Journal of Teacher Education and Lifelong Learning (TELL)

Volume: 4 Number: 2 Year: 2022 Research Article ISSN: 2687-5713

The Effect of the Enriched Book (E-Book) Supported Instructions on the Students' Academic Success and Attitude to Physics

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Article Info

Article History
Received: 14/08/2022
Accepted: 05/11/2022
Published: 31/12/2022

Keywords:
E-Book,
Physics Education,
Achievement,
Attitude

ABSTRACT

This research was carried out to determine the effect of enriched book (z-book) supported instruction on students' academic success towards the pressure unit and their attitudes towards physics. In the research, a quasi-experimental research design with pre-test post-test control group was used. The research was applied to 42 students in two branches of the 10th grade students studying at Vocational and Technical Anatolian High School in the Suluova district of Amasya province in the 2021-2022 academic year. In the research, a physics achievement test consisting of 20 questions, the validity and reliability of which was tested with a pilot application, was used. In the process, the pressure unit was explained to the experimental group students by using Z-book supported teaching. Subject gains were given to the control group by using the current curriculum. At the end of the process, it was analyzed whether there was a significant difference in the academic achievements and attitudes of the students in the experimental group towards the physics course. According to the results of the analysis, it was determined that the academic achievement of the students was significantly different from the students in the experimental group who received e-book supported education from the students in the control group who received traditional lectures. It was concluded that there was no significant change in the attitudes of the students towards the Physics course in both groups

Citation: Bağçeci, Z., & Korkmaz, Ö. (2022). The Effect of The Enriched Book (E-Book) Supported Instructions on The Students' Academic Success and Attitude to Physics to The Pressure Unit. *Journal of Teacher Education and Lifelong Learning*, *4*(2), 275-288.

INTRODUCTION

It is known that Physics has an important place in science and education programs. Physics is known as a branch of science that expresses cause and effect relationships in our environment scientifically and examines the interaction of matter and energy (Aycan & Yumuşak, 2003). The science of physics contributes to the developing science by examining the events in nature (Wambugu & Changeiywo, 2008). Therefore, understanding and interpretation of physics is important. However, physical science, by its nature, includes abstract concepts and is difficult to understand by students.

It is known that physics is among the courses that students have difficulty in understanding from time to time because it includes abstract concepts. The important thing is to transform abstract concepts into concrete ones and make them comprehensible (Lakoff & Johnson, 1980: 115). For this reason, the use of visual content is an important situation in concretizing abstract concepts in the subject content (Kruteskii, 1976). One of the most important goals of the physics course is to provide students with an understanding of basic physics concepts and to enable students to be successful in this field. Studies have revealed that the inadequacy of teaching methods, time factor, material deficiencies, students' lack of knowledge and teacher characteristics are the factors that most affect the learning status of students (Bozan, Küçüközer & Işıldak, 2008). Using technology in physics lessons can increase the academic success of students. The use of technology products such as smart boards and similar tools in classrooms is very important (Buzkan, Ersoy, Çiço & Ceni, 2016). It is inevitable that the books used in teaching will be replaced by technological applications (Minor, Bracken, Geisel, & Unger, 2006). At the same time, the use of technology in Physics course can enable students to develop a positive attitude towards Physics course. It has been stated that using technology resources in the lessons increases the student's desire to learn (Mambaeva, 2018). Likewise, different methods and techniques used in teaching cause an increase in the level of education.

As a matter of fact, many technology-supported studies have been carried out to increase the success of students in Physics lessons. It has been determined that these studies increase student achievement. (Karamustafaoğlu & Aydın, 2005; Atayev, 2019; Öztürk, Akdeniz & Bakırcı, 2017; Erdem & Uzal, 2018; Tekdal & İlhan,2021). As it is known, computers have features that increase learning in learning and provide convenience to the teacher in terms of use. In this context, many software has been made in line with the need. One of them is the E-book. The 21st century is known as the age of science and there are rapid developments and changes in the fields of science and technology (Şahin, 2017). It is also stated that the self-confidence and competence of students who use technology actively during their education increase (Rugayah, Hasbim, &Wan, 2004). It is said that the use of technology in students' learning environments both increases the permanence of students and is useful in terms of time (Korkmaz & Ünsal, 2016: 32). FATIH (Movement to Increase Opportunities and Improve Technology) project, which started a new technological era in education in Turkey, was carried out. Thanks to this project, many technological tools and equipment support were provided to our schools and made available for use. FATIH project tried to provide equal opportunity in education and aimed to reduce the education and training gap in regions with different levels of development (Gökmen & Akgün, 2016). Ertekin (2016) examined the level of use of the smart board and the opinions of the teachers on the subject and concluded that the use of the smart board attracts the attention of the students, motivates them towards the lesson, is useful by the teacher, students are more active in the lesson and many technological features of the smart board can be used. Uzun and Sunal (2017) examined the perceptions created using smart boards in the Physics course in their research and concluded that the use of smart boards at a high rate created positive opinions. Some of the participants concluded that the use of interactive whiteboards did not make any difference in learning. Yıldırım (2016) talked about the importance of using smart boards in lessons and concluded that the use of smart boards had positive effects on students' attitudes. In addition, it is stated that the most important factor determining the way this project achieves the desired results is the teachers (Öçal & Şimşek, 2017).

With the developing technology, the content needed within the scope of the FATIH project also develops over time. Enriched books are also seen as important tools in providing these contents. E-book; It can be considered as digital content with many variable elements that appeal to many visual and auditory areas. These contents can also interact with the user (Bozkurt & Bozkaya, 2013). The E-book, defined by the Ministry of National Education, is defined as the digital material that comes together with the elements containing images and sounds added on the computer format of the textbooks used as a course tool in schools, without changing the content (MONE, 2011). The e-book is used as a digital media material that enriches the content with visual and technological elements and provides convenience to the user.

This research was carried out to determine the effect of enriched book (e-book) supported teaching on the academic achievement of the students in the pressure unit and their attitudes towards the physics course. In previous studies, it has been determined that abstract concepts in Physics course affect students' learning. It is thought that e-books can contribute to the concretization of abstract concepts. For this reason, the use of e-books, which are advantageous in terms of content, has been found appropriate. It is possible to come across studies on e-books in the literature. Yanlız Hakkari, Yeloğlu, Tüysüz, and İlhan (2007) used the material they created with the support of e-books in a unit in the chemistry course and concluded that this contributed significantly to the academic success of the students. Önder and Sılay (2016), in their study on pre-service teachers, concluded that the computer programs with increased content with e-books they used in laboratory activities caused a positive change in the attitudes of pre-service teachers. Varol, Özer and Türel (2014) conducted a study that is thought to contribute to the e-books to be developed by determining the strengths and weaknesses of the e-book, after examining the ideas for the z-book designed for the ARCS model. Ormancı (2018) used the example of an e-book in internet-supported science material in his study and concluded that the z-book caused an increase in students' conceptual understanding in the results he obtained in the research inquiry approach. In his study, Doğan (2018) examined the e-book applications of students in learning foreign languages and concluded that the e-book was useful for the instructors in his examination. However, it is seen that the studies in the literature on the use of e-books, which are a content produced by the development of technology, are quite limited. For this reason, the effect of e-book use was investigated in this study. Especially in the literature review, it was seen that the use of e-books was used in studies in many fields, but its success-enhancing effect was not discussed within the scope of Physics course.

Another researched subject is how e-book supported learning will affect students' attitudes towards Physics course. Attitude is seen as a substructure of behavior (Anderson, 1988). It was stated that for a meaningful Physics teaching, students should be willing to the lesson (Whitelegg & Paryy, 1999). In previous studies, it was investigated how different methods used in teaching affected students' attitudes towards Physics. However, there are no studies in the literature examining the attitude of e-book application on physics lesson. The effectiveness of different methods was investigated and some of the results were as follows. In their experimental research, Çağan, Kızılcık and Yavaş (2020) investigated how the physics attitudes of the students participating in the TÜBİTAK science fair changed and concluded that the attitudes of the students were positively affected, but there was a statistically significant change only in their anxiety levels. Pehlivan (2019) examined the attitudes towards Physics in science high schools and concluded that student attitudes were different according to grade levels. In his study, Pehlivan (2019) tested students' attitudes towards Physics with an inquiry-based teaching model and concluded that it had a positive effect on students. In their research, Moğol and Eke (2017) investigated the effect of cooperative learning method on physics course and as a result, they showed a positive trend in their academic achievements and attitudes. Hırça (2012) investigated the results of the context-based technique he applied in his study on students' understanding of the physics lesson and their attitudes towards Physics and concluded that the approach was more effective than the traditional method in student attitudes. In their study, Mun and Abdullah (2016) concluded that

the use of smart boards increased the success of students and their course attitudes changed positively. Hırça, Çalık and Seven (2011) examined the change in students' conceptual knowledge and their attitudes towards physics lesson based on the material developed according to the 5E method. In his study, he concluded that the materials caused a change in the attitudes of the students. Tekin (2013) stated that the use of smart boards within the scope of the Fatih project in Physics teaching changed both the success of the students in the physics course and their attitudes and opinions towards Physics. Şalgam (2009) investigated the effect of the problem-based learning method he used in the physics lesson and found that this application did not create a different situation or change in the attitudes of the students towards physics. The data obtained as a result of this research will determine how e-book supported teaching will change the attitudes of students towards physics lesson and will guide the future studies.

The digital content that started to be used in Turkey with the smart board technology will become more widespread in time. The effectiveness of using enriched books (e-books), which is one of them, could not take its place in the literature, and the researches were insufficient. This research was conducted to find answers to the questions of how effective the use of e-books is on the Physics lesson, how much it contributes to student success compared to the traditional lecture method, and how much it changes the attitudes of the students towards the physics lesson.

Problem Statement

What is the effect of enriched book (e-book) supported instruction on students' academic success towards the pressure unit and their attitudes towards physics?

Sub-problems

1. Does enriched book (E-book) supported instruction significantly contribute to the success of students in the Physics course?
2. Does enriched book (E-book) supported instruction significantly contribute to students' attitudes towards Physics lesson?

METHOD

Research Design

In this study, students' academic achievements in the pressure unit and their attitudes towards physics lesson in enriched book (e-book) supported instruction were examined using a quasi-experimental research design with pretest-posttest control group. This research design is used in studies where all variables cannot be controlled (Aydede & Matyar, 2009). In this framework, two groups were determined and randomly one of them was determined as the experimental group and the other as the control group.

Study Groups

The study group of the research consists of two classes randomly selected from the 10th grade students studying at a Vocational and Technical Anatolian High School located in a district center in Amasya in the 2021-2022 academic year. The study group was determined by easy sampling. It is stated that the studies will progress faster with the selection of this method (Yıldırım & Şimşek, 2008). The distribution of the study group by groups and gender is summarized in Table 1.

Table 1. *Distribution of the students by group*

Groups	Female	Male	Total
Experiment Group	0	21	21
Control Group	0	21	21

In the Vocational and Technical Anatolian High School, where the students in the experimental

and control group receive education, there are electrical and electronic technology, motor vehicle technology, machinery and design technology, metal technology and furniture and interior design fields. These areas train intermediate staff to respond to industrial needs and are preferred by male students. Therefore, there were no female students in the study group.

Data Collection Tools

The academic achievement test consists of 30 multiple choice questions. These questions were prepared in accordance with the level of the student by examining the achievements determined in the education program. A table of specifications related to the achievements was created, and the question distribution was made in accordance with the achievements. The distribution of 30 questions in the specification table is given in the table.

Tablo 2. *Achievement test specification table*

Gains	knowledge	Understanding	Practice	Analyses	Synthesis	Evaluation	Total
"Explains the variables on which the concepts of pressure and pressure force depend on solids, static liquids and gases".	1, 2, 3, 4, 5, 7, 11 14, 15, 6, 17, 19, 25, 26	6, 8, 10, 24, 29, 28	9, 12, 13, 30				24
"Relates flow velocity and fluid pressure in fluids".		18, 20, 21, 22, 23, 27					6

It was aimed to determine the effect of the Enriched Book (e-book) application used in the research on the academic success of the students in the Physics course. For this purpose, a draft scale form consisting of 30 questions was created by the researcher within the scope of the 'Pressure' unit. The obtained scale form was examined by two field experts and their evaluations regarding content validity and suitability of the items were taken. In this direction, necessary corrections were made and the draft scale form was given its final form. A pilot study was conducted by applying the prepared draft scale form to 102 11th grade students. As a result of the pilot study, items with a discrimination index below 0.30 were removed from the test and a test consisting of 20 items was obtained. At the end of the pilot study, the Kr-20 value of the test was determined as 0.8165, the average difficulty index was determined as 0.47, and the distinctiveness values of the questions are summarized in Table 3.

Table 3. *Discrimination levels of achievement test items for physics course*

Item No	Discrimination	Item No	Discrimination
I1	0,51	**I11**	0,33
I2	0,59	**I12**	0,51
I3	0,40	**I13**	0,51
I4	0,51	**I14**	0,55
I5	0,59	**I15**	0,62
I6	0,70	**I16**	0,51
I7	0,40	**I17**	0,62
I8	0,77	**I18**	0,37
I9	0,62	**I19**	0,44
I10	0,62	**I20**	0,40

Accordingly, it can be said that the scale can measure the academic achievement of the students in the Physics course in a valid and reliable way.

In this study, the Physics Attitude Scale prepared by Tekbıyık and Akdeniz (2010) was used to analyze students' attitudes towards physics lesson. The scale consists of 4 factors and 30 items. It was prepared in a 5-point likert type. The factor names are Importance, Comprehension, Need and Interest. There are 10 items in the Importance factor, 7 items in the Comprehension factor, 7 items in the Needs factor, and 6 items in the Interest factor. It was determined that the factor loads of the items were between 0.532 and 0.812. The 4 factors explain 48% of the total variance. Cronbach Alpha coefficients of the factors; 0.838, 0.795, 0.749, 0.717 and 0.873 for the whole scale.

Experimental Process

In the experimental group, training was carried out using the Pressure Unit, enriched book (e-book) for 4 weeks and 2 hours a week. The e-book published by Çap Yayınları was used in the experimental process. The tools in the e-book were tried to be used effectively during the lecture. In summary, the applications made according to the weeks in the experimental group are as follows:

1. Week

Gains: Explains the variables that the concepts of pressure and pressure force depend on in solids, stagnant liquids and gases.

a) "Students are provided with examples from daily life of the effects of pressure on our lives. The effects of pressure on state change are emphasized".

b) "Mathematical models of solid and stagnant liquid pressure and pressure force are given. It does not enter into components and mathematical calculations".

Under the title of solid pressure in the e-book, the definition of solid pressure, the unit table, and the physical expression of solid pressure were explained to the student. The force diagrams were given to the student over 3 figures under the title of solid pressure applications. Example images from the z-book are given in Figure 1 and Figure 2.

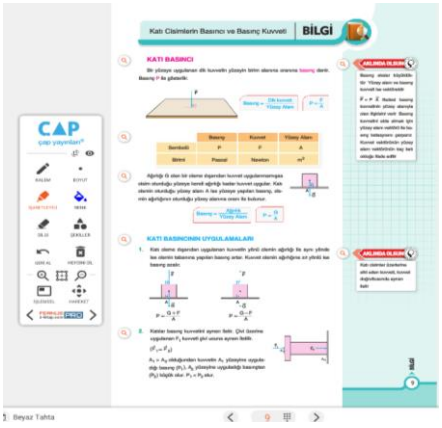

Figure 1. *Pressure and Compressive Force of Solids*

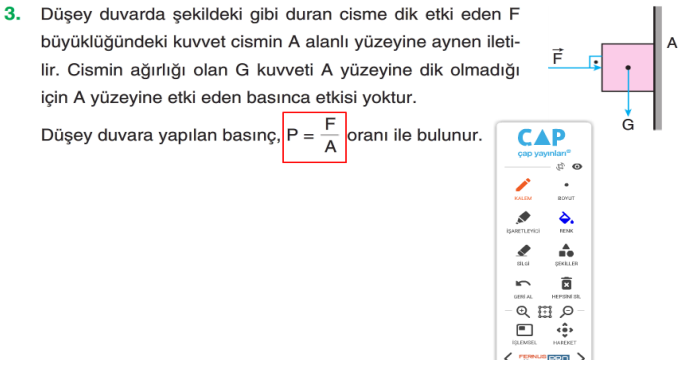

Figure 2. *Pressure Force Diagram*

The effects of pressure on daily life are exemplified by 5 items in the e-book. The effects of pressure on phase change were explained with examples from daily life. The application area diagram questions, table fill-in-the-blank and problem questions on the 12th and 13th pages of the e-book were solved with the active participation of the students by using the e-book features. These pages are given in figure 3 and figure 4.

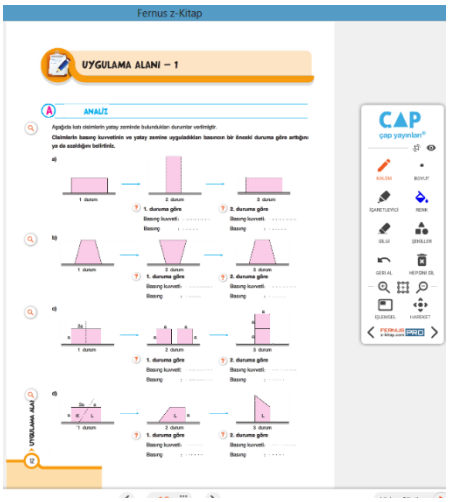

Figure 3. *Basınç diyagramı etkinlikleri*

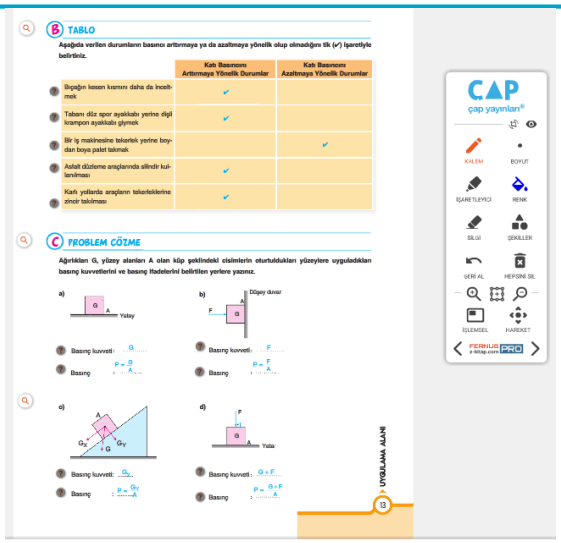

Figure 4. *Katı basıncı alıştırma-2*

The end-of-unit questions on pages 14-18 of the e-book were solved using the video feature. The reinforcement questions on pages 17-18 were given to the students as homework. On page 24, the static fluid pressure variables are obtained. Fluid pressure variation was interpreted with graphs. On page 34, the pressure force variables were examined, and the activities and graphics on page 35 were examined with e-book auxiliary tools.

2.Week

Gains: c) "The Torricelli experiment is explained and the difference with capillarity is indicated".

ç) "Information about barometer, altimeter, manometer and bathymeter, which are measuring instruments working with pressure effect, is given".

d) "Pascal's Principle is mentioned. Mathematical models of gas pressure and Pascal's Principle are not given".

The toricelli experiment is explained along with the open-air pressure on pages 49 and 50 of the e-book. The sample form of the outdoor pressure in the e-book from daily life was examined with the students. The toricelli experiment and capillarity comparison tables in the e-book were provided to be interpreted by the students. The definitions of pressure measuring instruments on pages 50 and 51 were made and their visuals were examined. The areas of use in daily life were mentioned. Pascal's principles are examined on pages 41 and 42. Pressure changes on the vessels were interpreted. The questions at the end of the chapter were solved with video support.

3. Week

Gains: Establishes a relationship between flow velocity and fluid pressure in fluids.

a) "By using experiments or simulations, a connection is established between cross-sectional area, pressure and fluid velocity".

b) "The Bernoulli Principle is explained through examples from daily life (such as flying roofs, inverting umbrellas, doors closing hard in windy weather)".

c) "Mathematical calculations related to Bernoulli's Principle are not entered".

Bernoulli's principle on page 65 was derived by examining the relationship between velocity and pressure of fluids. The figures given in the e-book were examined. On page 65, the explanation of the bernoulli principle is provided by associating the examples in daily life with the principle.

4.Week

Gains: "The conveniences that fluid pressure can provide in daily life (such as the flying of airplanes) and the health and safety measures to be taken against its negative effects are emphasized".

The positive and negative effects of the examples given in the 3rd week were discussed. Information about security measures has been given. On pages 66, 67, 68 and 69, the end-unit questions were completed with the help of student active participation and video solutions.

The control group students were given the same gains in the experimental group by applying the current curriculum of the Pressure unit for four weeks, two hours a week. The achievement test prepared for the control group was applied as a pre-test. At the end of the four-week period, the same test was applied as a post-test. The physical attitude scale was also applied to the control group before and after the process. The following activities were carried out in the control group according to the weeks.

1.Week

The topics on pages 71 to 85 in the textbook provided by Mone were explained to the students using the direct lecture method. Solid, liquid and gas pressure definitions were made by the teacher, the variables were written on the board and the students were allowed to take notes. The sample questions in the book were solved by the teacher.

2.Week

The topics in the textbook, ranging from 85 to 91 pages, were explained to the students by using the straight lecture method. Torricelli experiment was drawn on the board and transferred to the student. The definitions of pressure measuring instruments were made by the teacher, and the students were allowed to take notes.

3.Week

The subjects in the course book, ranging from 92 to 95 pages, were explained to the students by using the straight lecture method.

4.Week

The unit evaluation questions on pages 105 - 108 of the textbook were solved by the teacher by writing them on the board.

Analysis of Data

SPSS program was used in the analysis of the data. Whether the physics achievement pre-test, which was prepared to measure academic achievement, which is the variables to be tested during the research process, shows normal distribution or not, was analyzed with the Kolmogorov Smirnov test and the findings are summarized in Table 4.

Table 4. *Experimental and control group achievement pretest and attitude pretest normality distribution analysis*

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	p	Statistic	df	Statistic
Achievement Pre-test	,145	42	,026	,960	42	,142
Attitude pre-test	,129	42	,077	,953	42	,082

When the table is examined, it is seen that the physics achievement pre-test does not show a normal distribution ($p= 0.026<0.05$), but the attitude towards Physics Lesson pre-test scores show a normal distribution ($p=0.086>0.05$). In addition, the normality levels of the data were investigated by examining the kurtosis and skewness coefficients and summarized in Table 5.

Table 5. *Experimental and control group achievement pre-test kurtosis and Skewness coefficients*

		Stat.	Sh
Achievement pre-test	Mean	33,10	2,561
	Media	30,00	
	Variance	275,552	

	Std. devieation	16,600	
	Minimum	5	
	Maximum	80	
	Ranj	75	
	Skewness	,482	,365
	kurtosis	,515	,717
Attitude Pre-test	Mean	90,14	2,962
	Media	90,00	
	Variance	368,467	
	Std. devieation	19,195	
	Minimum	30	
	Maximum	135	
	Ranj	105	
	Skewness	-,628	,365
	kurtosis	1,022	,717

Since the skewness and kurtosis coefficients are between −1.5 and +1.5 in Table 5, it was decided that it can be assumed to be normally distributed (Büyüköztürk, 2013). The achievement post-test and attitude post-test scores of the experimental and control group students were analyzed with the Kolmogorov Smirnov test whether they showed normal distribution. The findings are summarized in Table 6.

Table 6. *Experimental and control group achievement and attitude posttest normality test*

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	p	Statistic	df	Statistic
Achievement Post-test	,173	42	,003	,939	42	,026
Attitude Post-test	,111	42	,200*	,945	42	,041

When Table 6 is examined, it is seen that the achievement post-test scores do not show normal distribution (p= 0.03<0.05), but the physical attitude post-test scores show normal distribution (p=0.200> 0.05). It is necessary to look at the skewness and kurtosis coefficients in order to show the normal distribution feature. The findings are summarized in Table 7.

Table 7. *Experimental and control group achievement and attitude posttest kurtosis and skewness coefficients*

		Stat.	Sh
Achievement post-test	Mean	56,55	2,914
	Media	62,50	
	Variance	356,693	
	Std. devieation	18,886	
	Minimum	20	
	Maximum	85	
	Ranj	65	
	Skewness	-,446	,365
	kurtosis	-,863	,717
Attitude Post-test	Mean	91,95	2,602
	Media	90,00	
	Variance	284,388	
	Std. devieation	16,864	
	Minimum	48	
	Maximum	148	
	Ranj	100	
	Skewness	,420	,365
	kurtosis	0,880	,717

Since the kurtosis and skewness coefficients of the achievement post-test scores in Table 7 are

between −1.5 and +1.5, it is assumed that they show normal distribution. In this direction, it was decided that parametric tests could be performed on the data. Before the experimental application, it was investigated whether the groups were equivalent in terms of academic achievement and attitudes towards physics, and it was summarized in Table 8.

Table 8. *Equivalence of experimental and control group students in terms of academic achievement and Attitude in Physics*

	Groups	N	X	Sd	df	t	p
Achievement Pre-test	Experimental	21	37,86	13,470	40	1,919	0,062
	Control	21	28,33	18,326			
Attitude Pre-test	Experimental	21	89,57	20,422	40	−0,191	0,850
	Control	21	90,71	18,374			
F1: Importance	Experimental	21	3,0333	,65141	40	−0,480	0,634
	Control	21	3,1524	,93092			
F2: Understanding	Experimental	21	2,7891	,80890	40	0,602	0,550
	Control	21	2,6531	,64614			
F3: Need	Experimental	21	3,2177	,76880	40	0,444	0,659
	Control	21	3,1088	,81804			
F4: Interest	Experimental	21	2,8651	,90618	40	−1,903	0,281
	Control	21	3,1429	,73084			

In Table 8, it is seen that the achievement pre-test average of the experimental group is higher than the achievement pre-test average of the control group. However, it can be said that this difference is not statistically significant ($t_{(2-40)}$= 1.919, p> 0.05). Accordingly, it can be said that the academic achievements of the experimental and control groups before the experimental process were equivalent to each other. Whether the difference between the experimental and control group attitude pre-test scores was significant was analyzed with the independent sample t test. It was not determined that there was no statistically significant difference in the pre-test attitude scores of the groups towards physics ($t_{(2-40)}$= −0.191, p> 0.05). It was determined that the sub-factor scores of importance, comprehension, need and interest in the attitude pretest did not differ between the groups ($t_{(2-40)}$= −0.480, p> 0.05; $t_{(2-40)}$= 0.602, p>0,). 05; $t_{(2-40)}$= 0.444, p> 0.05; $t_{(2-40)}$= −1.903, p> 0.05). Accordingly, it can be said that before the experimental process, the experimental and control groups were similar in terms of their attitudes towards physics. In this framework, the effectiveness of the experimental process was tested by performing a t-test on the post-test scores for the effectiveness of the experimental process.

FINDINGS

To conclude whether enriched book (e-book) supported teaching contributes significantly to the academic success of the students after the experimental process, it is necessary to examine whether there is a significant difference between the achievement post-test scores of the students in the experimental and control groups. For this, analysis was made with independent sample t test. The findings are summarized in Table 9.

Table 9. *Findings on the effect of e-book application on achievement*

	Groups	N	X	Sd	df	t	p
Achievement	Experimental	21	62,38	14,108	40	2,081	0,044
	Control	21	50,71	21,464			

According to Table 8, the achievement post-test average of the experimental group is higher than the average of the control group. It was determined that there was a significant difference in the success of the experimental and control groups at the end of the experimental process ($t_{(2-40)}$= 2.081, p<0.05). Accordingly, it can be said that enriched book-supported teaching contributes significantly more to the academic success of students. The findings regarding the effect of enriched book (e-book) supported instruction on students' attitudes towards Physics lesson are summarized in Table 10.

Table 10. *Findings on the effect of e-book application on attitude*

	Groups	N	X	Sd	df	t	p
Attitude	Experimental	21	89,38	9,646	40	−0,988	0,329
	Control	21	94,52	21,819			
F1: Importance	Experimental	21	3,0286	,35376	40	−0,814	0,420
	Control	21	3,2048	,92654			
F2: Understanding	Experimental	21	2,9388	,42755	40	−0,085	0,933
	Control	21	2,9524	,59818			
F3: Need	Experimental	21	2,9796	,59468	40	−1,112	0,273
	Control	21	3,2517	,95073			
F4: Interest	Experimental	21	2,9444	,56108	40	−1,116	0,271
	Control	21	3,1746	,76099			

According to the findings in Table 10, it was seen that the attitude post-test mean score of the control group was higher than the arithmetic mean of the experimental group. However, this difference does not appear to be statistically significant ($t_{(2-40)}$= −0.988, p> 0.05). When examined in terms of factors, it was determined that there was no statistical difference between the groups in the mean of the factors of importance, comprehension, need and interest ($t_{(2-40)}$= −0.814, p> 0.05; $t_{(2-40)}$= −0.085, p>0 .05; $t_{(2-40)}$=−1.112, p> 0.05; $t_{(2-40)}$= −1.116, p> 0.05). Accordingly, it can be said that the enriched teaching practice using Z-books does not have a significant contribution to the attitudes of the students towards the physics course.

DISCUSSION

As a result of the research, it was determined that e-book supported teaching contributed significantly more to the academic success of the students but did not differentiate their attitudes towards the physics course. In his study, Budiyar (2017) determined that the e-book application was statistically significant for students' attitudes towards mathematics but did not only contribute to the academic success and motivation of students. Vardar (2022) investigated the effects of the e-book used in distance education on students' academic achievement, attitudes towards the course and motivation. It was observed that there was a decrease in the post-test results applied to the experimental and control groups after the process, compared to the pre-test results, and it was concluded that the students' perspectives on technology were negatively affected after using e-books. In the same study, it was concluded that the use of e-books increased the academic achievement of the students. Şanal (2016) concluded in his study that the use of e-books has a positive effect on students' reading comprehension. Henawy and Mansur (2013) concluded in their study that students learn information more easily by enriching the content of e-books used in education. It is said that the lesson is more efficient thanks to the multimedia materials used in the e-book. In addition, in some studies, content analyzes of e-books were made. Ekici and Yılmaz (2013) listed in their study that there are deficiencies related to the development of the content of e-books and that these deficiencies are the lack of an update board, the lack of determination of the necessary deficiencies and the inability to express them with the achievements in the textbooks.

The effects of using smart board technology on academic achievement and attitude have also been examined in studies. Saraç (2020) investigated the effect of using smart boards on the academic achievement of 6th grade students. As a result, it was seen that the use of smart boards increased the academic success of the students. İşcan (2018) also investigated the effect of using smart boards in Physical Education and Sports lessons on students' attitudes. As a result of this research, there was a statistically positive difference in the attitudes of the students. In addition, it was thought that students' motivation towards learning increased and their academic success would increase with these results. In

a study conducted by Wall Higgins & Smith (2005), students' opinions were taken to determine the effectiveness of using smart boards in learning. Students said that the smart board had positive effects on learning, their interest in the lesson increased, and learning enriched with visuals made learning easier. In addition, in this study, students stated that their interest in the lesson decreased due to technical problems on the smart board. Kennewel (2006) states in his study that the use of smart boards in the application of different teaching methods and techniques increases the success of the students in the course, their interest in the course increases and what they learn is more permanent. Hakkari (2016) developed materials for the Chemistry course in his study and concluded that this material, which he applied, increased the academic success of the students. Kuş Serin (2015) stated that the enriched materials used by the students in the lesson have a positive effect on their learning, and their motivation towards the lesson has increased. Banoğlu, Madenoğlu, Uysal, and Dede (2014) stated in their study that teachers' content of e-books is not sufficient to be used in teaching, and that they need to be enriched with more digital materials. Kelley (2011) determined in his study that students who use e-books increase their reading comprehension levels.

In the study conducted by Dulda (2009), the experimental research method was used. He concluded that the experimental group was more successful in the pre-test and post-test results he applied to the two groups. In addition, he argued that the application of simulation and interactive whiteboard support in vocational courses in vocational high schools in schools with equipment and financial inadequacies will contribute to learning, albeit a little. Marshall and Ruotole (2002) used textbooks in e-book format in their studies. Students used these e-books on tablets in order to be easily accessible. The aim of this research is to determine whether the students read these contents from the tablets. In order to determine this, the students were interviewed, and it was concluded that the short texts were read more and the marking options on the text were used more.

Within the framework of these results, it can be recommended to apply e-book supported teaching on physics course unit subjects at all levels of secondary education. It can be said that the e-book, which will be used not only in the Physics course but also in other courses, can contribute to the academic success of the students.

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