The use of project-based learning technology in the professional training of special teachers

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Abstract

In this study, it is aimed to create the use of project-based learning (PBL) technology in the vocational training of private teachers. The research was applied in the spring term of 2021–2022. The study, which was carried out with the participation of 178 special education teachers, was designed through the quantitative research model. In the study, special education teachers were given 4-week distance education and PBL training. In order to collect data in the study, the data collection tool created by the researchers who created the study was used. The findings collected from the data collection tool used in the research were added to the study in the form of tables and comments, when the results obtained are taken into consideration, it is seen that the use of PBL technology by the special education teachers is good and they will use this field in their education.

Keywords: Special education teacher, project-based learning, distance education;

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1. Introduction

It is known that a qualified educational environment in education can be effective and efficient when students learn by working together and making sense of the information according to their age and development characteristics. Nowadays, researches in the field of education reveal that students learn better when they are at the centre of information and actively access information (Begna, 2022). When the studies are examined, the studies carried out in the field of project-based teaching in our country in recent years concentrate on the effects of various learning approaches on students' learning. Among these, it is remarkable that the learning approaches in which students actively construct knowledge and work together stand out (Salama, Altıparmak, & Cubukcuoglu, 2021). When they are at the centre of special education teachers and connected with knowledge, they reach higher levels of thinking more easily. Emphasising on the project-based teaching model, they can go to the stages of comprehension, application, analysis, synthesis and evaluation beyond memorising and use their knowledge more functionally (Mohadesi, 2021). This study focuses on project-based learning (PBL) in all its aspects. Starting from the project, which is the main basis of PBL, it is discussed what PBL is. The PBL process and the role of the teacher in this process are discussed (Soedjono, Yusuf, & Yuwono, 2022). By revealing the useful and limited aspects of PBL, information on which learning environments it is suitable for is also presented. In addition, the effect of PBL on students' science and mathematics attitudes is also discussed, and the effect of its use on students' affective characteristics is revealed with the support of the literature (Rugh, Beyette, Capraro, & Capraro, 2021). Finally, the relationship between PBL and problem-based learning, which is often difficult to distinguish from each other, is discussed. It is hoped that this study will contribute to the literature on PBL.

PBL is an education and training model that focuses on concepts and scientific principles, which includes students' problem-solving skills and other meaningful learning, allows students to work on their own to construct their knowledge and to conclude their work in a realistic way and produce their own products (Khatsrinova, Pavlova, & Gorodetskaya, 2021). In the PBL approach, learning, as a requirement of its design-based and process-oriented structure, means the constant reorganisation of the learner's mental structure. As can be seen here, PBL is a learning approach that requires process-oriented and interactive classroom environments. These learning environments are technology-based learning environments where students construct and direct their own learning and thus develop their creativity; try to solve the problems they encounter in cooperation; decide on their success; bring life to the classroom; and families actively participate in the learning process (Liu & Zhao, 2021). In the PBL process, students can work individually or in groups. There is no specific lesson time to apply this approach. Students can work on their projects wherever and whenever at their convenience. The main philosophy of this approach is that the child lives life in the environment he lives in, even if it is small. Learners decide for themselves how to approach the problem and what activities to do. They collect information from a wide variety of sources and reach information by analysis and synthesis. Since students enjoy working with projects more and have the opportunity to learn by living, they understand the subjects better (Urinova & Abdullaeva, 2021). Students associate PBL with subjects such as mathematics, social studies, literature and science in order to find answers to open-ended questions and thus become excited for learning (Liu, Wang, Su, & Zhou, 2019). In PBL, the topics are linked to real life. In this context, it can be said that students' learning is unique and valuable because it is related to real life and they reach the information with their own efforts.

1.1. Related studies

Gómez-Pablos, del Pozo, and Muñoz-Repiso (2017) aimed to examine the opinions given by teachers in different schools about PBL, and as a result, most of the teachers found that PBL technology gave students activities and projects and encouraged active participation of students. In this respect, it is seen that PBL technologies provide benefits to both teachers and students.

In the study of Hira and Anderson (2021), considering the motivation of teachers and students to learn through online learning experiences and PBL technologies, they aimed to see how this approach presents itself as a candidate for learning during the pandemic, and as a result, motivation sharing basic principles with learning style. They have achieved positive results, such that they created a conceptual framework informed by their theories and that people who taught with a PBL approach before the pandemic and made the transition to teaching using this framework.

Bagheri, Ali, Abdullah, and Daud (2013) aimed to examine the effects of PBL strategy on students' self-learning skills in a system-based education course presented in the educational technology department, and as a result, the students taught using the strategy were found to be more self-directed compared to the students taught using the informatin technology strategy. They found that they performed significantly better in terms of learning skills.

From the studies mentioned in the related research section, it is seen that project-based instructional technologies provide benefits to the relevant parts and the audience. When these researches are considered in their entirety, it is seen that they are beneficial in related researches. Moreover, it is known that it will always be indispensable for a problem situation that each value in the research sheds light on the event and facts and continues on this plane.

1.2. Purpose of the study

In this study, it was aimed to create the use of PBL technology in the vocational training of private teachers, and answers were sought for the following questions regarding the general purpose determined regarding the problem situation:

1. What are the project-based teaching use cases of the participants participating in the research?

2. What is the distance learning situation of the participants participating in the research?

3. What is the purpose of using project-based instruction for the participants participating in the research?

4. Is there a difference in the PBL situations according to the gender variable of the participants participating in the research?

5. What are the views of the participants participating in the research on PBL before and after the study?

2. Method

In this section, the materials used in the study, data, data type, participant group, data collection tool, daily needed numerical data etc. are explained.

2.1. Research model

When the model part is examined in the research, it is seen that the researchers chose the quantitative research model. It is known that the quantitative research model or method is used in

studies to reveal and clarify the definitions and names of concepts, objects, facts and ideas determined by the group. In addition, this method is used to illuminate a situation, evaluate and define the relationship between events (Uzunboylu et al., 2022).

2.2. Working group/participants

The research was carried out in the 2021–2022 spring academic year. A total of 178 volunteer special education teachers, who continue their studies in Kazakhstan, voluntarily participated in the data of the research. All of the special education teachers continue their studies with online and distance education.

2.2.1. Gender

In this section, the gender divisions of the participants included in the study are given in Table 1.

Table 1. Distribution of the participants participating in the research by the gender variable

Gender	Male		Female	
	F	%	F	%
Variable	91	51.12	87	48.88

As presented in Table 1, it is seen that the distribution of the participants included in the research according to the gender variable is added by examining the information. It is seen that 48.88% (87 people) are female participants. In the gender section, the findings reflect the gender distribution of actual special education teachers.

2.2.2. Project-based teaching usage time of the participants

In this section, the project-based teaching usage times of the participants participating in the research were investigated regarding the problem situation and the values were digitised and the relevant information is given in Table 2.

Table 2. Project-based teaching usage times of the research participants

Project-based teaching	1–3 hours		4–6 hours		7 hours or more	
	F	%	F	%	F	%
Variable	11	6.18	54	30.34	113	63.48

When Table 2 is examined, the research problem of the participants about the status of project-based teaching time is seen. 6.18% (11 people) expressed using it for 1–3 hours, 30.34% (54 people) expressed using it for 4–6 hours and 63.48% (113 people) expressed that they used PBL technologies for 7 hours and above. In this context, it is seen that the participants prefer using PBL technologies for 7 hours and above in the research.

2.2.3. The time devoted to distance education and online education by the participants participating in the study

In this section, the situations related to the problem situation of the participants participating in the research regarding the PBL model of distance education and online education time allocation

were investigated and examined according to the time periods on a daily basis. Detailed information is given in Table 3.

Table 3. Time devoted to distance education by the participants participating in the study

Taking time for distance education	1–3 hours		4–6 hours		7 hours and above	
	F	%	F	%	F	%
Variable	9	5.06	38	21.35	131	73.59

In Table 3, the surveyed participants' PBL model for online training time allocation on a daily basis is examined. Detailed information is given in Table 3. In this context, 5.06% (9 people) expressed devoting 1–3 hours to distance education, 21.35% (38 people) expressed devoting 4–6 hours to distance education and 73.59% (131 people) expressed devoting 7 hours and more to distance education. In this context, it can be seen that majority of the participants preferred devoting 7 hours and more to distance education.

2.2.4. Age status

In this section, the age information of the special education teachers of the study group was examined and detailed information is given in Table 4.

Age Status Table 4.

Age	23–25		26–28		29 and above	
	F	%	F	%	%	F
Variable	101	56.74	59	33.15	10.11	18

When Table 4 was examined, the distribution of the participants participating in the study according to their age status was considered and the information related to this section was added to the table. In this context, 56.74% (101 people) were in the age range of 23–25, 33.15% (59 people) were in the age range of 26–28 and 10.11% (18 people) were aged 29 and above. In the age situation section, the findings reflect the actual distribution.

2.3. Data collection tools

In this section, it is seen that there is a data collection tool developed by the people who created the problem situation of the research within the research. The data collection tool has been simplified by removing unsuitable items from the study by examination of the experts in the field of project-based teaching for the participants participating in the study. It is seen that a personal information form called 'project-based teaching' measurement tool is used, which is applied to the participants participating in the study and developed by the researchers. The validity of the scope of the measurement tool developed was examined by five experts with the title of professor who conducted studies on distance education and project-based education, and unnecessary items were removed from the measurement tool and simplified and rearrangements were made.

1.   Personal information form (demographic data): In the personal information form, information such as gender, age, PBL, as well as usage times and usage environments for daily distance education are provided.

2.   Project-based teaching data collection tool: A 5-point Likert-type data collection tool was prepared for the development of PBL opinions of on special education teachers participating in the study. 18 items of the measurement tool consisting of a total of 23 items were used and 5 items were removed from the measurement tool, thanks to the experts' opinions. The opinions of special education teachers from two factorial dimensions, such as 'project-based learning' and 'online education and distance education', of the participants participating in the study, were sought. The Cronbach alpha reliability coefficient of the measurement tool as a whole was calculated as 0.87. The measurement tool is rated as 'I strongly disagree' (1), 'I disagree' (2), 'I am undecided' (3), 'I agree' (4) and 'I definitely agree' (5). The measurement tool was also collected from special education teachers in the form of an online environment.

2.4. Application

In this part of the research, it is seen that the application part is included in the study, and the application part is included in the parts such as how to plan and do it dimensionally, and it is seen that there is information about the dimensions definitively. The project-based instructional model in distance education with time and use cases showed that the application programme has been prepared on the Microsoft Teams by experts in the field of the environment on this activity. When the event studies are completed, special education teachers for project-based instructional model are scheduled to be shown with remote training videos and online content. During the 4-week training, private teachers will receive live lessons on field courses during the pandemic process by 'using distance education', 'project-based teaching technologies' etc. Such information was provided to special education teachers in the form of distance education, and special education teachers were expected to participate in this issue every week. After 4 weeks of training, an online measurement tool and an information form were applied to special education teachers, and the data were given in the tables in the findings section. The Microsoft Teams video conferencing application used by most of the education institutions and organisations is distributed through the programme, with a maximum of 65 special education teachers in each section. Each session had 45 minutes of training and 15 minutes of question and answer sessions, totalling 60 minute, processed in the form of online education. Special education teachers with tablets, phones, computers and microphone were expected to attend the training. In this study, the measurement tool applied to special education teachers was collected through an online questionnaire and transferred to the Statistical Package for the Social Sciences programme by coding them in the environment of calculation programmes.

2.5. Analysis of the data

In the analysis part of the data, statistical data obtained from special education teachers were analysed in the Statistics programme using frequency (f), percentage (%), mean (M), standard deviation (SS) and t-test with IRA. The data obtained from the programme are given in tables accompanied by numerical values, findings and comments.

3. Findings

In this section, findings related to project-based teaching and distance education use cases for the use of special education teachers participating in the research in their professional skills are given, and each finding of the research is presented in numerical values accompanied by values in this section.

3.1. Project-based teaching objectives of the participants participating in the research

In this part of the research, it is seen that the project-based teaching use purposes of the participants participating in the research are included, the use purposes are examined in headings and the relevant information is given in Table 5.

Table 5. Purpose of using project-based teaching by the participants participating in the research

Variable		F	%
Project-based teaching purpose of use	Preparing support for education	48	26.97
	Helping special education students	127	71.35
	Other	3	1.68
	Total	246	100

When Table 5 is examined, the purpose of the project-based teaching technologies of the participants participating in the study was investigated and it was seen that the relevant information was added to the table according to the problem situation of the research. In this context, 26.97% (48 people) chose to prepare support for education, 71.35% (127 people) preferred to help special education students and 1.68% (3 people) chose other reasons. In this context, it can be said that, based on Table 5, where the research uses to help special education students, most of the segments turn to the problem situation according to the problem situation, based on the problem situation.

3.2. PBL situations according to the gender variable of the participants participating in the study

In this part of the research, the research was conducted according to the project-based gender variable and detailed information is given in Table 6.

Table 6. PBL situations according to the gender variable of the participants participating in the study

	Gender	N	M	SD	Df	t	p
Project-based teaching technologies cases	Male	91	4.42	0.27			
	Female	87	4.34	0.34	78	−128	0.242

When Table 6 is examined, the project-based teaching technology situations of the participants participating in the study were examined according to the gender variable and it was found that there was no significant difference according to the gender criterion [Df (178) = −128, $p < 0.05$]. When the project-based situations of the participants participating in the study are examined, it is seen that male private education teachers have an average score of $M = 4.42$ in this area, while female private teachers

have an average score of $M = 4.42$ in project-based educational technology situations. In this context, it can be said that there is no difference between the scores of male special education teachers and project-based teaching model compared to female teachers in this study. It can also be said that the findings of the study show that male teachers have high scores.

3.3. PBL opinions of the participants participating in the study before and after the study

Table 7.

No	Variable	Pre-test 1		Post-test 2				
		M	SS	*M*	SS	df	*t*	*p*
1	I found the project-based teaching effective and understandable	3.41	0.82	4.42	0.52	178	−4.62	0
2	I found project-based teaching technologies understandable for special education	3.35	0.72	4.48	0.62	178	−5.42	0
3	It is understandable for students to see it in special education for project-based teaching technologies	3.42	0.69	4.46	0.52	178	−3.88	0
4	I understand project-based technology education better through distance learning	3.48	0.72	4.47	0.51	178	−4.42	0
5	Thanks to the project-based training, I will work harder to explain the lesson more successfully	3.39	0.85	4.42	0.59	178	−4.25	0
6	I have seen that there is an opportunity to teach project-based teaching concepts learning opportunities	3.49	0.72	4.43	0.54	178	−5.58	0
7	Project-based teaching I can express my ideas very easily with the help of technology in education	3.47	0.83	4.49	0.58	178	−4.28	0
8	I watch project-based teaching and distance learning videos over and over again	3.38	0.87	4.52	0.58	178	−3.75	0
9	I would like to use project-based teaching training classes in different courses	3.31	0.72	4.49	0.59	178	−3.71	0
10	I can connect to project-based teaching and distance learning from any smart device I want	3.37	0.82	4.58	0.54	178	−3.73	0
11	Project-based teaching and distance learning give me the opportunity to do it again	3.36	0.81	4.56	0.52	178	−3.61	0
12	Project-based teaching education The education I receive in classrooms allows me to improve myself	3.39	0.92	4.52	0.57	178	−4.01	0
13	I have gained a difference in my old habits towards the field with project-based teaching training	3.49	0.81	4.58	0.61	178	−5.62	0

14	Project-based teaching I take more responsibility for being more successful in educational classes	3.58	1.02	4.62	0.62	178	−4.61	0
15	Project-based teaching using education with a distance learning method allows me to better understand the lesson	3.51	0.69	4.42	0.63	178	−4.32	0
16	I believe that a positive bond has been formed between my students and me thanks to this technology education I have received Dec	3.42	0.72	4.53	0.63	178	−5.42	0
17	Project-based teaching with training, I can easily get used to any idea	3.45	0.82	4.53	0.52	178	−4.26	0
18	It is fun to study in the classrooms I have attended with technology education.	3.57	0.82	4.56	0.58	178	−5.71	0
	Overall average	3.43	0.79	4.50	0.57	178	−4.51	0

As shown in Table 7, the project-based instructional model's pre- and post-test results are examined; according to the high risk, a significant difference is observed ($p < 0.005$). Although a significant value was found in all statements, according to the results of the post-test, it is seen that the most obvious statement of the special education teachers participating in the study is 'I watch project-based teaching and distance learning videos over and over again', with a pre-test score of $M = 3.38$ and a post-test score of $M = 4.52$. The findings of the research also examined the pre-test and the most obvious expression of the special education teachers is 'I believe that a positive bond has been formed between my students and me thanks to this technology education I have received', with a pre-test score of $M = 3.42$ and a post-test score of $M = 4.53$. In addition, it is seen that the average pre-test score of 'I can connect to project-based teaching and distance education from any smart device I want' is $M = 3.37$ and the post-test score is $M = 4.58$.

Although positive results are seen for each item of the survey, the opinion 'Project-based teaching I can express my ideas very easily with the help of technology in education' had a pre-test average score of $M = 3.47$ and a post-test score of $M = 4.49$. Thanks to special education teachers, it is obvious that there was a bond with their students. In addition, among the opinions of special education teachers, 'Project-based teaching using education with a distance learning method allows me to better understand the lesson' had an average pre-test score of $M = 3.51$ and a post-test score of $M = 4.42$. In addition, in the opinions of special education teachers, 'It is fun to study in classrooms that I attended with technology education' had an average pre-test score of $M = 3.57$ and an average post-test score of $M = 4.56$. Finally, it is seen that the pre-test average of special education teachers is $M = 3.43$, while the post-test average is $M = 4.50$. In Table 7 we see that the ideas of special education teachers with project-based education have developed positively.

4. Discussion

In the studies conducted by Ortega-Sánchez and Jiménez-Eguizábal (2019), PBL is considered one of the most valuable methods for the development and acquisition of competencies at all levels of education. From an interdisciplinary and collaborative focus, students gain knowledge and skills through research tasks by responding to a problem or challenge in the form of a final product. PBL in the context

of the methodological implementation of specific teacher training, especially in the didactic curriculum relevant to contemporary social problems and social inclusion and vibrant for a discussion of the questions, and as a result they did research PBL methodologies, including active didactic potential, providing special information. Similarly, the PBL methodology, social and communicative competences, facilitates collaborative work in connection with the acquisition of technological competences. In this context, when combined with the research objectives of this value for students, they threw themselves to the forefront of special education teachers in their work, and they want to learn these technologies. It is seen that the results that have been achieved and it can be said in the discussion section of the research that the PBL methods used in the research benefit both areas.

In the studies conducted by Sintawati, Yuli Erviana, Bhattacharyya, Habil, and Fatmawati (2022), Industrial Revolution 4.0 is one of the qualifications that teachers should master. It can be prepared in the event that a teacher is a pre-service teacher at a university. The aim of this study was to determine the effect of PBL on primary school teacher candidates, and as a result, they concluded that PBL for teacher candidates is in the high range. The results of this research combined with the values of the research and compared to the research on distance education included training show that high values are reached. In the research, it is seen that these values are always one step ahead that will be a PBL model, and it is obvious that one will take a step forward.

Sudira, Nurtanto, Masrifah, Nurdianah, and Mutohhari (2022), in their study, defined the concept of education, the perception of vocational teachers to measure PBL in online learning. During coaching and training of vocational teachers, measuring the effectiveness was based on the characteristics of the subject, and as a result, the project-based approach to professional development teacher training and implementation of online learning resulted in the PDCE. Among the vocational teachers, the content, relevance, content, relevance, presentation and quality of content mastery and achieved very good results in relation to the aspects of time allocation. It was observed that when combining the value of this research in this context has been reached values observed in this study where almost the same value. In this context, it can be argued that the PBL model in the professional lives as teachers provides benefits.

5. Conclusion

The conclusion discusses the meaning of the digitising data interpreted; this is the most important data within a research and it is observed that the number of the participants in this research was reached because the facts and events; it would make sense that the number of participants is of no benefit to this value as the field type. In this context, when the first value in the research is examined, it is seen that 178 special education teachers participated and were included in the research. Another value of the research is that when project-based teaching is examined by giving usage times, it is seen that the participants prefer to spend 7 hours and more project-based teaching technologies. Another value of the research is that the use cases of the participants participating in the research used daily during the online training time allotted for the PBL model were investigated, and as a result, it is seen that the participants preferred more than 7 hours.

Another value of the research participants participating in the study of project-based instructional technology is used for where and for what purpose the research problem was investigated and most of the cut to help special education students towards problem according to the state that uses it is seen that the outcome is reached. According to the gender variable of the group surveyed, another value of a research, it is seen that no significant difference is reached, the outcome of the participants participating in the survey project-based situations are examined, where the average score is high for

this area for male special education teachers. In addition, women special education teachers in project-based instructional technologies in relation to their state of scores with high value are reached the conclusion that close to each other. The final conclusions of the study participants is the before and after study, i.e., project-based instructional model's pre- and post-test values. As a result, project-based instruction and distance education were carried out with videos again and again; they have this technology; education is positive; they believed they formed a bond with the students; regarding project-based instruction and distance education, one can connect from one's smart device whenever or wherever they want.

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