

Article

Project-Based Learning for Teacher Training in Primary Education

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Abstract: Teaching at the university is subject to continuous methodological change, which poses a significant challenge when assessing teaching methodologies. The main objective of this research was to analyze the impact that project-based learning (PBL) has on knowledge acquisition concerning the Didactics of Social Sciences. The study involved 290 students of the Primary Education Degree at the University of Cordoba, Spain. In order to collect information, a survey with a Likert scale (1–5) consisting of fifteen items was used. The results of the study show the need to make changes in traditional teaching—so deeply rooted in Social Sciences learning—and the methodological deficiencies that future teachers have in relation to active learning. In sum, the research provides an insight into good teaching practices implemented at the university for initial teacher training and the development of their professional skills.

Keywords: collaborative learning; didactic research; educational project; learning outcomes; skills; social sciences; teacher training; university studies



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1. Introduction

One of the most necessary challenges in university teaching is to rethink the teaching and learning process so as to achieve the most appropriate professional practice for novice teachers. Students are used to receiving expository, memoristic, and unmotivating sessions [1]. The work of Kilpatrick expanded the project method in education and confirmed that learning is more effective when it is based on experiences [2]. In this regard, Project-Based Learning (PBL) is a teaching method in which students learn actively and they explore real-world practices with a dynamic approach [3,4]. PBL is associated with meaningful learning and constructivism. In fact, one of the learning approaches that reflect the theory of constructivism is PBL [5].

Notwithstanding, the need for a change in the teaching of Didactics of Social Sciences is decisive in gradually converting the transmissive class into innovative and constructivist learning. In a certain way, students become familiar with educational intervention situations that improve their methodological education [6]. To achieve this, it is essential to change the conception of the teaching and learning process in relation to History and Geography contents. In this sense, traditional teaching hardly contributes to the development of capabilities, abilities, and skills that improve the professional environment of teachers in training. It is advisable to implement an active learning methodology in their training practices to complement more traditional teaching methods [7].

Innovation, research, and training are combined in this study. Thus, the project effectiveness has been achieved in an environment of active learning and collaborative work [8]. PBL motivates the students, and this motivation provides a high degree of commitment to autonomous learning, together with great performance in this sense. Knowledge construction and evidence-based learning are predominant factors in this didactic method, as shown in Figure 1. Teaching by discovery facilitates the role of the teacher as a counselor in the educational process, where the student collects, selects, analyzes, and solves different problems [9]. The students' needs are met by the research strategies they learn, which contrast with their transmissive skills. With this goal, the students delve deeper into certain

topics and simulated contexts to promote a more analytical and reflective research process and less memorization.

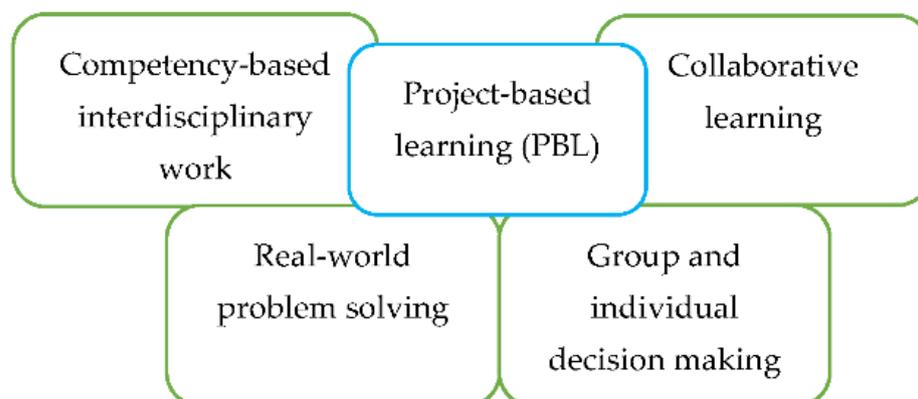


Figure 1. Characteristics of project-based learning (PBL). Source: Drawn up by the author.

Theoretical Framework

In recent decades, the results of implementing project-based learning (PBL) have led to greater student involvement and an approach to learning which avoids memorizing is practical and away from traditional teaching activities [10]. To strengthen this method at the university, professional skills, self-reflection, and interpersonal relationships must be promoted. Therefore, the use of PBL has been reflected in the scientific literature, generating a large number of papers in the field of university studies [4,11–15]. In the research conducted by Roessingh and Chambers [16], it was found that, as an educational project progressed, students had the chance to carry out tasks encouraging reflection, their needs, and their interests in order to analyze knowledge in a real learning situation. It is clear that, from a methodological perspective, this experience fostered autonomy in the students to acquire knowledge through the renewal of concepts, along with the freedom to choose a topic researched in the project. To this end, it is necessary to develop competency-based work to promote educational research in initial teacher training and to use cooperative learning strategies in the classroom [17].

Thus, curriculum development in the application of PBL is more time-consuming in relation to obtaining positive results in the students' learning [18]. However, this methodological change is not applied in the curricula, which hinders the implementation of active methodologies. In addition, the rigidity of the teaching programs makes it possible to structure a subject around a traditional method without considering any innovative and participatory methodology. In this sense, when designing the project, it was necessary to take into account the good results gathered by different authors who focus their research on the challenge of moving from a traditional model to a cooperative and dynamic method [19]. Likewise, through the development of a work project, students are involved in reinforcing their teaching skills and their commitment to a new way of learning. Notwithstanding, it is crucial to learn about the school's reality to implement an educational project which is the result of group elaboration.

On the other hand, project-based learning—together with having specific training in this methodology—allows teachers to have the time to plan and organize teaching according to the needs and concerns of their students. Despite this, one of the difficulties when implementing PBL in a university classroom is the lack of pedagogical training for teachers to propose more innovative and interdisciplinary curricular proposals [20]. Another disadvantage is the widespread use of the expository, conceptual method for university students' training [21]. Thus, in these circumstances, inquiry-based learning is not encouraged to learn how to teach Social Sciences. Here, traditional training presents the contents through an expository, receptive, and mechanical method that focuses on the teacher's discourse, so collaborative group work is not developed.

The reality is that different educational competencies are acquired through project-based learning, which has been a challenge for problem-solving in initial teacher training. From this constructivist approach, students are placed in a real, personalized, and cooperative environment. Thus, this proposal is intended to change the training process with the different phases of investigative and competency-based work. In this sense, the traditional lecture-based teaching system gives way to active and interdisciplinary learning that adapts to current teaching challenges [22]. Encouraging inclusion and self-learning improves the integration of practical and theoretical sessions. Anyhow, these measures are conditioned by the effort and involvement of the students in using PBL. Last but not least, its implementation has enabled us to analyze, on the one hand, whether traditional training is more highly valued than an active methodology and, on the other hand, whether the results of project-based teaching allow for significant learning experiences.

Therefore, the main goal of the research focuses on analyzing the perceptions of novice teachers about project-based learning. In order to achieve this, four specific objectives have been considered: (1) To analyze the role of students with respect to traditional methodology and active learning methods, (2) to identify the didactic resources used to teach Social Sciences, (3) to know the difficulties of methodological learning in order that future teachers acquire the necessary professional skills, and (4) to evaluate the theoretical-practical contents implemented in a Primary Education classroom.

2. Materials and Methods

2.1. Participants and Sample

The study population (N = 290) consisted of third-year students taking the subject “Didactics of Social Sciences” in the Primary Education Degree at the University of Cordoba, Spain. The participants are divided into 181 female (62.4%) and 109 male students (37.6%). The selection of this sample was non-probabilistic by convenience, and the average age was 21–23 years old. The students selected for the research had been previously trained with a traditional teaching model, but they had no knowledge of how to implement a participatory methodology, such as PBL.

2.2. Design of the Research

This research relied on a non-experimental quantitative design was used. This research instrument allowed gathering extensive information on both the methodological and professional training of the students in the Primary Education Degree. As Mills and Gay [23] point out, this type of design is used to analyze different variables in the educational field for evaluative and research purposes. For this reason, when planning this survey, different questions were elaborated to specify and discover the participants’ opinions, as well as their general vision in relation to working by methodological competencies. Furthermore, we think that, as a result, students would be interested in using an active learning methodology in their teacher training.

2.3. Data Collection and Analysis Instrument

A non-experimental survey consisting of fifteen items and a five-value Likert scale, from 1 (strongly disagree) to 5 (strongly agree), was used to collect information. The work of Tashakkori et al. [24] was considered in the elaboration and classification of the items. The survey was entitled “Perceptions of novice teachers on didactic methodologies” (Table 1). It was divided into two parts—the first one focused on implementing the traditional model in Social Sciences classes in Primary Education, and the second part analyzed the students’ opinions about the didactic function of project-based learning and its role as a participatory methodology.

Table 1. “Perceptions of novice teachers on didactic methodologies”. Source: Drawn up by the author.

First part of the survey on the use of traditional methodology	
1.-	I think that expository teaching only serves to learn theory by heart.
2.-	I consider that the traditional method allows me to learn the conceptual contents.
3.-	I would like to learn Didactics of Social Sciences with a more innovative methodology.
4.-	I think that learning the subject contents by heart does not allow me to interpret the Social Sciences.
5.-	I believe that the educational resources used with traditional teaching do not lead to meaningful learning.
6.-	I consider that the masterclass is the method used in all the subjects in the Primary Education Degree.
7.-	I understand that the written test is the only assessment instrument available when using an expository method.
Second part of the survey on the use of PBL	
8.-	I think that PBL is an appropriate methodology for my curricular training.
9.-	I understand that it is necessary to know about active learning methodologies.
10.-	I believe that my methodological training improved after implementing PBL.
11.-	I would like to make competency-based work part of my teaching and learning process.
12.-	I consider that collaborative project-based learning is essential in teacher training.
13.-	I believe that the main resources used in PBL are multidisciplinary.
14.-	I think that implementing an educational project favors both problem-solving and decision-making.
15.-	I understand that assessment in PBL has an investigative focus.

In contrast, the content of this survey was validated by three experts in Didactics of Social Sciences and training of competencies in active learning methodologies from three different universities. Data collection was carried out in the classroom during the students' school hours. The instrument was anonymous so that students could respond voluntarily without feeling identified. Finally, an Excel spreadsheet was used to process and interpret data, with the aim of analyzing percentages, frequencies, means, and standard deviation. All this allowed us to validate both the results of the survey and the objectives achieved in this research.

3. Results

To answer the first objective of the study related to the role of students in implementing traditional and active learning teaching methods, items 1 and 8 were selected. In Table 2, the results show that, for item 1, 77% of the students agree that the traditional methodology is expository, memoristic, and conceptual. For item 8, around 62% of the students think positively that knowledge about project-based learning favors their curricular training. This situation understands that the direct participation of students in implementing active learning methodologies—and combining them with a transmissive method—is an opportunity to expand their teaching skills and functions.

Table 2. Traditional methodology and PBL. Source: Drawn up by the author.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	M	Sd.
1. I think that expository teaching only serves to learn theory by heart.								
Perc	100	6.9	3.8	12.3	21.4	55.6	3.623	1.198
Frq	290	20	11	36	62	161		
8. I think that PBL is an appropriate methodology for my curricular training.								
Perc	100	12.1	9	17.2	24.5	37.2	3.196	1.371
Frq	290	35	26	50	71	108		

For the second objective, which focused on distinguishing the educational resources used in teaching Social Sciences Didactics, items 5 and 13 were chosen. The results in Table 3 confirm that 65% of students agree that resources characteristic of traditional teaching do not favor meaningful learning. At the same time, it has been verified—with a similar percentage, 60%—that, for item 13, the students think that the materials used in PBL acquire a multidisciplinary character. With these results, it becomes clear that students bear in mind that those didactic resources which are not very innovative—typical of the expository methodology—do not increase motivation compared to the educational resources dedicated to implementing an active methodology, which are used in several scientific fields.

Table 3. Didactic resources used in the teaching of Social Sciences. Source: Drawn up by the author.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	M	Sd.
5. I believe that the educational resources used with traditional teaching do not lead to meaningful learning.								
Perc	100	9.3	6.2	19.3	23.5	41.7	3.337	1.292
Frq	290	27	18	56	68	121		
13. I believe that the main resources used in PBL are multidisciplinary.								
Perc	100	5.5	3.5	30.3	25.5	35.2	3.331	1.122
Frq	290	16	10	88	74	102		

In order to respond to the third objective of the study—which focused on finding out the difficulties that future teachers encounter in acquiring professional skills and methodological competencies—, items 6 and 11 were selected. For item 6, Table 4 shows that 84% of the students agree that masterclasses, reproducing theoretical contents, and dictating notes are frequent methodological practices in many Primary Education Degree subjects. At the same time, for item 11, about 74% of the students agree that their professional skills can be increased with knowledge about active learning methodologies. Consequently, it is demonstrated that current teaching methods do not facilitate the work by methodological competencies for novice teacher training.

Table 4. Professional and methodological skills of future teachers. Source: Drawn up by the author.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	M	Sd.
6. I consider that the masterclass is the method used in all the subjects in the Primary Education Degree.								
Perc	100	2.4	5.9	7.6	18.3	65.9	3.837	1.017
Frq	290	7	17	22	53	191		
11. I would like to make competency-based work part of my teaching and learning process.								
Perc	100	2.1	1	22.8	27.9	46.2	3.627	0.947
Frq	290	6	3	66	81	134		

Finally, in relation to the fourth objective, items 7 and 15 of the survey were chosen so as to assess the theoretical-practical contents implemented in a Primary school classroom. In Table 5, item 7 shows that 95% of the students agree that the written exam is the only evaluation instrument available when using an expository method. Likewise, in item 15, students think positively, with 82%, that project-based learning is evaluated by researching and self-evaluating the teaching practice. The purpose of this evaluation is to promote teacher-student feedback, in addition to the assessment of group work and its results.

Table 5. Evaluation of theoretical and practical contents. Source: Drawn up by the author.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	M	Sd.
7. I understand that the written test is the only assessment instrument available when using an expository method.								
Perc	100	0.7	0.3	3.8	18.6	76.6	4.105	0.625
Frq	290	2	1	11	54	222		
15. I understand that assessment in PBL has an investigative focus.								
Perc	100	4.1	2.4	11.4	22.4	59.7	3.765	1.042
Frq	290	12	7	33	65	173		

The results of the survey provide an overview of the incorporation of active learning methodologies at the university level (see Figure 2). Similarly, it is difficult to draw conclusions from this analysis due to the lack of information and case studies to determine whether current teaching methodologies meet the training demands of students. Nevertheless, the students’ opinions made it possible to verify the introduction of the different characteristics of project-based learning, and compare it with a traditional teaching method at the university [25]. In this case, it is necessary to highlight the assessment of the adequate use of PBL and its direct influence on a methodological space that involves students in their own learning.

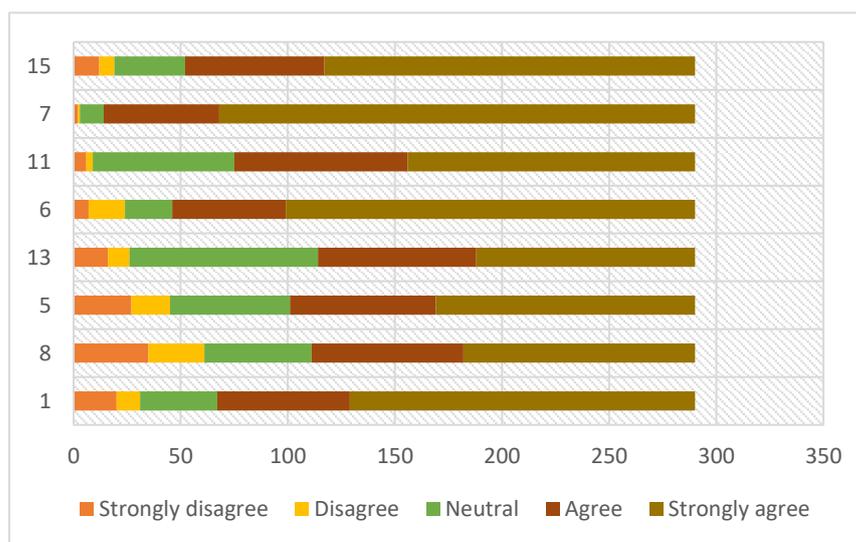


Figure 2. Quantitative comparison of the study objectives. Source: Drawn up by the author.

4. Discussion

From a formative and methodological approach, project-based learning allows university students to put their knowledge into practice by providing solutions to real problems. These training activities are related to acquiring professional skills and improving innovation in teaching [26]. This pedagogical method has a more effective purpose in meeting the educational needs of the students. Chu et al. [27] stress the need to improve the teaching method with a dynamic, collaborative, and interactive perspective. This interaction provides a favorable environment between teacher and student which facilitates a better teaching and learning process [28]. This highlights the importance of active learning methodologies in initial teacher training.

Marco-Fondevila et al. [29] studied the positive effects of PBL on students’ academic performance compared to masterclasses. In fact, the most current research shows the renewal of training programs for novice teachers in active learning methodologies. Despite these studies, when approaching the reality of the university classroom, it can be seen

that the theoretical-practical sessions of a subject are centered on memorizing lessons and dictating notes in an unmotivating environment. This situation is supported by research such as this one, which warrants the challenge of studying the possibilities of investigative teaching based on problem-solving [30]. For instance, Kartal [31] points out the need for a methodological change in university teacher training. One of the most outstanding advantages of this transformation is the application of active learning that brings originality, innovation, and creativity with the development of project-based teaching [32].

In practice, PBL offers students an approach to the topic they want to research, the search for information, and the elaboration of materials. This work dynamic solves the autonomous and group resolution in an educational context that goes beyond what happens in university classrooms. Accordingly, by providing greater interaction and new group learning dynamics, students face their teaching with an experiential vision [33]. The challenge of these learning tasks has been to encourage both cooperative work and the development of skills related to the construction of knowledge. The opportunity to implement this proposal confirms the difficult task of applying this active learning methodology in the university environment.

The results of the study point to clear incorporation of PBL in both university teaching and the initial training of novice teachers. As a training strategy, project-based learning is necessary between the university and the school [34]. After analyzing this active methodology, an improvement in student assessment was observed compared to the traditional model. In other studies, similar results have been achieved in the productivity of project-based learning, motivation development, and learning through discovery. In this active teaching process, the classroom environment becomes flexible, autonomous, and dynamic. The achievement of educational competencies with a transversal purpose in the academic curriculum is also a pedagogical advantage of this didactic method [35,36].

In this sense, an examination of the data from this constructivist model shows an educational advance in teacher coordination. Students have perceived that using didactic resources which are characteristic of active teaching favors both meaningful learning and interdisciplinarity. These results show that the students acknowledge that less innovative and more traditional resources are an obstacle to redefining teaching in a more motivating and less expository way [37]. Along these lines, studies such as those of Cintang et al. [38] confirm the limited use of educational materials and research focused on the specific contents of a subject. In addition, the interaction between students achieved a high degree of engagement regarding their academic performance. Students also value collaborative learning as opposed to masterclasses and expository lessons. This methodological training is obviously linked to good teaching practices and training programs with inclusive teaching planning [39].

As a future line of work, the aim was to analyze the students' receptiveness to training in order to incorporate the educational advantages of PBL into their teaching practice [40]. When studying their perceptions regarding the didactic possibilities of this method, students approach their learning with a personalized follow-up in their specific training. Thus, it is necessary to pay attention to the student's evolutionary process with the aim of strengthening both reflective activities and autonomous work. This research provided a level of competency that favors student satisfaction with the proposal. Nevertheless, the results that have been presented clearly confirm that the evaluative instruments in the traditional methodology are based upon a written test, while the PBL evaluation assumes an investigative character away from memorization [41].

5. Conclusions

The findings of this study show that both cooperative learning and the implementation of investigative activities lead to good teaching practices. In this research, it has been confirmed that students in the third year of the Primary Education Degree at the University of Cordoba value active learning methods and are aware that knowing about them favors their training as teachers. Another strength of the study was the positive perceptions of the

participants when implementing PBL. For all these reasons, the use of active methodologies represents an advance in the curricular training of the participants [42]. Its implementation in the curricula is also presented as a didactic alternative to complement the masterclass. In this regard, the improvement of professional skills provided an opportunity to learn how to learn with more autonomy. In fact, this research also showed students are interested in improving their critical thinking, creativity, self-learning, and collaboration.

After developing the proposal, it can be concluded that the university environment is a suitable space to implement project-based learning. The students' opinions about their educational and assessment process show a positive attitude towards the work done both at home and in the classroom with rubrics and questionnaires. However, not all students are prepared to plan and develop educational resources used in PBL to teach Social Sciences [43]. Moreover, it is observed that this research concretizes the need for a less conceptual and more participatory specialization to implement an active learning methodology. For this reason, the development of this innovative method that promotes transversality in teaching influences the conditions for teacher improvement and problem-solving in the classroom [44].

Limitations of the Study

As for the study limitations, they focused on the training deficiencies and demotivation of the students because they do not know the PBL in practice. Another possible limitation could be the limited dissemination of the projects among the educational community through PBL. From this perspective, it seems appropriate to strengthen the coordination between the university and the school to expand teacher training. The strategic lines of action in this area should be oriented towards practical teaching and having enough means to train teachers in methodological competencies [45]. Equally important in this study is the size of the sample, as an increase in the number of participants is necessary. Therefore, it would be convenient to improve professional skills, reinforce autonomy, and participate more actively in the application of real-life knowledge to implement the PBL.

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