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Students' Perceptions of Project-Based Learning (PBL) in Primary Education: Evidence from a Multi-Project Study in Iraq

Rusul salam Jabbar[1], Haneen Abd Alkadhim Abd Alhassan [2] , Noor Mohammed Kadhim[3]

1. Department of Science, College of Basic Education, Mustansiriyah University
   ORCID: https://orcid.org/0009-0005-6977-7541
   Email: rusul.s.j@uomustansiriyah.edu.iq
2. Department of English, College of Education for Humanities, University of Wasit
   ORCID: https://orcid.org/0009-0004-3885-2484
   Email: Haneenabdalhassan@uowasit.edu.iq
3. Department of Educational and Psychological Sciences
   College of Education for Humanities - University of Wasit
   ORCID: https://orcid.org/0009-0007-5778-743X
   Email: noormk@uowasit.edu.iq

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Abstract: This research investigates primary school students' perspectives of project-based learning (PBL) utilized in various curricular initiatives within Iraqi schools. The objectives were to create and validate a student-reported PBL assessment scale, analyze students' evaluations of collaborative projects, and investigate variations based on gender and project type. A descriptive, cross-sectional methodology was utilized, employing a semantic differential questionnaire administered to 364 pupils in Grades 5 and 6. The reliability analysis showed a good level of internal consistency (Cronbach's $\alpha = 0.912$). Due to non-normal data distribution, Mann–Whitney U and Kruskal–Wallis tests were applied. The results showed that there were no statistically significant gender differences in motivation, organization, interaction-collaboration, learning, or overall scale scores (Z values between −1.04 and −1.87, $p > .05$). In contrast, substantial differences were noted among project types across all dimensions ($\chi^2 = 32.046–65.816$, $p < .001$). Projects that focused on great organization and working together got better reviews from students. The results show that PBL is a good way to teach and stress the need for good project design and support from the school.

Keywords: Project-Based Learning (PBL), Primary Education, Multi-Project Study in Iraq

1. Introduction

Project-Oriented Learning is a task-based way of teaching that focuses on getting a final outcome through a collaborative process of negotiation among participants. This method encourages students to learn on their own and set their own goals and follow particular steps. Students take charge of their own learning by figuring out what they want and how they like to learn (Abdurahman al., 2024).

They might also be involved in decisions on what to teach and how to grade students' work. (Ramesh et al., 2022)

We believe that projects are a different way to teach in the classroom. They encourage

students to ask questions that they think are important and useful, and these questions may come from the students themselves. During project creation, students explore and pinpoint their interests, formulate queries, organize their tasks, collect information from diverse sources, share ideas and compare them with new data, refine or alter them, present their conclusions, and provide suggestions (Ali et al., 2024)

Project-Based Learning (PBL) has a lengthy history, with its first ideas coming up in the early 1900s. Dewey (Dewey, J. 1938), emphasized the importance of experience in education and advocated for interdisciplinary projects that allowed students to interact with other concepts and domains of knowledge. Additionally, he prioritized social learning, which led to a strong focus on working together in his projects. Kilpatrick (Kilpatrick, 1918), another teacher who supported this teaching style, said that project-based learning in schools makes the best use of students' natural abilities and helps them become responsible, motivated learners. (Kadhim et al., 2024)

PBL and problem-based learning are closely related, but they are not the same thing. The first one focuses on the ultimate product and the skills learned along the way, while the second one focuses on finding solutions to problems that have already been identified. However, both are still based on the following constructivist ideas:

- Understanding is a personal construct that comes from interacting with the environment.
- Cognitive dissonance drives learning.
- Knowledge grows through social negotiation.

  Many studies (Anggaira, 2023), (Beier, 2019), have shown that project-based learning works best when certain things are in place: Motivation is a key factor in the growth of a project. When students take on more responsibility in their work and become more well-known, their drive goes up. So, the project needs to be focused on the students, fit their needs and interests, spark their curiosity, and encourage them to work hard on their own. The effort requires careful preparation and organization. The learning goals and skills must be clearly defined, as well as the workgroups that include people with different skill levels and roles that depend on each other. Another important part is how the teacher and students connect and work together, as well as how the students work together. The project needs to give students a lot of chances to work together and think about what they learned in class with their classmates. This will encourage participation and social value. Also, it is very important for the student to have feedback from the teacher on the work they did. The endeavour must ultimately generate numerous opportunities for substantial learning through research and the quest for answers to concerns. (Kadhim et al., 20223)

Empirical research demonstrates that PBL positively impacts students' information retention and the development of skills including as collaboration, critical thinking, and problem-solving. Additionally, students participating in PBL activities exhibit increased commitment to learning. Some people, on the other hand, say that Project-Based Learning (PBL) is a big problem for teachers, who need help planning and carrying out PBL well, and for students, who need help managing their time to get their work done and using technology in a meaningful way in their projects.

In this time of tremendous growth in digital technology, tech tools are very useful for Project-Based Learning (PBL) since they make it easy to get to different types of knowledge quickly and communicate and share information online right away (Tayyeh et al.,2025). This improves the process of teaching and learning, but only if the teacher knows how to use these resources well in their teaching (Biazus M., Mahtari,2022). Some people say that using technology makes it easier for pupils to do research, think critically, and engage with others (Bilgin et al., 2015), For example, students might work with other schools to share ideas, information, and resources.

In this situation, it's evident that we need to evaluate these teaching methods, especially to understand how kids feel about them in the classroom setting. Since student feedback can help improve these methods,

Objectives

This study focuses on knowing the opinion that students have of the project work in which they have participated in the school context following a PBL methodology, delving into the perceptions and assessments they can offer based on their experience. The specific objectives set for this are:

- Design a scale that validly measures the usefulness of project-based learning from the perspective of Primary students.
- Describe the assessment made by students of the various collaborative projects carried out.

  Determine if there are differences in student opinion based on the following variables: gender and project type.

Methodology:

The methodology used is fundamentally descriptive, although comparisons between subsamples will be made using a questionnaire as an information collection instrument, due to its suitability for studying the opinions of the studied group.

Sample:

The study sample consists of 364 Primary Education students participating in different collaborative learning projects, belonging to five educational centers in various governorates of Iraq, selected for implementing a project-based learning methodology, in which various curricular areas and digital competences are addressed. It was decided to limit the sample to 5th and 6th-grade Primary Education students, as students of this age are capable of understanding the item statements and reflecting on the tasks performed in the project and their learning process. The management teams of the educational centers were contacted, who were informed of the objectives and procedure of the study, its anonymous nature, and the confidential treatment of data. All gave their consent and conveyed the collaboration request to teachers and students. The questionnaire was applied in the presence of the responsible class teachers and answered anonymously by the students without time limitations and with detailed instructions on the first page of the questionnaire. The students are distributed 50% by gender and are between 10 and 13 years old.

Table 1: The sample

Projects	N	Description
1. Red flower with a green stem	24	This project was carried out by a teacher and their students in a school in Baghdad, Iraq. The objective is to collaboratively create a story, record it on video, and upload it to Youtube, based on the story "La Red flower with a green stem" by Helen E. Bluckey.
2. Monster Factory	29	A project by a teacher and their students in a school in Baghdad, Iraq. The goal is to draw monsters, describe them, scan them, and share them on a common class blog to foster student creativity and exploration of emotions.
3. Learning without books	24	A project by two teachers and their students in a school in Najaf. Its objective is to do without textbooks in Mathematics and Language subjects, promoting the use of student class notebooks and digital materials prepared by the teachers.
4. Twinning	45	A project by three English teachers and their students in two schools in Basra Governorate, Iraq. The aim is to develop students' digital skills, reinforce English content

		through motivating activities, and get to know students from other centers.
5. Platero and Us	31	This project was promoted and developed by two teachers and their students in a school in Karbala. The goal is to create an illustrated version of the book "Platero and Us" and publish it on different media.
6. Linguistics	25	An experience by three teachers and their students in a school in Mosul. The objective is to improve students' linguistic competence through different activities, using Web 2.0 resources (creating stories with Storybird, creating reviews with QR codes and stories with Zooburst).
7.English Speaking Countries	33	This project was developed by three teachers and their students in a school in Erbil, Kurdistan Region of Iraq. The objective is to create a tourist guide about an English-speaking country.
8. Scary Short Films	38	An experience by three teachers and students in a school in Erbil, Kurdistan Region of Iraq. The goal is to autonomously produce a script based on previously worked English structures and create a horror short film by performing a work created by the students themselves.
9. Associates	18	In this project, three teachers from a school in Basra Governorate, Iraq and their students participated. The goal is to create associations to promote healthy habits in children.

Information Collection Instrument:

To develop the questionnaire, a reflection process was carried out on the type of information desired and, consequently, on the type of questions and how to pose them so that students could answer without interpretation difficulties. It was decided to create a scale using the semantic differential technique, given the sample's age. (Changming, L., 2020). As is known, this technique consists of gathering a series of pairs of adjectives with opposite meanings and defining a continuum between them within which the person has to specify where the concept in question is located.

For item wording, general recommendations from some authors were followed: items worded clearly, containing a single idea; all questions related to the study topic;

items posed simply, concisely, clearly, and without ambiguity; also easy for students to answer and not requiring great effort.

Based on these recommendations, a first experimental version of the scale of 35 items with 7 response categories was developed, addressing four dimensions identified from theoretical contributions: Motivation, Organization, Interaction-collaboration, and Learning. The choice was made based on suitability, rational criteria, and adaptation to the sample's age. The dimensions are defined as follows:

1. Motivation: degree to which the project arouses student interest.
2. Organization: students' perception of task organization in the project.
3. Interaction-collaboration: degree of relationship and collaboration between students and teachers during the project.
4. Learning: assessment of the degree to which the project promotes meaningful learning.

In the questionnaire presentation, items were distributed alternating different dimensions. Format and font type were considered to contribute to text comprehension.

Data Analysis

Statistical analyses were performed with the IBM SPSS 19 package. First, descriptive statistics for each item (mean, standard deviation) and the scale dimensions for the total sample were calculated. For this, a global mean of responses for each dimension was calculated.

Normality of distribution was tested in each dimension, finding it was not met in any of them. Due to the lack of normality, non-parametric tests were used in subsequent analyses: Kruskal-Wallis test for k independent samples and Mann-Whitney U test for pairwise contrasts (Duman, B. & Yavuz, Ö., 2018), taking each questionnaire dimension as dependent variables and considering the studied variables (gender and project type) as grouping variables.

Results

The results presented below are shown following the order of the study's three objectives:

1) Study of the reliability and content validity of the scale

To evaluate content validity, in accordance with the Delphi Method, two human groups were formed to validate the designed instrument: the coordinating group and the expert group.

The coordinating group consisted of members of the Research Group participating in this study, who assumed functions: instrument development, studying and approving the list of experts, invitation to participate via email, follow-up by email, and analysis of responses and interpretation of results. The expert group selection was based on candidates' competence in the research topic. Twelve people were selected, including university professors and researchers of recognized prestige, as well as Primary teachers with experience in PBL methodology. The decision was made to select specialists who presented, on one hand, common experiences necessary to evaluate the instrument's content adequacy, as well as diverse experiences whose complementarity favored assessment from varied perspectives.

The first version of the instrument was subjected, in a first round, to analysis and discussion by coordinating group members, where certain corrections and adjustments were made based on qualitative criteria that obtained greater consensus. Once modified, it was subjected to a second round of consultation with the selected expert group, intending to gather the most stable quantitative and qualitative criteria.

Based on the information provided by reviewers, appropriate modifications were made, generally attending to: spelling and punctuation changes, syntactic changes, item elimination, and incorporation of new items.

Of the 35 items comprising the questionnaire, 25 were not modified, as they obtained values close to 5 and experts did not propose another version. Five items with values around 3 were eliminated, and two new items were added following expert recommendations; and the remaining 5, with values close to 4, were modified according to that group's opinion, with their final wording agreed upon by the coordinating group.
Subsequently, a series of statistical indicators were considered, such as the discrimination index and descriptive statistics for each item. The reduction process was based on analyzing these indicators, selecting the 20 items that showed the highest factor loading in the exploratory factor analysis. Thus, the definitive scale called "Scale for PBL assessment by students" was constructed.

Reliability was obtained through Cronbach's alpha coefficient, based on which the scale's reliability is 0.912, which can be considered fully satisfactory.

2) Description of the assessment made by students of the various projects carried out with PBL methodology.

Table 2 presents descriptive statistics (means and standard deviations) of the different scale items for the set of evaluated projects.

The results show a positive assessment of this teaching-learning methodology by the students, highlighting that they loved this way of working (6.24) and it was interesting (6.29). As we see, the projects guarantee something fundamental like student motivation, as they allow organizing activities around a common interest defined by the students themselves. Students are more motivated when they value what they are learning, when they engage in personally meaningful tasks, and when they believe the learning outcome is under their control.

Furthermore, students emphasized that it is now easier for them to relate to their peers (6.25) and share materials among themselves (6.28). It is evident that these experiences provide students the opportunity to work collaboratively, share ideas, express their opinions, and negotiate solutions. This dynamic means no one alone can reach the goal if their peers do not. This type of interaction involves facilitative attitudes of help, so students are stimulated by their own peers.

Finally, they claim to have understood the activity or activities they had to perform (6.26); the teacher explained what they had to do (6.41); indicated if they were doing tasks well (6.31) and informed them about the work result (6.39). These data show that teacher support is crucial in designing this type of methodology. Project-based learning is more productive when teachers offer students frequent guidance and assessments through pro-

ject reference guidelines and reflection activities. Thanks to continuous assessment, teachers can adapt project activities and their support to students' learning needs, guiding them in the development of their work.

Table 2: descriptive statistics (means and standard deviations) of the different scale items for the set of evaluated projects.

Item	Mean	Standard Deviation
1. It has been boring / It has been fun	6.13	1.192
2. I wasted time / I made good use of time	5.88	1.223
3. I learned less than other times / I learned more than other times	5.94	1.323
4. I read little / I read a lot	5.15	1.613
5. It was not interesting / It was interesting	6.29	1.372
6. I did not understand what we did / I understood the activity	6.26	1.128
7. I got distracted / I concentrated	5.77	1.236
8. I copied and pasted information / I created and shared information	5.87	1.455
9. I am no longer interested in the topic / I want to learn more about the topic	6.04	1.298
10. It was useless / It was useful	6.15	1.208
11. I did not like this way of working at all / I loved this way of working	6.24	1.114
12. The teacher did not help me / The teacher helped me	6.05	1.406
13. The teacher did not give clear instructions / The teacher clearly explained what we had to do	6.41	1.068
14. We did not share materials among peers / We shared materials among peers	6.28	1.428

15. Now it is more difficult for me to relate to my peers / Now it is easier for me to relate to my peers	6.25	1.149
16. Working in group we did not manage to do the task well / Working in group we managed to do the task well	6.15	1.239
17. The group size was not adequate (too few or too many for the task) / The group size was adequate	5.93	1.434
18. I did not feel comfortable with my peers / I felt comfortable with my peers	6.14	1.231
19. The teacher did not monitor our work / The teacher indicated if we were doing tasks well	6.31	1.208
20. The teacher did not indicate the quality of the presented work / The teacher told us what was good or bad about the work	6.39	1.136

***Response categories: from 1 to 7.**

As can be seen in Table 3, interaction-collaboration among peers and with teachers (6.15) along with motivation (6.12) are the dimensions best valued by the entire sample.

Table 3: Interaction-collaboration among peers and with teachers

Dimensions	Items	Mean	Std. Dev.	N
1. Motivation	1, 5, 9, 11	6.12	1.002	
2. Organization	2, 4, 13, 17, 19	5.93	.898	
3. Interaction-Collaboration	12, 14, 15, 16, 18, 20	6.15	.880	364
4. Learning	3, 6, 7, 8, 10	5.97	.892	
Global Score		6.05	.784	

3) Determine if there are differences in student opinion based on the variables: gender and project type.

Traditionally, in scientific literature in educational research, when conducting comparative studies, the first variable usually used as a predictor is gender, a predisposition that currently remains the main axis of many investigations both nationally and internationally. Following this trend, the first studies to conduct are based on searching for significant differences based on student gender in the different study dimensions.

Based on data in Table 4, the first observation is that basic descriptives manifest very similarly in the two groups. Although girls show slightly higher means than boys in all dimensions.

Table 4: student opinion based on the variables: gender and project type.

Dimensions	Boy Mean	Boy Std Dev	Girl Mean	Girl Std Dev	U	Z	p
1. Motivation	6.15	1.052	6.33	0.979	14999.7	-1.91	0.064
2. Organization	5.99	0.965	6.11	0.857	15825.4	-1.06	0.297
3.Interaction/ Collaboration	6.21	0.951	6.33	0.836	15692.3	-1.20	0.231
4. Learning	6.01	0.961	6.17	0.847	15076.6	-1.82	0.076
Global Score	**6.09**	**0.089**	**6.24**	**0.747**	**14973.1**	**-1.91**	**0.06**

N=182 N=182

The Mann-Whitney U test, conducted at a significance level of $\alpha = .05$, revealed no significant difference. Consequently, we can assert that the variable "gender" does not create statistically significant disparities in the evaluations provided by students on the project technique, irrespective of their expertise. A secondary variable of interest for examining differences between subsamples pertains to project type. Following the use of the Kruskal-Wallis test at a significance level of $\alpha = .05$, significant differences were identified in the overall score and across all dimensions.

Table 5: The Mann-Whitney U test

	Motivation	Organization	Interaction/Collaboration	Learning	Total Scale
Chi-square	32.046	65.816	37.422	51.137	60.873
df	8	8	8	8	8
Asymptotic Sig.	.000	.000	.000	.000	.000

Once these differences are detected, it is considered appropriate to delve deeper and perform some type of subsequent multiple comparison to establish in which pairs of groups the noted differences are concretized and facilitate both subsequent interpretation of results and establishment of conclusions. Using the Bonferroni approximation, the new value called α' is calculated (Fadhillah et.al, 2024) The formula is based on $\alpha' = \alpha / T$, where T is the number of comparisons or possible statistical tests to perform a posteriori. Once our

significance level $\alpha' = 0.001$ is established, the Mann-Whitney U test is performed for each pair of groups into which the variable "project types" is divided in the global score and in the dimensions where the Kruskal Wallis test previously detected significant differences. Table 6 shows the global mean scores of the different projects and significant differences (marked with an x). We can say that the best-rated experience is "Platero and Us", followed by "Associates" and "Twinning".

Table 6: Interpretation of results and establishment of conclusions using the Bonferroni approximation

Projects	Global mean score on the scale	Projects (significant differences at .001)								
1. Red flower with a green stem	5.67	1	2	3	4	5	6	7	8	9
2. Monster Factory	5.90									
3. Learning without books	5.94									
4. Twinning	6.44					x				
5. Platero and Us	6.70	x	x	x			x	x		
6. Linguistics	5.83									
7.English Speaking Countries	6.25									
8. Scary Short Films	5.94									
9. Associates	6.61	x	x	x			x	x		

Analysis of the significance of differences between projects by dimensions reveals that project 4 (Twinning) stands out in Interaction (showing significant differences with projects 2, 6, and 8) and in Motivation (significant differences with projects 1, 2, and 6). While project 9 (Associates) excels in Organization along with project 5 (Platero and Us), presenting significant differences with projects 1, 2, 3, 6, 7, and 8. "Platero and Us" also differs positively from other projects in Learning (significant differences with projects 1, 2, 3, 6, and 8).
Figures 1 to 4 show box plots of scores by project in each dimension. It can be appreciated that while the median does not vary much in the Motivation and Interaction-collaboration dimensions, the variability of opinions reflected in quartile values does change. Projects 4, 5, and 9 are those achieving greater agreement among students in all dimensions.

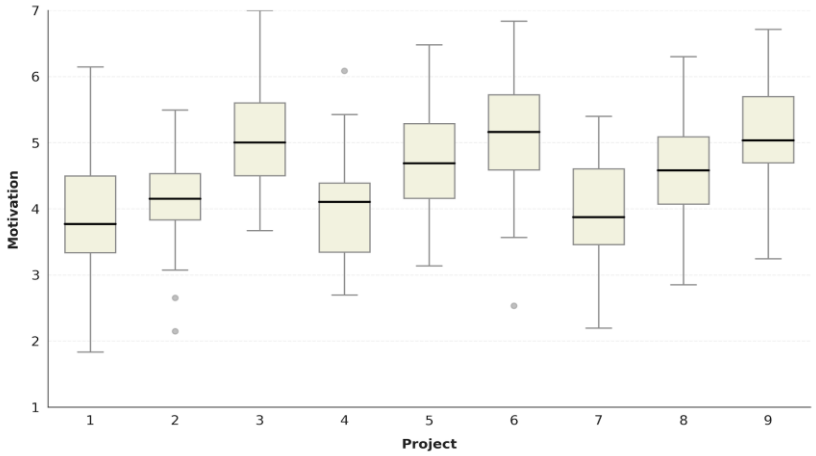

Figure 1. Differences between projects in the "Motivation" dimension

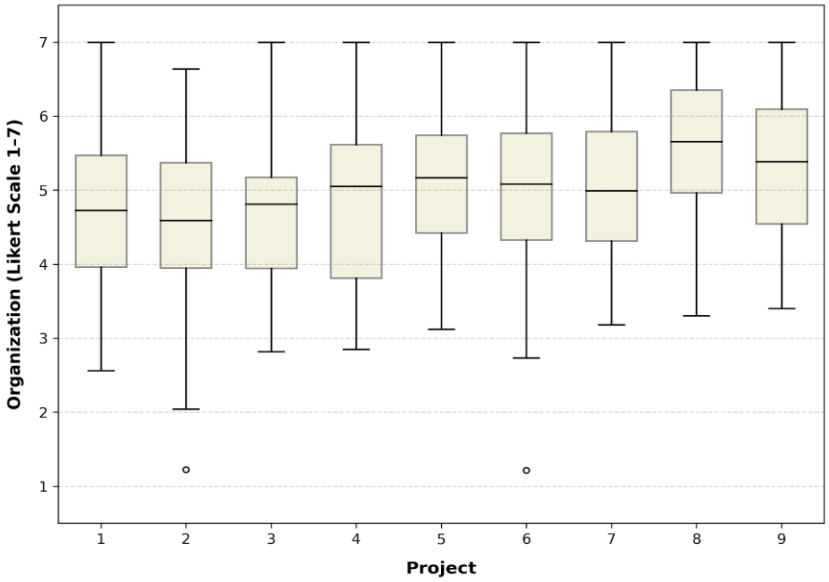

Figure 2. Differences between projects in the "Organization"

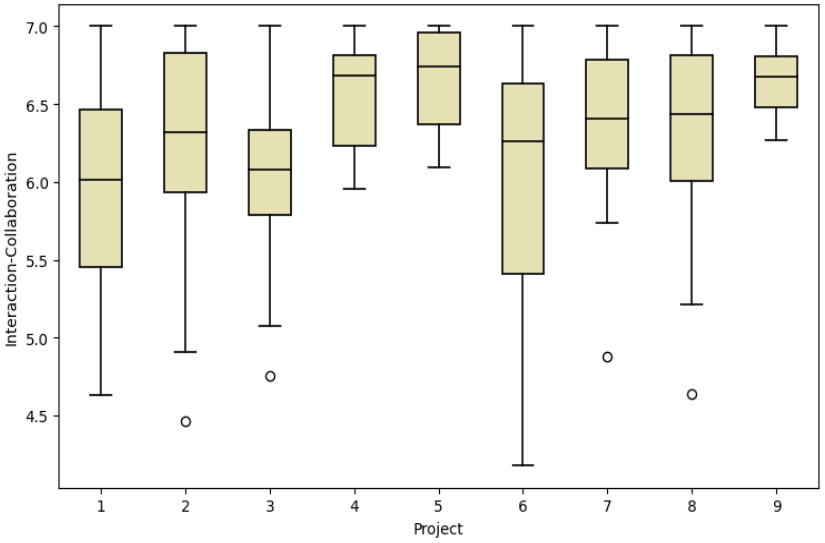

Figure 3. Differences between projects in the "Interaction-collaboration" dimension

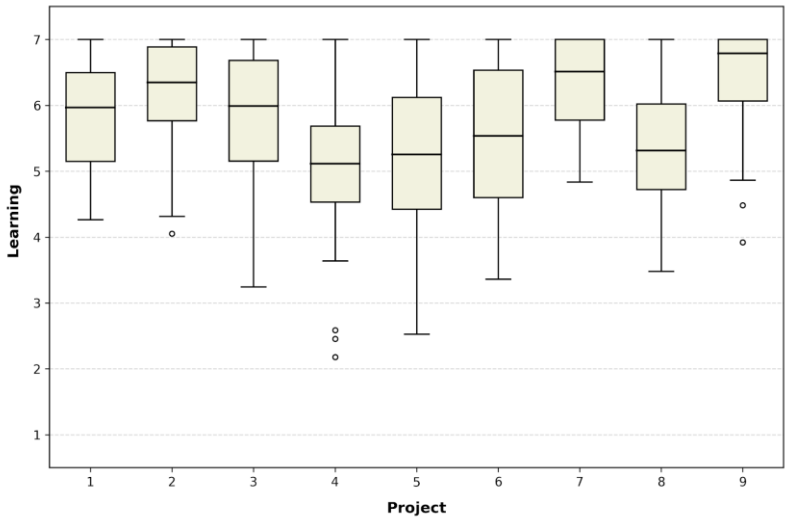

Figure 4: Differences between projects in the "Learning" dimension

To compare project assessments by gender, data is shown in Figure 5, where it can be observed that in some cases boys and girls differ in their assessments. Such is the case for projects "Red flower with a green stem", "Linguistics", and "Scary short film".

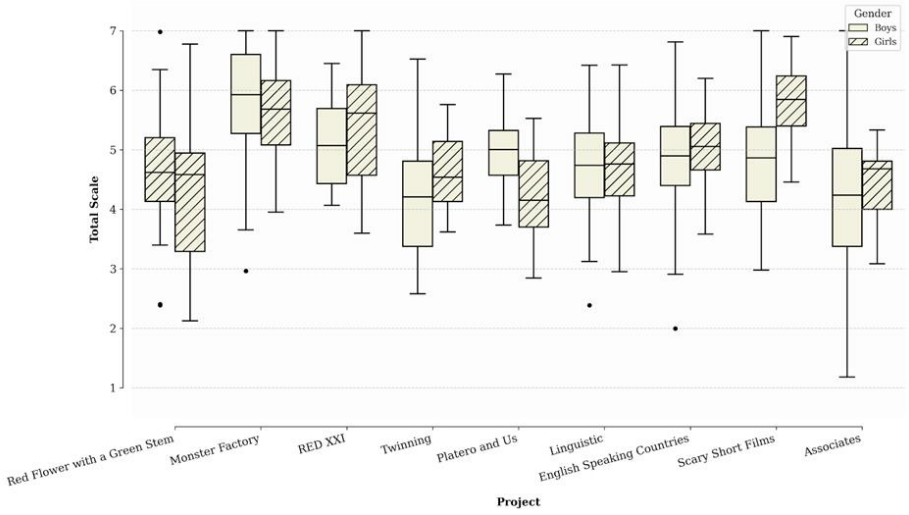

Figure 5: Assessment of each project by gender

Discussion:

The findings indicate a predominantly favorable evaluation by students on the project-based learning methods, reflecting their school experiences, with no significant gender disparities identified (Guo, P. et al., 2020). There are, however, disparities in how the students judged the two projects. The students who worked on the collaborative project "Platero and Us" and the project "Associates" gave them better ratings. The dependent variables examined (scale dimensions) correlate with elevated values for the cohort of students engaged in these initiatives, particularly in terms of organization and learning. To figure out what made these projects so successful for students, we look at their traits and see that both were supported and guided by the management team. This makes the whole school responsible for the project, which leads to better progress and fewer problems that could

come up. The positive attitude of teachers toward actively participating in the project and helping students with their work, as well as organizing tasks, has also had a beneficial effect. These are things that were made clear to students from the start of the project (Hernández et al., 2009).

The project "Platero and Us" was worked on in all of the Spanish Language and Literature and Art Education classes for two months of the school year. The objective was to work together to make an illustrated version of the book and publish it in several formats (Karaçalli, S., & Korur, 2014), (Karpudewan et al., 20216), starting with the digital reading of a few chapters from Platero and Us. It was suggested that small group activities would help with the big group work. The school library was also used for some activities, but most of them happened in the ordinary classroom. Two sorts of materials were used: a) regular classroom supplies and b) special supplies for the activity. Students published the book on a class blog with support from their teacher.

The project "Associates," on the other hand, took six months to finish and was split into six parts: 1) reading an article about childhood obesity, 2) forming work groups and making a Google Drive document, 3) naming the group, making a logo, and starting a blog, 4) doing surveys about diet and exercise, 5) planning a healthy week with different activities, and 6) celebrating the healthy week and doing planned activities.

Teachers used the digital whiteboard to explain activities and material. Students used iPads to get to internet content, share documents, send reports to teachers, and make activities. Families also got involved by helping pupils with surveys (Lazić et al. 2021), (Patmasari et al., 2025). The students' great desire to learn by working together on projects that use a variety of technical tools is linked to their very positive self-evaluation of their learning outcomes. Students had fun while making good use of their time, found the topic interesting, and said they wanted to learn more about it. Concerns that have been confirmed by interviews with educators who worked on the project, which makes the instrument more reliable. Motivation and academic success come from doing things that are interesting to students and giving them responsibility for their work, which gives them a sense of control.

Students show a lot of dedication through their reading, attentiveness during activities, and the development and sharing of information (Kirschner et al., 2006). There has been a connection between what students think and what the teachers in charge of creating educational projects think. The findings underscore the importance of student motivation in promoting meaningful learning, as well as the need for efficient planning and organization of tasks within projects. Previous study indicates that project design requires planning and supervision, as the creation of a shared area does not ensure communication or collaboration. As a result, it is important to carefully look at ways to keep track of and analyze processes. Kirschner (Sanchez, 2024), identifies three critical factors related to activity necessary for the establishment of collaborative learning settings applicable to any project-based learning context: 1) Ownership of tasks, 2) Nature of tasks, and 3) Control of tasks. A lot of study on the topic has shown how important the teacher is in making project-based learning work (Setyowati D. et al., 2017), (Yulianti, N., & Roza, V., 2023). This includes coming up with relevant, real, and interesting activities that let students suggest ideas as the process goes on, as well as guiding them through the steps of completing the task by setting up frameworks and phases. This helps students understand the steps they need to take and the results they get (Zubaidah et al., 2027).

Conclusion:

Ultimately, we hope that this work will support project-based learning as a good alternative to traditional teaching methods. It will also show how important it is to find new ways to assess students within these teaching frameworks that look at both the results or products of project work and the processes that collaborative teams go through. Teachers' participation in school events is very important, but they need to have relevant and dependable tools to really comprehend how their kids think. The "Scale for PBL Assessment by Students" is a useful tool for teachers who use project-based learning in their classrooms.

References:

Abdurahman, A., Setiawati, E. C., & Pradesa, K. (2024). Students' perceptions of project-based learning in chemistry: A qualitative analysis. Jurnal BELAINDIKA, 6(3), 330–341. https://doi.org/10.52005/belaindika.v6i3.298

Ali, M., Maros, M., Rehman, A., et al. (2024). Effectiveness of project-based learning combined with a flipped classroom on students' computational thinking skills. Education Sciences, 15(4), 448. https://doi.org/10.3390/educsci15040448

Anggaira, A. S. (2023). Project-based learning model and its implementation: Students' perception in curriculum development subjects. Journal of Education Research, 3(3), 273. https://doi.org/10.37985/jer.v3i3.273

Beier, M. E., Kim, M. H., Saterbak, A., et al. (2019). The effect of authentic project-based learning on attitudes and career aspirations in STEM. Journal of Research in Science Teaching, 56(3), 3–23. https://doi.org/10.1002/tea.21465

Biazus, M., & Mahtari, S. (2022). The impact of project-based learning on creative thinking skills. International Journal of Essential Competencies Education, 1(1), 38–48. https://doi.org/10.36312/ijece.v1i1.752

Bilgin, I., Karakuyu, Y., & Ay, Y. (2015). The effects of project-based learning on undergraduate students' self-efficacy beliefs. Eurasia Journal of Mathematics, Science and Technology Education, 11(2), 469–477. https://doi.org/10.12973/eurasia.2014.1015a

Changming, L. (2020). Why do we need project-based learning? Primary and Secondary School Management. https://doi.org/10.13811/j.cnki.eer.2019.02.012

Dewey, J. (1938). Experience and education. New York, NY: Macmillan.

Duman, B., & Yavuz, Ö. K. (2018). The effect of project-based learning on students' attitudes toward English lessons. Journal of Education and Training Studies, 6(11), 186–196. https://doi.org/10.11114/jets.v6i11a.3816

Fadhillah, N., Sudjarwo, & Habsari, D. (2024). Students' perception of project-based learning in writing classes. International Journal of Education and Digital Learning, 1(3), 12. https://doi.org/10.47353/ijedl.v1i3.12

Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and assessment methods. International Journal of Educational Research, 102, 101586. https://doi.org/10.1016/j.ijer.2020.101586

Haven, K. (2007). Story proof: The science behind the startling power of story. Westport, CT: Libraries Unlimited.

Hernández-Ramos, P. F., & De La Paz, S. (2009). Learning history in middle school through project-based instruction. Journal of Research on Technology in Education, 42(2), 151–173. https://doi.org/10.1080/15391523.2009.10782545

Kadhim, N. M., & Hamad, A. A. (2024). Mathematical Foundations and Principles Be-hind These Methods. Coding Dimensions and the Power of Finite Element, Vol-ume, and Difference Methods, 116–133. https://doi.org/10.4018/979-8-3693-3964-0.ch005

Kadhim, N. M., Mohammed, H. A., Radhawi, S. N., Jabur, A. M., Gottraan, R. B., Abdulridha, M. M., Kadhim, W. M., & Mohammed, Z. Q. (2023). Investigation of the next generation science standards including in the science book according to E-learn : analytical study. Tamjeed Journal of Healthcare Engineering and Science Technology, 1(2), 30–35. https://doi.org/10.59785/tjhest.v1i2.23

Karaçalli, S., & Korur, F. (2014). The effects of project-based learning on students' academic achievement and attitudes. School Science and Mathematics, 114(4), 224–235. https://doi.org/10.1111/ssm.12071

Karpudewan, M., Ponniah, J., & Zain, A. N. M. (2016). Project-based learning to enhance energy literacy among secondary school students. Asia-Pacific Education Researcher, 25(2), 229–237. https://doi.org/10.1007/s40299-015-0256-z

Kilpatrick, W. H. (1918). The project method. Teachers College Record, 19, 319–335.

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work. Educational Psychologist, 41(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1

Lazić, B. D., Knežević, J. B., & Maričić, S. M. (2021). The influence of project-based learning on student achievement in elementary mathematics. South African Journal of Education, 41(3). https://doi.org/10.15700/saje.v41n3a1909

Patmasari, A., Ismail, M., Kamaruddin, A., Idrus, M., & Apridayani, A. (2025). Students' perceptions of project-based learning in sociolinguistics classes. Journal of Learning Improvement and Lesson Study, 5(1), 146. https://doi.org/10.24036/jlils.v5i1.146

Ramesh, V., Hamad, A. A., Jwaid, M. F., Sathyabama, M., Abdulridha, M. M., Kadhim, N. M., & Belay, A. (2022). Early Recognition of Skin Malignancy in Images Based on Convolutional Networks by Using Dynamic System Model. Journal of Nano-materials, 2022(1). Portico. https://doi.org/10.1155/2022/1754658

Sánchez García, R. (2024). Teachers' and students' perceptions of competence acquisition through project-based learning. Journal of English Studies.

Setyowati, D., et al. (2017). Teachers' perceptions toward the implementation of project-based learning. Journal of Primary Education, 6(2), 81–93. https://doi.org/10.15294/jpe.v6i2.17552

Tayyeh, A. M., Hamad, A. A., Yaseen, R. B., Al-Badri, K. S. L., Jasim, F. T., Kadhim, N. M., Aldoori, S. K. S., Hussein, H. A., Turki, A. I., & Abbas, O. A. (2025). Adaptive Transfer Learning for Robust Phishing Attack Detection Using Recurrent Layers. Inte-

grating Intelligent Control Systems With Sensor Technologies, 311–328. https://doi.org/10.4018/979-8-3373-0330-7.ch011

Yulianti, N., & Roza, V. (2023). Students' perceptions of project-based learning implementation in English education. Journal of Educational Management and Strategy, 2(2), 183–201. https://doi.org/10.57255/jemast.v2i2.290

Zubaidah, S., Corebima, A. D., & Mahanal, S. (2017). The effects of project-based learning on students' collaborative skills. Journal of Education and Learning, 11(2), 189–197. https://doi.org/10.11591/edulearn.v11i2.5918