*, 2002).

The foundations of digital story, which refers to the digital narration of stories for a specific purpose, were laid in the USA in the 1970s and 1980s, and it has been used by teachers and students since then. The Digital Media Center, which was established in San Francisco in 1994, moved to Berkeley in 1998 and became a Digital Storytelling Center, and this center has worked with many institutions and organizations from different parts of the world, forming the basis for workshops that will teach digital storytelling skills in the following years (Center for Digital Storytelling, 2020). Another important institution related to digital story is The Educational Uses of Digital Storytelling, which was founded by Bernerd Robin at the University of Houston, aiming to use digital story for educational purposes. (Bull & Kajder, 2004; Lambert, 2003):

The elements of the digital story, with personal stories, informative and teaching stories, and stories examining historical events as three sub-types, are as follows: (Lambert, 2003; Robin, 2006):

- Perspective
- A dramatic question
- Emotional content
- Economy
- Voice
- Music
- Pacing / Rhythm

The first four of these components are related to the content and writing of the story, while the others are related to the formation of the story. Robin & Pierson (2005), on the other hand, talked about the 10 components by adding the “Story Purpose”, “Image Quality” and “Good Grammar and Language Use” components to these 7 components in order to provide the use of digital storytelling for educational purposes.

Today, developments and changes in the field of science and technology have brought important changes in the field of education, as in all areas of life. It is possible to see these

changes clearly on the tools, materials and methods - techniques used in educational processes. Thus, one of the important methods we have is the digital story method. The digital story, which emerged as a result of the transfer of traditional storytelling to the computer environment by developing technology, is actively used in many fields, especially in educational activities. Digital story, which is inherently a suitable method in terms of contemporary educational approaches, has become a popular pedagogical tool used by different branch teachers for students of all ages and all levels to learn (Garcia & Rossiter, 2010; Göçen, 2014). Digital storytelling method is a method that can be used to provide a permanent and efficient education for today's digital generation, to include them with an active participation in this education, to maintain continuity and vibrancy in education, and to introduce them to students together with features of this century expected by the generation raised (Çakıcı, 2018).

The digital story method, which provides deep and project-based learning by increasing students' participation in the course, and thus aims to make learning more permanent, is also a student-centered method that provides technology integration into the learning environment (Barret, 2009; Çakıcı, 2018).

Howell and Howell (2003) list the benefits of using digital stories in educational processes as follows:

• It creates an environment for students to share their feelings, thoughts, ideas, experiences and cultures in a fun way.

• Students using digital stories go a long way in the context of performing their own learning.

• Digital stories are an important method for students to be independent and active.

• Students' proficiency in language development and using technological tools increases through digital stories.

• They acquire the skill of critically examining the media.

• Digital storytelling contributes greatly to increasing students' motivation to learn.

• Students' creative writing skills increase.

• The student's ability to use language on subjects such as writing, speaking fluently, and critical reading improves.

All these are important indicators emphasizing the positive effects of the use of digital story applications in educational environments.

Students who have the opportunity to become the author of their own stories and share their own stories with others through digital stories will naturally have a positive attitude and high motivation towards the digital story method. As a matter of fact, this situation has been emphasized in many studies in the literature.

It is an emotional and mental state of preparation for all the beings and situations related to attitudes and experiences that have the power to guide and influence individual's behavior (Tavşancıl, 2002). The attitude that students develop towards all other dynamics of the education and training process (to the lesson, school, teaching method, teacher, etc.) is one of the most critical determinants of the extent to which the achievements of this complex process will be succeeded. In this context, while the students' positive attitudes will positively affect the

process, a negative attitude developed by the student against any element of the process will lead the process to a dead end. For this reason, choosing contemporary methods that can positively change the student's characteristics such as interest, motivation, and attitude and make students active in the teaching process plays a crucial role in reaching the final goals. Attitude variable has been chosen as the focus of this meta-analysis study since there are no studies in the literature that address the impact of digital stories, which is one of these contemporary methods, on students' attitudes with a holistic perspective and aim to synthesize the results of experimental studies conducted in this direction and reach universally accepted results. In addition, although there are meta-analysis studies on the impact of digital stories on students' academic achievement (Şahin & Çoban, 2020) and motivation (Şahin, 2021) in the literature, the absence of a meta-analysis study investigating how digital stories affect students' attitudes has been another factor affecting the preference of the attitude variable in this study. Many studies investigating the effect of digital story use on students' attitudes in educational processes have taken their place in the literature. Some of those are provided as examples below: The most important result of these studies is that digital story applications positively and strongly affect students' attitudes. For this reason, both the substantial number of individual studies carried out in this direction and the positive results indicated by these individual studies have made it essential to combine and synthesize the statistical results obtained from these studies, thus gaining a clearer idea about the effect of digital stories on students' attitudes (Baki, 2015; Demirer, 2013; Gakhar, 2007).

1.2. Meta-Analysis

The meta-analysis, which is a method that synthesizes the results of different experimental studies through statistical processes and calculates their common effect sizes, and thus summarizes the results of these studies based on this common effect size, can be applied to quantitative studies such as experimental, quasi-experimental, observational, and controlled clinical studies.

Since meta-analysis focuses on comparing or putting together different results found in different studies, the findings must be in order for the data to be able to compare significantly. For this reason, first, the results of the research that will be applied meta-analysis can be conceptually compared - it is imperative that the same structure and relationships are present, and second, they should be shaped in a similar statistical form (Bakioğlu & Özcan, 2016).

Application stages of meta-analysis studies can be listed as follows (Akgöz *et al.*, 2004; Çağatay, 1994; Çarkungöz & Ediz, 2009; Dinçer, 2014; Elwood, 2003):

1. Problem Definition

2. Literature review or compilation of all studies that meet the admission requirements

3. Determining the inclusion criteria of the studies to be examined within the scope of meta-analysis,

4. Compilation of studies to be examined within the scope of meta-analysis,

5. Coding and classification of individual studies that will be performed meta-analysis,

6. Combining the findings of individual studies,

7. To establish the relationship between the findings combined with the characteristics of meta-analysis,

8. Reporing the results obtained from meta-analysis.

1.3. Research Objective and Research Problems

Although meta-analysis studies investigate the effects of digital story applications on students' academic achievement and motivation in the literature, no meta-analysis study investigates the impact of digital stories on students' attitudes. Although experimental studies investigating the impact of the digital story on students' attitudes have found considerable space in the literature, the lack of comprehensive and reliable meta-analysis studies that will lead to new research by interpreting the knowledge obtained from the data obtained from these studies is an essential deficiency in the literature. For this reason, it was decided to conduct this meta-analysis study in order to make more reliable and generalizable judgments about the effect of the classes taught using digital story-based activities on students' attitudes compared to the classes taught with other teaching methods. In this context, in this meta-analysis study, it is aimed to determine the effect of using digital stories in educational activities on students' attitudes. The following research problems were answered in line with this objective:

1. Is there any difference between the attitudes of the students in the classes taught with digital story applications and those taught using other methods?

2. Is the difference between the attitudes of the students in the classes taught using digital story applications and other techniques of methods significant according to the type of publication (article-dissertation) of the studies included in the meta-analysis?

3. Is the difference between the attitudes of the students in the lessons taught using digital story applications and other techniques of methods significant according to the education levels (kindergarten, primary school, middle school, high school and university) of the students included in the meta-analysis?

4. Is the difference between the attitudes of the students in the lessons taught using digital story applications and other method techniques significant according to the fields of classes (mathematical/statistical - non-statistical) of the experimental processes in the studies included in the meta-analysis?

2. Method

2.1. Research Model

The meta-analysis method was used in this study, which aims to combine the results obtained from empirical studies investigating the effect of the digital story method on students' attitudes in the literature and thus to obtain more precise and generalizable results. Meta-analysis is the calculation of effect sizes by combining the results obtained from quantitative studies conducted for certain purposes with various statistical methods (Cohen *et al.*, 2011; Dinçer, 2014; Durlak & Lipsey, 1991; Hedges, 2007; Salkind, 2007).

2.2. Data Collection and Determining of Inclusion Criteria

In the research, the keywords "digital story", "digital storytelling", "attitude", “dijital hikâye”, “dijital öykü” and “tutum” were used. Using these keywords, related studies were searched in ULAKBİM TR Index, ERIC, Web of Science, EBSCOhost, Google Academic and YOK (Council of Higher Education) Thesis databases. The data of the research were collected

in April 2020. As a result of the researches, 21 experimental studies investigating the effect of digital story-based applications on students' attitudes were found.

The criteria for inclusion of studies in meta-analysis are provided below:

1) Research must be conducted between the 2000 – 2020.

2) Studies must be published in either Turkish or English.

3) Researches should be published as postgraduate dissertation or scientific article.

4) Statistical data on the validity and reliability of the measurement tools used in the research should be included.

5) The courses should be taught by using the digital story method with the students in the experimental groups in the researches as well as one of the other teaching methods with the students in the control groups.

6) The effects of using digital stories on students' attitudes should be investigated.

7) The statistical information required to calculate the effect sizes for each study should be provided.

The studies reached as a result of the first review were re-evaluated according to these criteria and 8 studies (articles and theses) were not included in the scope of meta-analysis since they did not meet these criteria. After these reviews, a total of 13 different studies that were found to be compatible with the above criteria were included in the scope of meta-analysis. In one of these studies, it was observed that the effect of digital story on attitude towards more than one case was investigated, and attitudes towards each case were regarded as separate research and included in the meta-analysis. Thus, starting from these 13 studies (articles and thesis) included in the scope of meta-analysis, the effect sizes of a total of 14 different studies in meta-analysis were calculated for the topic of the effect of the digital story on students' attitudes.

2.2.1. *Coding the Data and Ensuring the Validity and Reliability of the Coding Process*

Before starting the meta-analysis, a coding form was created to outline the articles and postgraduate dissertations about the digital story method. Information on this form is as follows:

• The identification of the study (name, author, year of publication, and type of publication)

• Study area

• Subject of the study

• Study design, method, technique

• Duration of experimental operations

• Sample size of treatment and control groups

• Teaching level and grade level of the study group of the research

• Availability of validity and reliability information about measurement tools used in the study.

The coding made in this section are of great importance in order to prevent errors in data entry. In order to ensure the reliability of the coding, the coding of the related researches were completed by two academicians, one academician with the title of doctor in Turkish education, and one academician with the title of doctor in the field of measurement and evaluation. On the other hand, a common decision on the subject was reached by coming together to resolve different opinions on coding between academicians. The reliability formula of Miles & Huberman (1994) was used to express the reliability of the coding statistically. As a result of the estimations, the reliability rate was found to be 96%. This result shows that the coding is reliable.

In this study, a total of 14 studies were included in the meta-analysis. Descriptive data for the related studies are provided in Table 1

Table 1: Descriptive information on studies examining the impact of digital story applications on students' attitudes

		Frequency	**Percentage**
Type of The Study	Article	4	28.57%
	Dissertation	10	71.42%
Study Year	2019	3	21.42%
	2018	1	7.14%
	2017	4	28.57%
	2016	2	14.28%
	2015	2	14.28%
	2013	2	14.28%
Level of Education of the Sample Group	Kindergarten	1	7.14%
	3rd Grade	1	7.14%
	4th Grade	1	7.14%
	6th Grade	7	50%
	7th Grade	1	7.14%
	9th Grade	1	7.14%
	10th Grade	1	7.14%
	Associate Degree First Year	1	7.14%
Sample Size	$31 \leq N \leq 50$	3	21.42%
	$51 \leq N \leq 70$	7	50%
	$71 \leq N$	4	28.57%
Application Duration	$1 \leq S \leq 10$	10	71.42%
	$11 \leq S \leq 20$	3	21.42%
	No Information	1	7.14%
	Total	14	100%

When Table 1 is analyzed, it is seen that a total of 14 studies, 10 of which are postgraduate education dissertations (71.42%) and 4 articles (28.57%), are included in the meta-analysis. Considering the years when these studies were published, it is seen that the most studies were done in 2017. In 2017, 4 (28.57%) studies were conducted investigating the effect of digital story use on students' attitudes. Looking at the other years, respectively, it is seen that 3 studies (21.42%) were carried out in 2019, 1 (7.14%) study was conducted in 2018, and 2 studies (14.28%) were conducted in each year of 2016, 2015, and 2013. When the education levels of the sample groups of the studies are examined, it is observed that 7 (50%) studies were carried out with 6th grade students, which is half of the research included in the meta-analysis. 1 study (7.14%) was carried out with Pre-School students, 3rd Grade students, 4th Grade students, 7th Grade Students, 9th Grade Students, 10th Grade Students, and associate degree freshman students. When the sample sizes of the studies analyzed within the scope of meta-analysis are examined, the number of students in the sample group of 7 (50%) of 14 studies is in the range of $51 \leq N \leq 70$. It is seen that 4 (28.57%) of the number of students in the sample group of the

remaining 4 studies were in the 71 ≤ N range, and the number of students (21.42%) in the sample group of 3 studies were in the range of 31 ≤ N ≤ 50. When the application periods of 14 studies are examined, it is seen that the application period of 10 studies (71.42%) covers a period of 1 to 10 weeks. While the application period of 3 (21.42%) of the remaining 4 studies was between 11-20 weeks, no information was given about the application period of 1 study (2.43%).

The effect size values of each of the 14 studies included in the meta-analysis were estimated by the researcher. The effect size value of each study was calculated by making use of statistical data (weighted averages and standard deviations; t value; p value, U value, and sample size of experiment - control groups) presented in different types of studies (While calculating the effect size values of the studies, "https://www.psychometrica.de/effect_size.html" and "https://campbellcollaboration.org/research-resources/effect-size-calculator.html" websites were used). The sample size gathered through the studies included in the meta-analysis is given in the table below.

Table 2: Total sample size in experimental and control groups achieved through individual studies

	TREATMENT	**CONTROL**
N (Sample Size)	496	492

When Table 2 is examined, a total of 988 students were reached, 496 of which were in the experimental group and 492 were in the control group, through 14 studies included in the meta-analysis.

2.3. Analysis of the Data

In the study, where all analyzes are performed with Comprehensive Meta-Analysis (CMA) software, test of homogeneity was performed to determine which model (fixed effects / random effects) should be performed. Whether the studies examined within the scope of meta-analysis were distributed homogenously or heterogeneously were analyzed with Q value and I2 statistics. The effect size value and variance value of each study were calculated by the researcher one by one, and the format, where the common effect size value can be calculated by entering the effect size and variance values, was selected while entering the data into the CMA software. The effect sizes were expressed using the Cohen d coefficient and all calculations were performed in a 95% confidence interval. When interpreting the effect sizes, Cohen *et al.* (2011) 's criteria were taken into consideration (Dinçer, 2014).

-0.15 ≤ Effect size value ≤ 0.14 (Insignificant Effect),

0.15 ≤ Effect size value ≤ 0.39 (Weak Effect),

0.40 ≤ Effect size value ≤ 0.74 (Medium Effect),

0.75 ≤ Effect size value ≤ 1.09 (Strong Effect),

1.10 ≤ The magnitude of the effect value ≤ 1.44 (Very Strong Effect),

1.44 > Effect Size value (Excellent Effect)

Whether the meta-analysis study has publication bias, funnel plot graphic, Duval & Tweedei's trim and fill method, Rosenthal's safe N statistic, Orwin's safe N statistic, and Mullen, Muellerleile and Bryant's publication bias resistance formula separately analyzed.

2.3.1. *Heterogeneity Test and Meta-Analysis Model*

While determining which model should be used in meta-analysis studies made according to two different models as fixed effects model and random effects model, it is checked whether the studies included in the meta-analysis are homogeneous or heterogeneous. If the studies included in the analysis are homogeneous, the fixed effects model is used, and in the heterogeneous structure, the random effects model is used. Accordingly, to determine which model will be used in the study, tests for heterogeneity were conducted on 14 studies included in the meta-analysis and the results are presented in the table below.

Table 3: Test of homogeneity results according to fixed effects model

Model	Average Impact Size Value (ES)	95% Confidence Interval for Effect Size		Standard Error (SE)	Homogeneity Value (Q)	df (Q)	p	I^2
		Lower Bound	Upper Bound					
Fixed Effects Model	0.69	0.56	0.82	0.06	31.34	13	0.00	58.52

According to Table 3, the Q value was found to be 31.34 as a result of analyzing the homogeneity values of the individual studies included in the meta-analysis according to the fixed effects model. According to the x^2 table, the critical value of 13 degrees of freedom at the level of 95% significance is 22.36. These results show that 13 degrees of freedom of Q value (31.34) are greater than the critical value of the chi-square distribution (x^2 = 22.36 for df = 13). This result shows that the individual studies included in the meta-analysis have a heterogeneous structure. In addition, the 58.52% value obtained as a result of the calculation of the I^2 value indicates that the studies included in the scope of meta-analysis are of different structure, that is, high level of heterogeneity. Finally, when Table 3 is examined, it is seen that p value is 0.00. A p value of less than 0.05 indicates that there is a significant difference between individual studies, that is, the studies are heterogeneous. Thus, the heterogeneity of the study was demonstrated using p value.

Since the individual studies included in the scope of meta-analysis show a heterogeneous distribution, the analysis of the study was made and interpreted using the random effects model.

Table 4: Average ımpact sizes and confidence interval lower-upper values by random effects model

Model	Average Impact Size Value (ES)	95% Confidence Interval for Effect Size		Standard Error (SE)	Homogeneity Value (Q)	df (Q)	p	I^2
		Lower Bound	Upper Bound					
Random Effects Model	0.69	0.49	0.90	0.10	31.34	13	0.00	58.52

When Table 4 is analyzed, as a result of the analysis performed according to random effects model, the average effect size value was calculated as 0.66 and the standard error was estimated as 0.10. The lower bound of the effect size in the 95% confidence interval is 0.49 and the upper bound is 0.90. Based on Cohen *et al.* (2011), this result demonstrates that the lessons taught using a digital story have a moderate effect on increasing students' attitudes. The positive effect size value (+0.69) shows that the procedure is in favor of the experimental group in which

the lessons are taught using digital stories. The forest plot showing the distribution of the calculated effect size value for each study according to the relevant model is given in Figure 1.

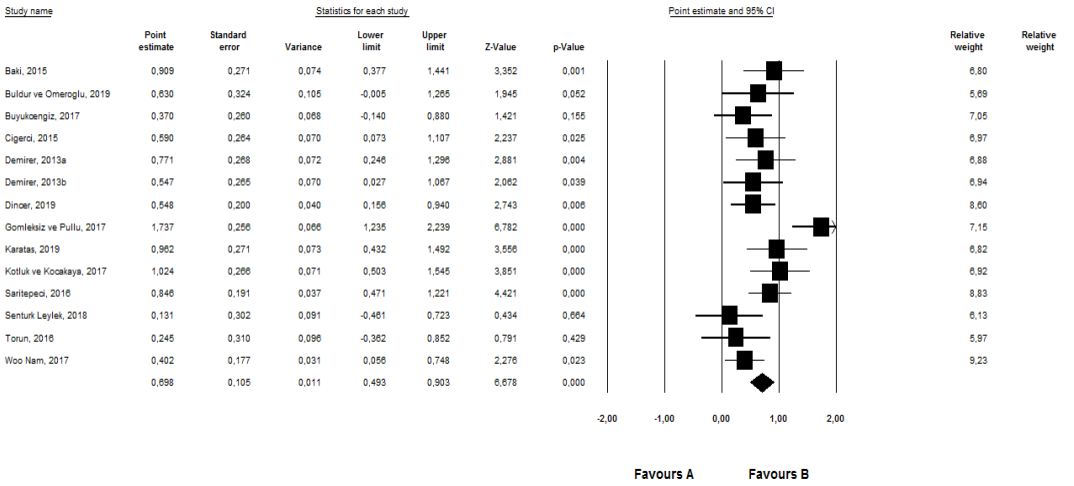

Figure 1. Forest plot showing the effect size of the research according to the random effects model

The black squares in Figure 1 show the effect size value for each study, and the lines next to the frames show the lower and upper bounds of the effect size value for each study in the 95% confidence interval. The percentages of weight on the right side of the graph represent the impact rate of each research on the meta-analysis result. When Figure 1 is examined, it is seen that the study with the widest confidence interval is Buldur & Ömeroğlu (2019), and the study with the narrowest confidence interval is Woo Nam (2017). As a result of the analysis of the weight of the studies on the meta-analysis result, it is observed that the study with the highest weight was Woo Nam (2017) with 9.23% and the study with the lowest weight was Buldur & Ömeroğlu (2019) with 5.69%. Other studies have a similar percentage of weight on meta-analysis results.

When the data on the effect sizes of the studies included in the scope of meta-analysis are analyzed, it is understood that the study with the smallest effect size value was Şentürk Leylek (2018) with 0.13, and the study with the largest effect size value was Gömleksiz & Pullu (2017) with 1.73. When we look at the overall results of the effect sizes, it is seen that all the studies included in the meta-analysis have a positive effect. The fact that all the studies have a positive effect shows that the classes taught using the digital story method have an effect in favor of the experimental groups.

2.3.2. *Research Validity and Publication Bias*

The biggest problem for meta-analysis studies is publication bias. The validity and reliability of meta-analysis studies with high publication bias are questioned. Funnel plot was used to determine the publication bias of the studies included in the meta-analysis. The funnel graph showing the publication bias in this study is presented in Figure 2.

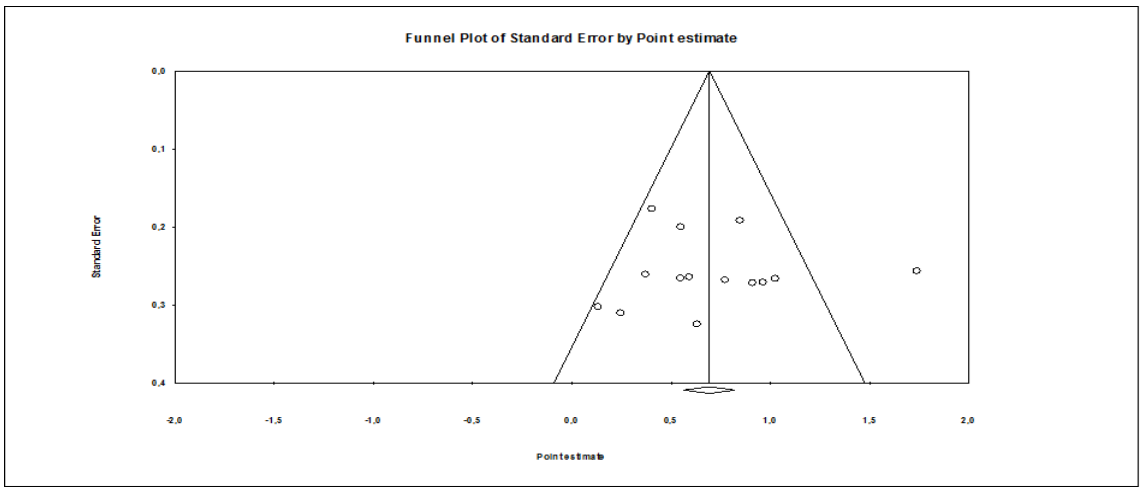

Figure 2. Funnel plot for publication bias

When Figure 2 is examined, it is observed that almost all of the studies included in the meta-analysis are collected in the funnel plot. This indicates that the studies included in the analysis have high effects on the outcome of meta-analysis. The line in the middle of the funnel expresses the overall effect and the researches included in the meta-analysis are expected to cluster around this line. When Figure 2 is examined, it is seen that the studies included in the meta-analysis cluster around the line and in the funnel. However, it is seen that there is one study that has spread out of the funnel. It is also seen in Figure 2 that the vertical line showing the combined effect size of the studies is distributed to the left and right sides in a symmetrical structure. However, it should be noted that there are studies that disrupt the symmetrical structure on the left side of the funnel. The results of this analysis bring to mind the suspicion that the studies included in the meta-analysis may have little publication bias. The trim and fill method of Duval and Tweedie have been used to make the funnel plot more symmetrical. According to the results obtained, 2 artificial studies have been added to the right side of the funnel in order to balance some of the studies that cause publication bias on the left side of the funnel so that the funnel plot becomes symmetrical. The new effect size value calculated with the addition of these studies is 0.74. The new funnel plot, which appeared with the use of the trim and fill method of Duval and Tweedie, is presented below.

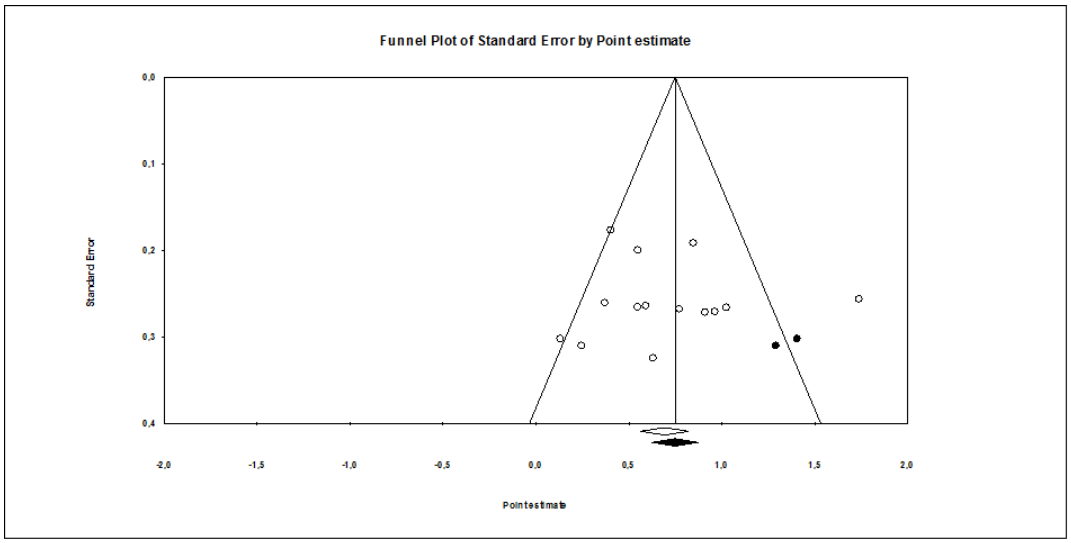

Figure 3. Funnel plot created using the trim and fill method of Duval and Tweedie

According to the trim and fill method of Duval and Tweedie, the low number of artificial studies that should be added in order to provide symmetry means that the publication bias of meta-analysis is also low. Here, two studies added to the funnel plot indicate that there is no publication bias in the meta-analysis conducted, even if this bias is very low.

The publication bias of the study was tested with the fail-safe N statistics of Rosenthal, and the related results are presented in Table 5.

Table 5: Rosenthal FSN calculation for meta-analysis examining the effect of the digital story method on students' attitudes

Bias Status	
Z Value for Observed Studies	10.35
P Value for Observed Studies	0.00
Alpha	0.05
Orientation	2
Z Value for Alpha	1.95
Number of Observed Work	14
FSN	377

According to Table 5, the fail-safe N number was calculated as 377. This value implies that 377 studies with zero impact level should be included in the meta-analysis in order for the common effect size calculated as 0.69 to be statistically insignificant. This result shows that the meta-analysis study conducted is resistant to publication bias.

Whether meta-analysis results have publication bias was also examined according to Orwin's fail-safe N statistics and, according to the results obtained, it was observed that 955 studies with zero effect level were required in order for the common effect size value calculated as 0.69 to be statistically insignificant. It shows that the results of the meta-analysis study conducted on the results obtained from Orwin's fail-safe N statistics are resistant to publication bias.

Finally, whether the study has publication bias was analyzed using the formula N / (5k + 10) of Mullen *et al.* (2001). According to this formula, in order for meta-analysis results to be resistant to publication bias, the value obtained using the formula must be greater than 1. When the necessary calculations were made, [377/(5*14+10)=4.71] was found to be greater than 1. This result indicates that the common effect size value reached as a result of the analyzes does not have publication bias.

3. Findings

3.1. Examining the Effect of Digital Stories on Student Attitudes According to Moderator Variables

In this section, the effect size value obtained by subjecting the researches comparing the effects of digital story and other teaching methods on students' attitudes to meta-analysis, whether they differed according to the type of publication, teaching level and type of class were examined.

In this context, first, it was examined whether the type of publication moderator variable made a significant difference on students' attitudes, and the respective results are summarized in Table 6.

Table 6: Investigation of the effect of digital story method on students' attitudes according to publication type moderator variable

Type of Publication	N	Average Effect Size Value (ES)	95% Confidence Interval for Effect Size		Standard Error (SE)	Homogeneity Value (Q)	df (Q)	p	.05 Confidence Level X^2
			Lower Bound	Upper Bound					
Article	4	0.94	0.32	1.56	0.31	0.96	1	0.32	3.84
Dissertation	10	0.62	0.46	0.78	0.08				

When Table 6 is examined, it was found that the publication type moderator variable does not make a significant difference on the effect size value (p>.05). Accordingly, students' attitudes do not differ according to the type of publication in which the studies are published. The common effect sizes of the studies published in all types of publications are significant, and the results are in favor of the experimental group.

Secondly, it has been examined whether the moderator variable of the academic level makes a significant difference on students' attitudes, and the respective results are summarized in Table 7.

Table 7: Investigation of the effect of the digital story method on students' attitudes according to the level of education moderator variable

Level of Education	N	Average Effect Size Value (ES)	95% Confidence Interval for Effect Size		Stnd. Error (SE)	Homogeneity Value (Q)	df (Q)	p	.05 Confidence Level X^2
			Lower Bound	Upper Bound					
Kindergarten	1	0.63	-0.00	1.26	0.32	18.37	4	0.00	9.48
Primary School	2	0.38	-0.06	0.83	0.22				
Middle School	8	0.66	0.49	0.83	0.08				
High School	2	0.68	0.07	1.28	0.30				
University	1	1.73	1.23	2.23	0.25				

When Table 7 is examined, it was determined that the moderator variable of the teaching level makes a significant difference on the effect size value (p <.05). Accordingly, students' attitudes differ according to the level of education they are studying. The university has the highest common effect size among all levels of education. It is followed by high school, middle school, kindergarten, and elementary school, respectively. Common effect sizes are significant in secondary, high school and university levels and in favor of the experimental group, but not in kindergarten and primary school levels.

Finally, whether the subject area moderator variable makes a significant difference on students' attitudes was examined, and the respective results are summarized in Table 8.

Table 8: Investigation of the effect of digital story method on students' attitudes according to the course type moderator variable

Course Type	N	Average Effect Size Value (ES)	95% Confidence Interval for Effect Size		Stnd. Error (SE)	Homogeneity Value (Q)	df (Q)	p	.05 Confidence Level X^2
			Lower Bound	Upper Bound					
Mathematical / Statistical	5	0.79	0.27	1.30	0.26	0.28	1	0.59	3.84
Non-Mathematical	9	0.64	0.47	0.81	0.08				

When Table 8 is examined, it was determined that the moderator variable of course type does not make a significant difference on the effect size value (p>.05). Accordingly, students' attitudes do not differ according to the course type variable. In both course types, common effect sizes are significant, and the results are in favor of the experimental group, where classes are taught with the digital story method.

4. Discussion, Conclusion and Recommendations

In this meta-analysis study, which aims to synthesize the results obtained from experimental studies investigating the effects of lessons conducted using digital stories on student attitudes, the effect size value of 14 studies was calculated. All of these 14 studies, whose effect sizes were calculated, were found to have positive values. This result shows that there is a significant difference in favor of students who receive lessons through digital stories. From this point of view, it can be interpreted that digital stories have much more positive effects on students' attitudes than other teaching methods (used in studies included in the meta-analysis). This situation; It shows that the use of the digital story method in lessons creates a much more positive learning and teaching process compared to other teaching methods in the studies examined within the scope of meta-analysis. In this context, it can be said that digital stories have important effects on the creation of a positive education and training process. Many reasons such as the inclusion of technology in the teaching process of digital stories, the opportunity for students to create their own stories, the fact that they save the education and training process from being dull and make it fun for the student can be cited as the reasons for the positive effect of digital story applications on students' attitudes. When the literature is researched, it is possible to find other studies that focus on the positive impact of digital stories on students' affective skills. For example, in the meta-analysis study conducted by Şahin (2021), which investigated the impact of digital stories on students' motivation, a similar result was reached with the result obtained from this study. The related research found that digital story applications affect students' motivation perfectly and positively. In many experimental studies (Baki, 2015; Demirer, 2013; Göçen, 2014; Karataş, 2019; Sarıtepeci, 2016; Woo Nam, 2017; Yang & Wu, 2012) in the literature, it is possible to see that the positive effect of digital stories on students' attitudes and all other affective skills has been found.

As a result of the analyzes made, it has been determined that the meta-analysis has a heterogeneous structure. Since the meta-analysis has a heterogeneous structure, all relevant analyzes were made according to the random effects model and the common effect size value of the meta-analysis was calculated as +0.69. According to Cohen *et al.*, (2011) this value means a moderate positive effect. Based on this result, it can be said that the digital story method has a moderate influence on students' attitudes compared to other teaching methods. The positive aspect of the effect size indicates that this medium-level effect is in favor of the experimental group students, where the lessons are taught with the digital story method. This positive effect of using digital stories in lessons on students' attitudes will undoubtedly be reflected in their academic success. When the literature is searched, it is possible to see the studies in which the results were obtained in this direction. For example, in the meta-analysis study conducted by Şahin & Çoban (2020) examining the effect of digital stories on the academic achievement of students, it was concluded that the teaching of the lessons with the digital story method had a strong and positive effect on the academic achievement of the students. In addition, it is seen that this positive and strong impact is emphasized in many experimental studies (Abu Elenein, 2019; Aljaraideh, 2020; Büyükcengiz, 2017; Çakıcı, 2018; Çiftçi, 2019; Dinçer, 2019; Liu *et*

al., 2018; Maureen *et al.*, 2018; Preradovic *et al.*, 2016; Şentürk Leylek, 2018; Torun, 2016; Verdugo & Belmonte, 2007; Woo Nam, 2017; Yang & Wu, 2012) investigating the effect of digital stories on students' academic achievement.

In order to determine whether the common effect size value calculated as a result of meta-analysis has publication bias, the funnel plot distributions of the studies examined within the scope of the research were investigated, and it was determined that almost all of the studies were clustered inside the funnel plot and at the edge of the plot. This indicates that the studies included in the meta-analysis have a high contribution to the calculated joint effect size. It is expected that the funnel plot created to avoid publication bias has a symmetrical structure. When the graphic created here is examined, it is seen that there are some studies that distort the symmetrical structure of the funnel plot. This indicates that meta-analysis results may have publication bias. However, in order to obtain more precise results in this regard, the necessary calculations were made using the publication bias formulas, and the results showed that the meta-analysis made was resistant to publication bias.

In the study; publication type, teaching level and course type variables were determined as moderator variables. It was analyzed whether the effect of digital stories on students' attitudes differed significantly according to these moderator variables. The results obtained are as follows:

Teaching level: The effect sizes obtained from the studies differ significantly in favor of the experimental group according to the education level in which the digital story activities are applied (p=0.00). According to the results obtained, the education level with the largest common effect size is the university. Then there is the ranking of high school, middle school, kindergarten, and primary school. Similar results were obtained in the meta-analysis study conducted by Şahin (2021), which investigated the effect of digital stories on students' motivation. According to Şahin (2021), there is a significant difference between different education levels in favor of the experimental group in terms of the effect of digital stories on students' motivation, and the education level with the largest common effect size is university. Therefore, the result of the study is similar to the result obtained from the study of Şahin (2021). In the study of Şahin & Çoban (2020), which deals with the effect of digital stories on the academic success of students, it was concluded that the impact of digital stories on academic success differed significantly according to the education level of the students and in favor of the experimental group. The level with the highest common effect sizes obtained from the study is kindergarten. In this context, the results obtained from the research are partially similar to the study by Şahin & Çoban (2020).

Publication type: The effect sizes obtained from the studies do not differ according to the type of publication in which the experimental studies in which digital story activities are investigated (p=0.32). Şahin (2021) is one of the studies investigating the differentiation status of digital stories according to publication type in the literature. In this study, the impact of digital story applications on students' motivation differs significantly according to the type of publication in which the studies are reported. In another meta-analysis study, Şahin & Çoban (2020), which can be compared in this context, it was concluded that the type of publication in which the experimental researches included in the meta-analysis were reported did not make a significant difference on the academic achievement of students. Accordingly, while the results obtained from the study are similar to Şahin & Çoban (2020), they do not similar to the results obtained by Şahin (2021).

Course area: The effect sizes obtained from the studies do not differ according to the fields of the courses in which the digital story activities are applied (p=0.59). Contrary to this result, Şahin & Çoban (2020) stated that the course areas where digital story activities are used make a significant difference in students' academic success. Accordingly, the findings obtained from the study do not overlap with Şahin & Çoban (2020).

With its structure that puts students at the center and activates more than one sensory organ at the same time, the digital story method emerges as a method suitable for contemporary education approaches and a subject area that has been frequently researched recently. The fact that the digital story has a moderate and positive effect on students' attitudes shows that this method is feasible in teaching different subjects in schools. It is thought that digital story applications enriched and supported by other methods and techniques will have much more positive effects on students' attitudes.

4.1. Recommendations

When the literature is analyzed, no meta-analysis studies investigating the general effect of digital story applications on students' attitudes were found. This meta-analysis study will be able to eliminate the shortcoming in the literature to a certain extent and will lead to other meta-analysis studies investigating the effects of digital story applications on students' different skills (incentive, concentration, resistance, etc.).

During the data collection phase of the research, some experimental studies could not be included in the meta-analysis because they did not share the statistical information necessary to calculate the effect size. For this reason, in all experimental semi-experimental studies that will investigate the effect of digital stories on students' mental and affective skills in the future, sharing the effect size value, application times, or statistical information necessary in this context will ensure that the meta-analysis studies to be carried out will be more comprehensive and reliable. In addition, in studies in which digital stories are used as an experimental intervention tool, reporting different demographic characteristics will enable different intermediate variable to be made analyzed and the results obtained to be examined comparatively.

The use of methods such as digital story and augmented reality that focus on students and bring them together with technology is of great importance in contemporary education systems. For this reason, it is considered that it is important for teachers to improve themselves on modern teaching methods such as digital story and augmented reality. On the other hand, institutions responsible for educational processes should include in-service trainings and courses that will train teachers accordingly, and offer teachers opportunities in this context. In addition, it is regarded as an important step in this context to include the necessary lessons in the curriculum to overcome the shortcomings of the education faculty students, who are the teachers of the future, in this field.

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