JPPIPA 9(5) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Teacher Perceptions in Understanding Student Scientific Creativity as a Basis for Developing Project-Based Learning Programs

Nasiruddin[1], Noor Fadiawati[1*], Chansyanah Diawati[1]

[1] Science Education, Faculty of Teacher Training and Education, Universitas Lampung, Indonesia

Received: February 22, 2023
Revised: May 18, 2023
Accepted: May 25, 2023
Published: May 31, 2023

Corresponding Author:
Noor Fadiawati
noor.fadiawati@fkip.unila.ac.id

DOI: 10.29303/jppipa.v9i5.3267

Abstract: This research aims to find out more about teacher perceptions in students' scientific creativity as a basis for project-based learning models as well as provide information about the use of project-based learning programs that are in accordance with PjBL syntax at the junior high school level in Metro City. This research is a type of qualitative research with a case study approach, data collection techniques used are interviews (interviews), observation and documentation. Then to ensure the validity of the data using technical triangulation and source triangulation followed by data analysis with the research flow, namely identifying problems, determining research designs, determining research roles, determining data collection procedures, data recording, data analysis and verification, and narrating the research results obtained. The results of this research indicate that 54% of teachers have not used the PjBL learning model in learning and the teacher's perception of PjBL is good, but 62% of teachers do not know the PjBL syntax that must be fulfilled in using this learning model. In relation to scientific creativity, teachers do not know what indicators must exist in assessing students' scientific creativity.

Keywords: Project Based Learning (PjBL); Scientific Creativity; Teacher Perceptions

Introduction

Technological developments in the 21st century are experiencing very rapid development (Maison et al., 2020). Based on a poll conducted by the Partnership for 21st Century Skills in 2007, stated that there were 80% of respondents who stated that an ability that was needed for students to learn 20 years ago and now must be different (Rahayu et al., 2022). The creativity of a teacher is demanded in learning that will be taught to students (Nugraheni, 2018), because teacher creativity is very important in learning, and teachers are required to demonstrate and demonstrate this creative process (Afriyanto & Pusporini, 2017). In accordance with the 2013 curriculum in Permendikbud number 20 of 2016 students are required to master various 21st century skills as a means of success in a century where the world is developing rapidly and dynamically (Andrian & Rusman, 2019; Sari et al., 2021; Septikasari, 2018; Umam & Jiddiyyah, 2020). Students who only have knowledge skills will certainly experience difficulties in facing challenges in the 21st Century (Pratiwi et al., 2019; Septikasari, 2018; Supena et al., 2021). Therefore, in order to be able to face the challenges of the 21st century, various skills are needed, one of these skills is scientific creativity (Nakano & Wechsler, 2018).

The learning that should be done by the teacher is learning that is able to train students' scientific creativity so that learning is not monotonous because the teacher in learning only uses the lecture method. Indicators of successful learning in the 21st century are based more on students' abilities to use information to solve real problems that occur in life, to be able to adapt and innovate in response to new demands and changing circumstances as well as expand the power of technology to create something that has never existed (Rizqi, Prabowo, 2019; Septikasari, 2018).

How to Cite:
Nasiruddin, N., Fadiawati, N., & Diawati, C. (2023). Teacher Perceptions in Understanding Student Scientific Creativity as a Basis for Developing Project-Based Learning Programs. *Jurnal Penelitian Pendidikan IPA*, *9*(5), 2438–2443. https://doi.org/10.29303/jppipa.v9i5.3267

Different educational backgrounds and teacher limitations in increasing literature review have an impact on reducing students' scientific creativity because learning is still monotonous and less interesting (Wahdan et al., 2017). There has been no innovation in the learning program especially the material used is only the result of downloading on the internet, so the learning program used is not based on real problems that occur in life and the learning references used have not trained students' scientific creativity. The concept of scientific creativity is difficult to explain by definition but can be interpreted through symptoms that refer to the originality of thought produced, imagination, flexibility as well as one's fluency are the main characteristics of creativity (Tran, Huang, & Hung, 2021).

Students are said to have scientific creativity if students have sensitivity to scientific problems and then are able to overcome them as well as students' ability to design a product (Hu & Adey, 2002; Mahtari et al., 2017). Referring to previous research as written by a researcher (Tran, Huang, & Hung, 2021) who conducted experiments on the effectiveness of STEAM-based courses to increase students' scientific creativity, the results showed that the group of students who took courses had higher scientific creativity. Strengthened by the findings of researchers (Tran, et al., 2021a) who conducted experiments on whether there was an increase in scientific creativity towards curriculum changes in schools and showed the results that 66 students who were divided into 2 different groups had shown a significant increase in scientific creativity of students in groups using STEAM-based curriculum. Therefore scientific creativity can certainly be increased with the right treatment.

Scientific creativity includes specific creativity (specific domain creativity) (Redhana, 2019), so that scientific creativity is not the same as creativity in general (general creativity) (Masruroh et al., 2017). Ability in knowledge with students' process skills are two things related to scientific creativity (Mohamed, 2006). Scientific creativity is a person's intellectual ability that is designed as well as possible based on the information provided with a specific purpose so as to produce something new and have social or personal value (Hu & Adey, 2002). The dimensions of scientific creativity according to (Hu & Adey, 2002) include 1) unusual use, to measure fluency, flexibility, and originality in using objects for scientific purposes, 2) problem finding, asking new questions, new possibilities from new points of view, requiring imagination and is needed to make real progress in science, this aims at fluency, flexibility, and originality, 3) product improvement, improves technical products and aims to create fluency, flexibility, and originality, 4) creativity imagination, measures students' scientific imagination, and can be used to assess fluency, flexibility, and originality, 5) problem solving, measuring scientific creativity problem solving abilities, 6) science experiments, assessing creative experimental abilities, and 7) product design, measuring the ability to design science products creatively. This design can measure product flexibility, technicality, and originality thinking.

Based on the findings of the problems above, researchers are interested in conducting a study of student creativity from the perspective of teachers and students as a basis for developing project-based learning programs for junior high school students in Metro City.

Method

This research is a type of qualitative research with a case study approach. The data collection techniques used were interviews, observation and documentation with the research flow as shown in Figure 1.

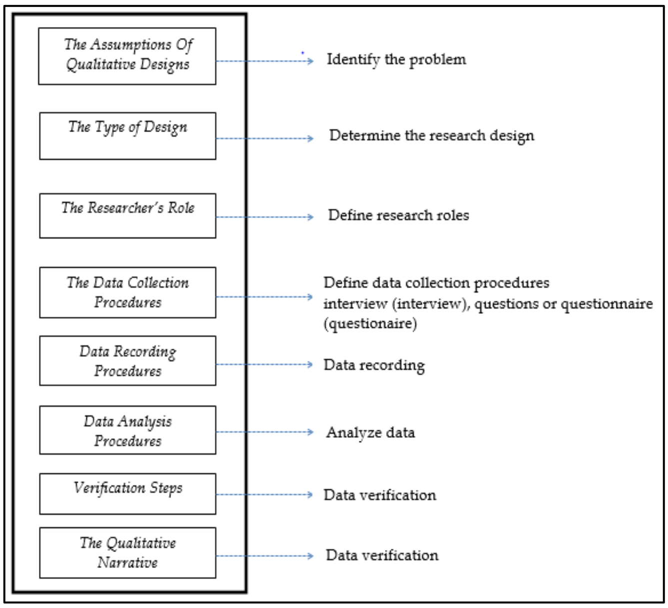

Figure 1. Research Flow (Hirose & Creswell, 2023)

In this study the process was emphasized by conducting an in-depth study of the matter to be examined, namely the teacher's initial perception regarding the use of the PjBL learning model, the teacher's understanding of the syntax that must be met in implementing the project-based learning model (PjBL), and the teacher's understanding of the indicators used in assessing students' scientific creativity. To test the validity of the data, researchers used technique triangulation and source triangulation. This can be achieved by comparing observational data, interview data and documentation data then comparing what the informant said in public with what was said privately, examining in depth the information conveyed by the informant from various perspectives in order to obtain accurate data sources. and trusted.

The data analysis technique used in this study was data collection that started with the process of entering researchers into the research site, namely 10 junior high schools in Metro City (5 private junior high schools and 5 public junior high schools), namely Bina Insani Metro IT Middle School, Ma'arif 1 Middle School, Cahaya Middle School Bangsa, Xaverius Middle School, Ahmad Dahlan Middle School, Metro 1st Middle School, Metro 3rd Middle School, Metro 5th Middle School, Metro 7th Middle School and Metro 8th Middle School. then proceed with data reduction in which at this stage the process of determining, determining also eliminating data that is not needed and focusing on various data which is then summarized and arranged in a complete and systematic manner so that the research data obtained is accurate and can be completed, then at the final stage, namely presentation data and drawing conclusions where at this stage the researcher presents the initial data to completion as well as gets conclusions and verification (Rijali, 2019).

Result and Discussion

This section describes the discussion and research findings based on data collection and analysis involving 10 schools in the city of Metro consisting of 5 public schools and 5 private schools, by interviewing 13 teachers and 32 student respondents then the researcher also made observations of student learning activities in class and collected supporting documentation as additional information in this study. In detail the results of this study are as follows:

Teacher's initial perception of the use of the project-based learning model (PjBL)

This study explores teacher perceptions of project-based learning in junior high schools in Metro City. The results of the study show that all the teachers who have been interviewed have a positive perspective on project-based learning.

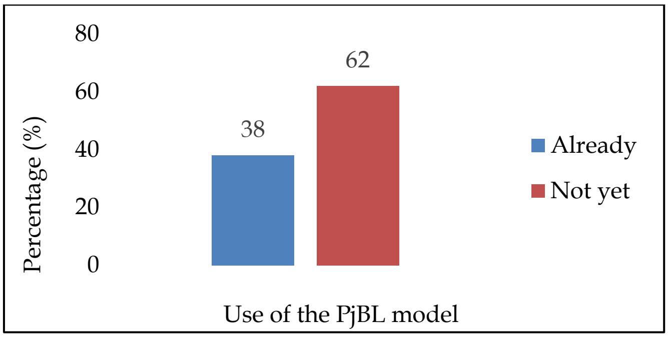

Figure 2. Percentage of Using the PjBL Model in Learning

However, based on the data above, 54% or 7 of the 13 teachers interviewed had not used the project-based learning model in learning. Teachers prefer to use learning that combines lecture and discussion methods. Many previous studies have discussed teacher perceptions regarding the use of project-based learning models. This study is important because theoretically this research can enrich the literature and provide information about what teachers should do in addressing the characteristics of 21st century learning.

Starting the presentation session, the researcher gave the view that mastery of 21st century interpersonal skills known as 6C namely character, citizenship, critical thinking, creativity, collaboration and communication. In science learning, the application of these skills can be trained one way or another through the use of this project-based learning model with the aim that students are expected not only to be able to learn theories from science material but more than that students can experience meaningful learning events and be able to implement them in everyday life day.

The results of the researcher's search are related to seeing how the teacher's understanding of the application of project-based learning models by exploring and analyzing based on the teaching experience of teachers who have implemented project-based learning models obtained the following results:

Table 1. Implementation of project-based learning

Informant	PjBL conducted	Material
Teacher 1 (28 Years of Teaching)	Make cassava tape	Biotechnology
Teacher 2 (19 Years of Teaching)	Making a simple water filter	Mix separation
Teacher 3 (3 Years of Teaching)	Create an artificial ecosystem	Ecosystem

The table above shows that the three informants have used the project-based learning model, which the researchers also found in the RPP (Learning Implementation Plan) prepared by the teacher. These data provide a good indication of teachers' perceptions of the use of project-based learning methods.

Strengthened based on the results of previous research which states that this project-based learning model has a beneficial effect on the teaching and learning process. Teacher perceptions also show good results, but more teachers have not used this learning model with several obstacles including having to use a long duration for the implementation as well as extra time in conducting the evaluation (Sari et al., 2021).

Teacher's understanding of the syntax that must be fulfilled in PjBL

In general, based on data collection conducted through interviews with respondents, it showed positive results, namely the teacher already knew information about the project-based learning model, which basically is learning that emphasizes products produced by students as an effort to solve natural problems that occur. However, not all teachers know the syntax or steps that need to be considered in using the project-based learning model.

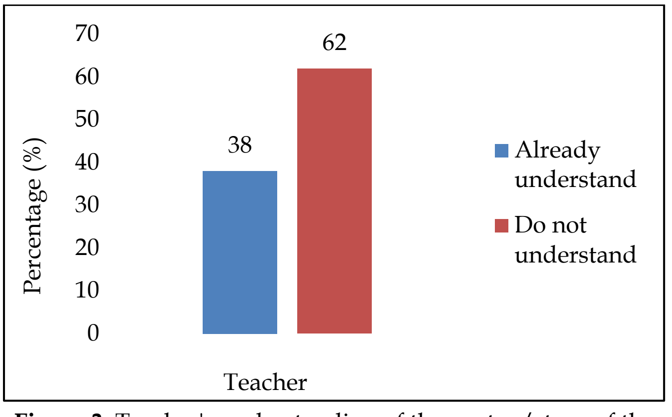

Figure 3. Teacher's understanding of the syntax/steps of the PjBL model

Based on the data above, it shows that 62% or 8 out of 13 teachers do not know it well. The teacher's perception is only limited to when the teacher thinks that giving assignments to students at home that produce a piece of work is already considered a project-based learning, even though in project-based learning the teacher must also pay attention to the syntax in PjBL. Referring to the PjBL learning steps according to (Kemendikbud, 2020) are as follows: 1) start with essential question, 2) design project, 3) schedule, 4) monitoring the students and progress of project, 5) assess the outcome, 6) evaluation the experience.

Another perception as a research finding is that 100% of teachers agree that the issues raised are real problems in everyday life, not problems in reference books so that they can provide meaningful learning for students.

The results of the researcher's search are related to seeing how the teacher's understanding of syntax in the application of project-based learning models by exploring and analyzing based on the teacher's teaching experience obtained the following results:

The data in the table above shows that some teachers do not understand the syntax in this project-based learning model. The perception that is built is that the teacher thinks that when the teacher has given assignments to students to make products and bring the results to school, this already includes the implementation of project-based learning methods without paying attention to other syntax that actually has to be done such as conducting monitoring and evaluation activities during the process of making the product.

Table 2. Implementation of the PjBL Syntax by the Teacher

Informant	Syntax done
Teacher 1 (Over 20 Years of Teaching)	Designing products, preparing tools and materials at home, making products at school, making presentations, conducting evaluations
Teacher 2 (11-20 Teaching Years)	Designing products, preparing tools and materials at home, making products at home, bringing the results to school, making presentations, conducting evaluations
Teacher 3 (1-10) Teaching Year)	Designing products, preparing tools and materials at home, making products at home, bringing the results to school, making presentations, conducting evaluations

The teacher's understanding of the indicators used in assessing students' scientific creativity

Scientific creative thinking is a mental ability to produce a new idea or improve something that already exists. This kind of scientific skill must be possessed by students. For this reason, educators must certainly understand how to manage learning in class with the aim of increasing students' scientific creativity.

Referring to the theory put forward by (Hu & Adey, 2002) indicators of scientific creativity include: *Unusual use* scientific creativity indicators aim to measure (fluency), (flexibility) and (originality) in using objects for scientific purposes. *Real advance* Aims to measure fluency, flexibility and originality in the level of sensitivity to scientific problems. Asking new questions, new possibilities from new points of view, requires imagination and is necessary to make real advances in science. *Technical production* Aims to measure fluency, flexibility and originality in improving technical products. *Imagination science* Aims to measure fluency, flexibility and originality in scientific imagination. *Science problem solving* Aims to measure flexibility (flexibility) and originality (originality) in solving science problems. *Creative experimental* Aims to measure the flexibility (flexibility) and originality (originality) in the ability of creative experiments. *Science products* Aims to measure flexibility (flexibility) and originality (originality) in designing science products creatively.

Based on the data collected by the researchers in this study, it showed that all the teachers who were the source of research data did not know what aspects should be considered in assessing students' scientific creativity. Teachers are still focused on students' cognitive values only so that further studies require more sources of information to provide teachers with an understanding of the assessment of students' scientific creativity.

Conclusion

This research is a preliminary analytical research to understand students' scientific creativity and teacher's perceptions regarding the use of project-based learning models as well as providing information about the use of project-based learning models that are in accordance with PjBL syntax at the junior high school level in Metro City. This temporary data can be used as initial input and consideration in designing appropriate learning media. Further and in-depth research will be carried out by developing research to create project-based learning programs to enhance students' scientific creativity. Based on observations on student learning activities and interviewing teachers, the data was analyzed using a qualitative approach. It can be concluded that 54% of teachers have not used the PjBL learning model in learning and the teacher's perception of PjBL is good, but 62% of teachers do not know the PjBL syntax that must be fulfilled in the use of this learning model. In relation to scientific creativity, teachers do not know what indicators must exist in assessing students' scientific creativity.

Acknowledgments
I would like to sincerely and sincerely thank the following people for helping with this research project: the supervisor, for guidance and feedback during this research; Lampung University Science Education Study Program. Furthermore, I would also like to thank the science teachers and students in Metro Lampung for all their participation and involvement in this research. Hopefully this article is useful for researchers and readers.

Author Contributions
All authors in this article contributed to the process of completing the research. Nasiruddin as the first author contributed to conceptualizing the research design, determining the methodology, taking initial research data, processing the data, writing research reports, writing articles. Noor Fadiawati directed the research flow, validated preliminary data collection instruments, reviewed articles, Chansyanah Diawati validated data collection instruments, refined results and discussion, reviewed articles.

Funding
This research is an independent research in which all funds spent during the research process use the researcher's personal funds.

Conflicts of Interest
In this study all authors do not have a conflict of interest, because this research is an independent research in which all funds spent during the research process use the researcher's personal funds. There are no other interests in this research, but researchers only want to contribute to advancing education by informing the findings in this research. So that it can provide more benefits to the reader.

References

Afriyanto, R., & Pusporini, W. (2017). Meningkatkan kreativitas dan hasil belajar IPA siswa kelas VIII MTs. YAPPI Jetis Saptosari Gunungkidul melalui penggunaan media alat peraga IPA. *Natural: Jurnal Ilmiah Pendidikan IPA*, *4*(1), 34–41. https://doi.org/10.30738/natural.v4i1.1862

Andrian, Y., & Rusman, R. (2019). Implementasi pembelajaran abad 21 dalam kurikulum 2013. *Jurnal Penelitian Ilmu Pendidikan*, *12*(1), 14–23. https://doi.org/10.21831/jpipfip.v12i1.20116

Hirose, M., & Creswell, J. W. (2023). Applying core quality criteria of mixed methods research to an empirical study. *Journal of Mixed Methods Research*, *17*(1), 12–28. https://doi.org/10.1177/15586898221086346

Hu, W., & Adey, P. (2002). A scientific creativity test for secondary school students. *International Journal of Science Education*, *24*(4), 389–403. http://dx.doi.org/10.1080/09500690110098912

Kemendikbud. (2020). *Langkah-Langkah Pembelajaran Project Based Learning (PjBL)*. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Retrieved from https://ayoguruberbagi.kemdikbud.go.id/artikel/project-based-learning/

Mahtari, S., Nur, M., & Tukiran, T. (2017). Pengembangan Prototipe Buku Guru Dan Buku Siswa Ipa Dengan Penemuan Terbimbing Untuk Melatihkan Kreativitas Ilmiah Siswa Smp. *JPPS (Jurnal Penelitian Pendidikan Sains)*, *5*(2), 924. https://doi.org/10.26740/jpps.v5n2.p924-930

Maison, M., Kurniawan, D. A., & Pratiwi, N. I. S. (2020). Pendidikan sains di sekolah menengah pertama perkotaan: Bagaimana sikap dan keaktifan belajar siswa terhadap sains? *Jurnal Inovasi Pendidikan IPA*, *6*(2), 135–145. https://doi.org/10.21831/jipi.v6i2.32425

Masruroh, M., Widodo, W., & Hidayat, M. T. (2017). Pengembangan Perangkat Pembelajaran Berbasis Inkuiri Terbimbing Untuk Meningkatkan

Kreativitas Ilmiah Siswa Smp. *JPPS (Jurnal Penelitian Pendidikan Sains)*, *5*(2), 1061. https://doi.org/10.26740/jpps.v5n2.p1061-1067

Nakano, T. C., & Wechsler, S. M. (2018). Creativity and innovation: Skills for the 21stcentury | Criatividade e inovação: Competências para o século XXI. *Estudos de Psicologia (Campinas)*, *35*(3), 237–246. http://dx.doi.org/10.1590/1982-02752018000300002

Nugraheni, D. (2018). Pengembangan lembar kegiatan siswa (LKS) berbasis inquiry materi pengukuran untuk meningkatkan kreativitas siswa. *Natural: Jurnal Ilmiah Pendidikan IPA*, *5*(2), 98. https://doi.org/10.30738/natural.v5i2.3252

Pratiwi, S. N., Cari, C., & Aminah, N. S. (2019). Pembelajaran IPA Abad 21 dengan Literasi Sains Siswa. *Jurnal Materi Dan Pembelajaran Fisika (JMPF)*, *9*(1), 34–42. https://doi.org/10.20961/jmpf.v9i1.31612

Rahayu, R., Iskandar, S., & Abidin, Y. (2022). Inovasi Pembelajaran Abad 21 dan Penerapannya di Indonesia. *Jurnal Basicedu*, *6*(2), 2099–2104. https://doi.org/10.31004/basicedu.v6i2.2082

Redhana, I. W. (2019). Mengembangkan Keterampilan Abad Ke-21 Dalam Pembelajaran Kimia. *Jurnal Inovasi Pendidikan Kimia*, *13*(1). https://doi.org/10.15294/jipk.v13i1.17824

Rijali, A. (2019). Analisis Data Kualitatif. *Alhadharah: Jurnal Ilmu Dakwah*, *17*(33), 81. https://doi.org/10.18592/alhadharah.v17i33.2374

Rizqi, Prabowo, T. K. (2019). The Importance of Scientific Creativity for Students on Science Learning. *IOSR Journal of Research & Method in Education (IOSR-JRME),* *9*(3), 12–15. Retrieved from https://www.iosrjournals.org/iosr-jrme/papers/Vol-9%20Issue-3/Series-4/C0903041215.pdf

Sari, R. A., Musthafa, B., & Yusuf, F. N. (2021). Persepsi Guru terhadap Pembelajaran Berbasis Proyek di Sekolah Menengah Kejuruan. *Jurnal Penelitian Pendidikan*, *21*(2), 1–11. https://doi.org/10.17509/jpp.v21i2.36972

Septikasari, R. dan R. N. F. (2018). Keterampilan 4C Abad 21 Dalam Pembelajaran Pendidikan Dasar. *Jurnal Tarbiyah Al Awlad*, *8*(2), 107–117. https://doi.org/10.15548/alawlad.v8i2.1597

Supena, I., Darmuki, A., & Hariyadi, A. (2021). The Influence of Learning Model on Students' Learning Outcomes. *International Journal of Instruction*, *14*(3), 873–892. https://doi.org/10.29333/iji.2021.14351a

Tran, N. H., Huang, C. F., Hsiao, K. H., Lin, K. L., & Hung, J. F. (2021). Investigation on the Influences of STEAM-Based Curriculum on Scientific Creativity of Elementary School Students. *Frontiers in Education*, *6*, 1–8. https://doi.org/10.3389/feduc.2021.694516

Tran, N. H., Huang, C. F., & Hung, J. F. (2021). Exploring the Effectiveness of STEAM-Based Courses on Junior High School Students' Scientific Creativity. *Frontiers in Education*, *6*, 1–8. https://doi.org/10.3389/feduc.2021.666792

Umam, H. I., & Jiddiyyah, S. H. (2020). Pengaruh Pembelajaran Berbasis Proyek Terhadap Keterampilan Berpikir Kreatif Ilmiah Sebagai Salah Satu Keterampilan Abad 21. *Jurnal Basicedu*, *5*(1), 350–356. https://doi.org/10.31004/basicedu.v5i1.645

Wahdan, A. W., Mulyani, S., & Suwarsi, E. R. (2017). Problem Based Learning Berbasis Socio-Scientific Issue untuk Mengembangkan Kemampuan Berpikir Kritis dan Komunikasi Siswa. *Journal of Innovative Science Education*, *6*(1), 129–137. Retrieved from https://journal.unnes.ac.id/sju/index.php/jise/article/view/17072#nav-references