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Analysis of Student Responses to Student Worksheets Based on Project Based Learning Models

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ABSTRACT

Purpose of the study: This research aims to determine student responses to project-based learning in chemistry courses.

Methodology: This research was conducted using mixed methods. The research design chosen is a sequential explanatory design. This design was chosen because the researcher carried out a quantitative method first and continued with a qualitative method to strengthen the data obtained from the quantitative method. The samples involved in this research were 90 students from the chemistry study program. The sampling technique is purposive sampling. The instrument used to collect quantitative data was a questionnaire sheet distributed to students to measure responses, while the instrument to collect qualitative data was interviews conducted with chemistry students. Data analysis was carried out to process quantitative data based on descriptive statistics, and qualitative data was analyzed based on Miles and Huberman's theory and supported by documentation studies.

Main Findings: The results obtained from this research are that chemistry students' responses to project-based learning are classified as good. The importance of the Project Based Learning Model (PjBL) lies in its ability to inspire active involvement in solving real problems, thus facilitating the development of critical and analytical thinking skills.

Novelty/Originality of this study: The latest research is that the research sample involved was from the chemistry education study program to measure the response to project-based learning. This research is limited by only measuring responses, so researchers do not know the truth of the project-based learning process. So, recommendations that can be given in further research are to directly implement the project-based learning process to strengthen the questionnaire results in this research.

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1. INTRODUCTION

College education is a higher level of education after completing secondary level education or high school. Universities are educational institutions that offer various academic programs, including bachelor's, master's, and doctoral degrees in various fields of study [1]–[3]. In college, students can choose study programs that suit their interests and career goals [4]–[6]. This becomes an investment for a person in developing himself to be more professional. To achieve this goal, there needs to be guidance from lecturers by implementing project-based learning.

Project-Based Learning (PBL) is an educational approach that emphasizes learning through challenging and authentic projects or assignments. In project-based learning, students work in groups or individually to complete projects that focus on solving concrete problems or achieving specific goals [7]–[9]. Opinions expressed by Ernawati et al [7] The following are some of the characteristics of project-based learning: (1) authentic projects, (2) student involvement, (3) problem solving, (4) collaboration, (5) skills development, and (6) integrated evaluation. With these characteristics, it is known that project-based learning is very important for students.

Project-based learning has many benefits for students and is an important approach in higher education. According to [8], [12], [13] here are some reasons why project-based learning is important for students: (1) relevance of content, (2) development of practical skills, (3) higher motivation, (4) practical experience, (5) development of creativity and innovation, (6) problem solving, (7) in-depth understanding, (8) portfolio development, (9) independence in learning, (10) work team experience and a holistic evaluation. Project-based learning can help students become better prepared to enter the world of work or pursue graduate studies. It also helps them develop skills and a deeper understanding of the subjects they study, which can give them a competitive edge in an increasingly competitive job market.

Project-based learning has a significant impact on student abilities. With this project-based learning, the impact felt by students, namely their ability to manage time, communicate and experience field practice, will increase. Because students take action in the field to explore topics and theories in depth. The purpose of this research is to determine student responses to project-based learning. The variable used in this research is the response to the student research sample. This research is limited by only measuring responses so that researchers do not know the truth of the project-based learning process. So, recommendations that can be given in further research are to be able to directly implement the project-based learning process to further strengthen the results of the questionnaire in this research.

2. RESEARCH METHOD

Mix Method is the method used in this research. Mix method is a research approach that combines quantitative and qualitative elements in one study [14]–[17]. This mix method research uses a Sequential Explanatory approach type, which is a combination of quantitative and qualitative sequentially, with the first step carrying out quantitative method research which is to test hypotheses. Then use qualitative methods to deepen, strengthen, weaken or invalidate quantitative data [18], [19].

A population is a group of individuals, objects, or elements that have the same characteristics or features and are the object of research or statistical analysis, while a sample is a smaller part of the population that is used to represent the entire population. The sampling technique is using purposive sampling technique. This technique is one of the sampling methods in research which is used to select participants or sample units with a specific purpose [20], [21]. The sample for this research is explained in the following table.

Table 1. Research sample

Class	Students
Regular A	45 people
Regular B	45 people

The instrument for collecting data uses a Project Based Learning questionnaire sheet to obtain quantitative data and continues with interviews for qualitative data. Questionnaire sheet instrument for Project Based Learning, researchers distribute questionnaires to students. Project Based Learning ability questionnaire items are prepared based on 5 indicators of student responses to Project Based Learning [22]. The questionnaire grid for student responses to Project Based Learning is as shown in the table below

Table 2. Grid of student responses to Project Based Learning

Indicators	Question numbers
Interest	1,2,3,4
Meaningful learning	5,6,7,8
Communication and collaboration	9,10,11,12
Think critically	13,14,15,16
creativity	17,18,19,20

The questionnaire assessment score uses a 1-5 Likert scale. The answer choices for each statement item are: very good, good, pretty good, not good, very not good. Next, the assessment category for each Project Based Learning component is determined using the criteria as in the following table [22].

Table 3. Categories of student responses to Project Based Learning

Interval	Information
81-100	Very good
61-80	Good
41-60	Pretty good
21-40	Not good
0-20	Very not good

After data collection, proceed with analyzing the data using descriptive statistics. for quantitative data and Miles and Huberman for qualitative data analysis. Descriptive statistics is a description or presentation of large amounts of data that include mean, mode, median, maximum, minimum and standard deviation [23], [24]. Miles and Huberman analyzed the qualitative data process in three stages, namely collecting using various techniques such as observation, interviews and document review [25], [26].

3. RESULTS AND DISCUSSION

The research results have been distributed and analyzed using statistics. Data analysis uses descriptive statistics. The descriptive results of student responses to the PJBL model-based student worksheet in regular A and regular B classes in the chemistry education study program at Jambi University can be seen in the following table.

Table 4. Descriptive results of student responses to student worksheet based on the PJBL model

Class	Interval	Category	F	Mean	Median	Min	Max	%
Regular A	81-100	Very good	10					22.2
	61-80	Good	30					66.6
	41-60	Pretty good	5	49.81	48.5	43	99	11.1
	21-40	Not good	0					0
	0-20	Very not good	0					0
Regular B	81-100	Very good	7					15.5
	61-80	Good	26					57.7
	41-60	Pretty good	12	45.18	44.0	41	98	26.6
	21-40	Not good	0					0
	0-20	Very not good	0					0

From table 4, we get the descriptive results of student responses to the PJBL model-based student worksheet in regular A and regular B classes in the chemistry education study program at Jambi University, where the responses of regular class A students are dominantly more positive than the responses of regular class B students. With regular A results in the good category with a percentage of 66.6% while the good category with a percentage of 67.7% in regular class B.

Table 5. Results of interviews with students regarding learning using PJBL

Question	Answer
What do you think about the PjBL method as a way for lecturers to teach?	I think the PjBL method is very interesting and different from traditional teaching methods. In PjBL, the lecturer gives us a project assignment that is relevant to the course, and we work in groups to complete it. I like that we have more control over our learning, and it makes learning more interesting.
How do you respond to the PjBL method? Do you feel more motivated?	Yes, I feel more motivated. This method makes me feel more responsible for my own learning. When I know that project results will be a big part of the assessment, I feel more eager to learn and collaborate with friends. Additionally, this method gives us the opportunity to apply the knowledge we learn in real situations, which I think is very valuable.
Did you face any special challenges while following the PjBL method?	Yes of course. One of the challenges I encounter is managing my time well. As we have more involvement in these projects, it is sometimes difficult to manage time between lectures, projects, and other assignments. However, I feel this is part of learning and developing important time management skills.
Do you have any suggestions for lecturers who want to apply the PjBL	I think lecturers can provide clear guidance about what is expected of us in the project, as well as provide support and

Question	Answer
method more effectively?	constructive feedback throughout the learning process. Additionally, helping us understand how the project we are working on relates to the course material as a whole can help us see the relevance of that material in real context.

Respondents had a positive view of the PjBL method and saw it as an effective way to increase motivation and engagement in learning, although there are challenges that need to be overcome. The importance of the Project Based Learning Model (PjBL) lies in its ability to inspire active involvement in solving real problems, thus facilitating the development of critical and analytical thinking skills. PjBL can help individuals relate academic concepts to real-life situations, thereby strengthening their understanding and making learning more relevant [27]–[29]. The PjBL model also improves individuals' collaboration and communication skills, as they work in teams to complete different projects [30], [31]. In addition, PjBL stimulates individuals' interest and motivation to learn, as they have more control over the projects they work on, allowing them to increase their interest in learning.

Implementing PjBL (Project-based Learning) is a necessity for universities to improve learning outcomes and the level of student involvement [17], [18] . By implementing PjBL, universities can provide a more in-depth and contextual learning experience to their students, which in turn can increase their academic achievement and increase their sense of ownership of learning. In addition, PjBL can also help students develop collaboration, problem solving and critical thinking skills, which are important competencies for success in the real world [6], [34]–[36]. Therefore, PjBL has become an important innovation in the world of higher education to achieve higher goals in student learning and development.

Student responses to the Project Based Learning (PjBL) model are very positive. This PjBL model provides opportunities to develop independent, collaborative and active problem solving skills, all of which are highly relevant to the real world [36]–[39]. Students feel more deeply involved in the learning process, because they have more control over their understanding of the material and how they tackle project assignments [40]. Additionally, PjBL allows them to learn at their own pace, which can be adapted to individual needs and learning styles. Even though it requires greater responsibility, this positive response shows that the PjBL model provides a more meaningful learning experience for students.

The use of the project-based learning model (PjBL) has had a significant positive impact on student responses to the learning process [17], [41], [42]. Students who are involved in this learning method tend to be more enthusiastic and actively involved in learning. They feel more involved in decision making, solving problems, and collaborating with their peers, which helps them develop strong social and cognitive skills. In addition, the PJBL model encourages students to develop a deeper understanding of the subject matter, because they must apply their knowledge in the context of real projects. This not only improves understanding of concepts, but also motivates them to learn in a more meaningful and relevant way. Overall, the use of the PJBL model has a positive impact on student motivation, involvement and understanding in the learning process.

4. CONCLUSION

The conclusion of this research is that students' responses to student worksheet based on the project-based learning model in regular A and regular B classes in the chemistry education study program at Jambi University show differences. Regular class A students tend to give more positive responses than regular class B students. The results show that regular class A students give responses in the good category with a percentage of around 66.6%, while regular class B students give responses in the good category with a percentage of around 67.7%.

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REFERENCES

[1] S. Syaiful, K. Kamid, D. A. Kurniawan, and P. A. Rivani, "The impact of project-based learning on students' achievement in mathematics," *J. Educ. Res. Eval.*, vol. 5, no. 4, pp. 558–567, 2021, doi: 10.48081/kxbi5168.

[2] M. D. W. Ernawati *et al.*, "How scaffolding integrated with problem based learning can improve creative thinking in chemistry?," *Eur. J. Educ. Res.*, vol. 11, no. 3, pp. 1349–1361, 2022, doi: 10.12973/eu-jer.11.3.1349.

[3] A. Astalini, D. Darmaji, D. A. Kurniawan, S. W. Oktavia, E. Triani, and M. Z. Azzahra, "The exploration of character values in physics learning on momentum, impulse, and collision materials," *J. Educ. Res. Eval.*, vol. 7, no. 2, pp. 277–284, 2023, doi: https://doi.org/10.23887/jere.v7i2.52381.

[4] D. Darmaji, A. Astalini, D. A. Kurniawan, N. Sari, O. H. Wiza, and Y. E. Putri, "Investigation of students' psychology: The relationship among students' attitudes, persistence, creativity, and tolerance toward natural science subjects," *Univers. J. Educ. Res.*, vol. 8, no. 4, pp. 1155–1166, 2020, doi: 10.13189/ujer.2020.080405.

[5] K. Kamid, N. Fajriah, D. A. Kurniawan, and R. I. Widodo, "Elementary school students' mathematical process skills in gender perspective," *Int. J. Elem. Educ.*, vol. 6, no. 2, pp. 223–231, 2022, doi: https://doi.org/10.23887/ijee.v6i2.45219.

[6] S. W. Oktavia, N. Septiani, F. Sinaga, and N. N. Qoidah, "Analysis of the relationship in learning interest to learning outcomes static fluid material in senior high school," *J. Ilm. Ilmu Terap. Univ. Jambi*, vol. 7, no. 1, pp. 22–26, 2023, doi: https://doi.org/10.22437/jiituj.v7i1.26696.

[7] M. D. W. Ernawati, A. Asrial, R. Perdana, S. E. Septi, S. Rohana, and A. M. Nawahdani, "Evaluation of students' interest, attitudes, and science process skills in science subjects," *J. Educ. Res. Eval.*, vol. 6, no. 1, pp. 181–194, 2022, doi: 10.23887/jere.v6i1.37583.

[8] J. Jufrida, W. Kurniawan, A. Astalini, D. Darmaji, D. A. Kurniawan, and W. A. Maya, "Students' attitude and motivation in mathematical physics," *Int. J. Eval. Res. Educ.*, vol. 8, no. 3, pp. 401–408, 2019, doi: 10.11591/ijere.v8i3.20253.

[9] A. Astalini, D. Darmaji, D. A. Kurniawan, S. W. Oktavia, and F. P. Sinaga, "Identification of student character values in class x particle dynamics materials," *JIPF (Jurnal Ilmu Pendidikan Fisika)*, vol. 8, no. 3, pp. 380–388, 2023.

[10] K. P. Mainit and J. A. V. De Leon, "Comparative analysis of teaching strategies used in lessons on culture and lessons on heritage of a selected chinese-filipino school," *J. Educ. Learn.*, vol. 11, no. 4, pp. 41–51, 2022, doi: 10.5539/jel.v11n4p41.

[11] D. Darmaji, D. A. Kurniawan, and I. Irdianti, "Physics education students' science process skills," *Int. J. Eval. Res. Educ.*, vol. 8, no. 2, pp. 293–298, 2019, doi: 10.11591/ijere.v8i2.28646.

[12] K. Kamid, R. Theis, S. Sufri, S. E. Septi, and F. I. Putri, "Comparison of two learning models on students' process skills in elementary school," *J. Ilm. Sekol. Dasar*, vol. 6, no. 3, pp. 446–457, 2022, doi: 10.23887/jisd.v6i3.48681.

[13] H. Sabil, D. A. Kurniawan, R. Perdana, I. F. Putri, and S. E. Septi, "The influence of tarompa e-module on peace-loving characters," *Jurnal Pendidikan Indonesia (JPI)*, vol. 12, no. 2, pp. 283–292, 2023.

[14] N. Nadirah, A. D. R. Pramana, and N. Zari, "*Metodologi Penelitian Kualitatif, Kuantitatif, Mix Method*," 2022.

[15] M. Aizinsh, S. W. Oktavia, R. Firmansyah, and R. Ruttinawati, "Exploration of the character of cooperation in physics," *EduFisika J. Pendidik. Fis.*, vol. 8, no. 2, 2023.

[16] J. P. Casquilho, F. Sinaga, N. Septiani, S. W. Oktavia, N. N. Qoidah, and E. F. S. Rini, "The influence of critical thinking ability on students's science learning outcomes," *EduFisika J. Pendidik. Fis.*, vol. 8, no. 2, 2023.

[17] C. A. P. Vercaruz, N. Septiani, and R. S. Fitriani, "Perbandingan tanggung jawab karakter dan hasil belajar di meksiko dan indonesia di sma pertama," *EduFisika J. Pendidik. Fis.*, vol. 8, no. 2, 2023.

[18] F. Anggun Parastika and M. Tunjung Hapsari, "Analisis faktor komunikasi, konsep diri, dan lingkungan kerja terhadap kepuasan kerja dengan metode mix method pada karyawan bank syariah indonesia kcp Tulungagung Sudirman," *Reinf. J. Sharia Manag.*, vol. 1, no. 1, pp. 29–45, 2021, [Online]. Available: http://178.128.61.209/index.php/reinforce/article/view/5454.

[19] A. Astalini, D. Darmaji, W. Kurniawan, K. Anwar, and D. A. Kurniawan, "Effectiveness of using e-module and e-assessment," *Int. J. Interact. Mob. Technol.*, vol. 13, no. 9, pp. 21–39, 2019, doi: 10.3991/ijim.v13i09.11016.

[20] S. Maharani and M. Bernard, "Analisis Hubungan Resiliensi Matematik Terhadap Kemampuan Pemecahan Masalah Siswa Pada Materi Lingkaran," *JPMI (Jurnal Pembelajaran Mat. Inov.*, vol. 1, no. 5, p. 819, 2018, doi: 10.22460/jpmi.v1i5.p819-826.

[21] D. Darmaji, A. Astaliini, D. A. Kurniawan, F. I. Putri, and R. Perdana, "Student ' s need analysis in using ordinary differential equation e- module of Mathematical Physics II," vol. 7, no. 1, pp. 107–115, 2023, doi: 10.21067/mpej.v7i1.2023.

[22] K. B. Dinata, "Analisis kemampuan literasi digital mahasiswa," *Edukasi J. Pendidik.*, vol. 19, no. 1, p. 105, 2021, doi: 10.31571/edukasi.v19i1.2499.

[23] L. M. Nasution, "STATISTIK DESKRIPTIF," *J. Hikmah*, vol. 14, no. 1, pp. 49–55, 2017, doi: 10.1021/ja01626a006.

[24] V. Amrhein, D. Trafimow, and S. Greenland, "Inferential statistics as descriptive statistics: There is no replication crisis if we don't expect replication," *Am. Stat.*, vol. 73, no. sup1, pp. 262–270, 2019, doi: 10.1080/00031305.2018.1543137.

[25] S. Raibowo, Y. E. Nopiyanto, and M. K. Muna, "Pemahaman guru pjok tentang standar kompetensi profesional," *J. Sport Educ.*, vol. 2, no. 1, p. 10, 2019, doi: 10.31258/jope.2.1.10-15.

[26] M. Mulyati, F. I. Putri, and D. Deswalman, "Efforts to improve student activities and outcomes in physics learning using the two stay two stray technical cooperative learning model at senior high school," *Integr. Sci. Educ. J.*, vol. 4, no. 1, pp. 30–35, 2023, doi: 10.37251/isej.v4i1.294.

[27] A. Astlini, D. Darmaji, D. A. Kurniawan, N. N. Qoidah, M. Zannah, and E. Triani, "Character values of tenth-grade students during learning physics in vector material," *Jurnal Pendidikan Indonesia (JPI)*, vol. 12, no. 1, pp. 116–123, 2023.

[28] S. A. Rido, "Pengaruh metode mind mapping dalam peningkatan hasil belajar peserta didik pada mata pelajaran sosiologi kelas XI IPS," *J. Soc. Knowl. Educ.*, vol. 3, no. 2, pp. 29–33, 2022, doi: 10.37251/jske.v3i2.403.

[29] S. W. Oktavia, H. Mansyur, and M. Hidayat, "Investigasi Keterampilan mengajar guru fisika sman 9 Kerinci," *Relativ. J. Ris. Inov. Pembelajaran Fis.*, vol. 6, no. 1, pp. 24–30, 2023.

[30] J. P. Casquilho, F. Sinaga, N. Septiani, S. W. Oktavia, N. N. Qoidah, and E. F. S. Rini, "Pengaruh kemampuan berpikir kritis terhadap hasil belajar ipa siswa," *EduFisika J. Pendidik. Fis.*, vol. 8, no. 2, 2023.

[31] E. Suriyani and D. Desi, "Motivation to learn to read Al-Qur'an students," *JPAII J. Pendidik. Agama Islam Indones.*, vol. 4, no. 2, pp. 43–48, 2023, doi: 10.37251/jpaii.v4i2.661.

[32] F. T. Aldila, E. F. S. Rini, S. W. Octavia, H. N. Khaidah, F. P. Sinaga, and N. Septiani, "The relationship of teacher teaching skills and learning interests of physics students of senior high school: hubungan keterampilan mengajar guru dan minat belajar siswa fisika sma N 2 Batanghari," *EduFisika J. Pendidik. Fis.*, vol. 8, no. 1, pp. 101–105, 2023.

[33] A. Astalini, D. Darmaji, D. A. Kurniawan, F. P. Sinaga, M. Z. Azzahra, and E. Triani, "Identification the 2013 curriculum teacher's book to determine the character values of class x students on circular motion material," *J. Pendidik. Sains Indones.*, vol. 11, no. 3, pp. 545–558, 2023, doi: https://doi.org/10.24815/jpsi.v11i3.28567.

[34] S. Mundarti and F. T. Aldila, "Affective assessment instrument based on krathwohl-anderson taxonomy in senior high school," *J. Eval. Educ.*, vol. 4, no. 2, pp. 74–79, 2023, doi: 10.37251/jee.v4i2.323.

[35] J. Jamaludin, S. Kakaly, and J. R. Batlolona, "Critical thinking skills and concepts mastery on the topic of temperature and heat," *J. Educ. Learn.*, vol. 16, no. 1, pp. 51–57, 2022, doi: 10.11591/edulearn.v16i1.20344.

[36] N. N. Qoidah, S. Surya, and M. Hidayat, "Investigasi Metode Mengajar Guru di SMA N 2 Batanghari pada Pembelajaran Fisika," *KoPeN Konf. Pendidik. Nas.*, vol. 3, no. 2, pp. 138–142, 2021.

[37] P. R. Amnuel, F. P. Sinaga, and F. R. Winda, "Description of students' critical thinking ability of urban school in physics material," *Edufisika J. Pendidik. Fis.*, vol. 8, no. 2, pp. 217–225, 2023, doi: 10.59052/edufisika.v8i2.26531.

[38] R. Hermawati and D. Chen, "Increasing student cooperation through a project-based learning model with the theme of ecosystems," *J. Basic Educ. Res.*, vol. 4, no. 1, pp. 45–49, 2023, doi: 10.37251/jber.v4i1.299.

[39] M. Dwi Wiwik Ernawati, M. Damris, Asrial, and Muhaimin, "Development of creative thinking skill instruments for chemistry student teachers in Indonesia," *Int. J. online Biomed. Eng.*, vol. 15, no. 14, pp. 21–30, 2019, doi: 10.3991/ijoe.v15i14.11354.

[40] A. Aziz, A. Fauzan, F. I. Putri, and M.Yudis, "Perbandingan minat belajar ipa fisika siswa pada dua kelas di pondok pesantren," *J. Kependidikan*, vol. 15, no. 1, pp. 26–37, 2021.

[41] M. H. Feliza Paramitha Sinaga, Jurhana, Yusrita, "Analisis penggunaan metode mengajar (metode demonstrasi, metode eksperimen, metode inquiry, dan metode discovery) di sma negeri 11 Kota Jambi," *Relativ. J. Ris. Inov. Pembelajaran Fis.*, vol. 5, no. 2, pp. 103–110, 2022

[42] K. Kamid, S. Syaiful, R. Theis, S. Sufri, and S. Rohana, "Cooperative learning model with process skills for mathematics learning in elementary school," *Int. J. Elem. Educ.*, vol. 6, no. 1, pp. 58–68, 2021, doi: https://dx.doi.org/10.23887/ijee.v6i1.