



Problem Solving Ability of Junior High School Students Through the Application of Problem Based Learning Model on Simple Aircraft Material Seen from Gender Differences

Putri Ameliasari^{1*}, Insih Wilujeng¹

¹Master Program of Science Education, FMIPA, Yogyakarta State University, Yogyakarta, Indonesia.

Received: January 3, 2023

Revised: April 10, 2023

Accepted: June 25, 2023

Published: June 30, 2023

Corresponding Author:

Putri Ameliasari

putriameliasari.2021@student.uny.ac.id

DOI: [10.29303/jppipa.v9i6.2831](https://doi.org/10.29303/jppipa.v9i6.2831)

© 2023 The Authors. This open access article is distributed under a (CC-BY License)



Abstract: The purpose of the study was to describe the profile of students' problem-solving skills through the application of problem-based learning models in terms of gender differences. This type of research is descriptive qualitative research. The research population was students of class VIII A SMPN 19 Bengkulu Selatan. The research instrument used was a problem-solving skills test. The data collection technique used a test in the form of a description question. Data analysis techniques using descriptive statistics. The results showed that, the average of female students' completeness results increased by 72.5, and the average of male students' indicator completeness increased by 73.5 This shows that, male students' problem-solving skills are greater than female students. The average value of male students is 0.36, with a moderate category, and the average value of female students is 0.48, with a moderate category. This shows that there are differences in problem solving skills between male students and female students. The conclusion in this study is that female students' problem-solving skills are higher than male students.

Keywords: Gender; Problem Based Learning; Problem Solving.

Introduction

Learning is a process of guiding individuals to grow and development into an independent, responsibility, a creative, a knowledgeable, a healthy and a noble human being (Suyadi, 2013). In this 21st century, were increasing development of knowledge and technology. Important abilities that must be controlled in this 21st century are the critical thinking skill and problem-solving skill, creative and innovative, collaborative and communicative skills that must be controlled by technology, information and communication literacy. This literacy is very important for a person in selecting, criticizing, evaluating synthesizing, and using information (Redhana, 2019). According to (Lawi & Putra, 2020) essentially the final goal of studying is to generate students who have knowledge and skills in solving problems.

The problem solving is a method of giving an understanding to stimulate students to observe, analyze, and to think about a problem and then analyze the issue to develop the problem-solving skills (Majid, 2013). Students' problem-solving abilities will positively improve achievement, skills, and self-confidence (Gok, 2014). Problem-solving can improve a positive attitude of students by using problem-solving methods (Chao, Tzeng, & Po, 2017). Problem solving is the main goal of education, not just considered a mere learning method. It is essential to develop skills for students to be effective in problem solving real-world problems and to transfer problem-solving strategies from the specific to the general or vice versa (Greif, Holt, & Funke, 2013).

Natural Science (IPA) is a science that studies the surrounding nature, by investigating nature in an organized manner. Science is not just a skill in a series of knowledge, but also a process in a discovery

How to Cite:

Ameliasari, P., & Wilujeng, I. . (2023). Problem Solving Ability of Junior High School Students Through the Application of Problem Based Learning Model on Simple Aircraft Material Seen from Gender Differences. *Jurnal Penelitian Pendidikan IPA*, 9(6), 4566-4571. <https://doi.org/10.29303/jppipa.v9i6.2831>

(Mardiyana, 2018). Science is said to be a product when it includes a set of knowledge, while science becomes a process when it includes the skills and attitudes that exist in scientists in working scientifically (Rismawati, Yus, Sino, & Widyaningsih, 2017).

Science learning can develop students' is potential in problem solving by practicing various science process skills. Problem solving skills are scientific skills that can be used to discover and develop a science concept or theory, as well as train students in growing knowledge through scientific activities (Nurhudayah, Lesmono, & Subiki, 2016). Students are directed to think about what problems will be investigated, provide temporary conjectures on the problems presented, analyze data and make conclusions from the experiments carried out.

Problem solving skills are the highest learning outcomes in thinking and intellectual skills (Moreno, 2010). However, based on observations at SMPN 19 South of Bengkulu it shows that the completion skills of science learning are still low, so that students' problem-solving abilities are still not optimal. In line with research conducted by (Damopolii, Yohanita, Nurhidaya, & Murtijani, 2018), that there are still many teachers who have not trained problem-solving skills in students, where students get minimal opportunities to use problem-solving skills in solving problems that make understanding the concept of material learned in the classroom quickly disappear.

Learning problem solving can train students in dealing with problems, to find ways to solve these problems through a systematic and careful thinking process (Hadi & Radiyatul, 2014). Problem solving indicators used as a reference in assessing students' ability in problem solving, namely indicators developed by Curtis and Dempton (2003), namely: problem representation, planning, implementation, monitoring, and reflection.

Measurement of thinking skills that involve complex activities such as problem-solving skills is more appropriate using essay questions than using multiple choice questions (Kubiszyn & Borich, 2013). This cannot be separated from the weaknesses of multiple-choice questions that allow students to guess and only bring up students' final answers so that they are not rich in information (Henderson et al., 2001; Kastner & Stang, 2011). By using essay questions, students will be forced to activate their high-level thinking skills in finding a solution to the problem they face rather than just using memory (Baig et al., 2014). Kubiszyn & Borich (2013) argue that essay tests are able to test complex cognitive skills that require students to be able to organize, integrate, unify knowledge, and use information to solve new problems.

The use of essay questions is also considered appropriate because it allows teachers to see the quality

of students' work (Moeen-uz-Zafar-Khan & Aljarallah, 2011). By knowing the quality of students' answers, teachers can develop lesson plans that can improve students' problem-solving skills. So that the assessment carried out not only functions as a summative assessment, namely knowing the extent of students' problem-solving skills, but can also act as a formative assessment. For these reasons, it is necessary to measure physics problem solving ability using essay questions.

Problem solving ability is the process of searching and finding the best answer to something that is not yet known, and becomes an obstacle by combining the knowledge and abilities that have been owned to apply to the problem (Juliyanto, 2017). Teaching students in problem solving can lead students to be more sensitive and creative to problems encountered in everyday life. Therefore, there is a need for a learning model that is applied to encourage students to be active, creative, and able to develop student problem solving.

One of the learning models in question, namely by applying the Problem Based Learning (PBL) learning model. The Problem Based Learning (PBL) learning model is a learning process that trains students to learn to find solutions to problems with teacher guidance through the learning syntax stages, namely: presenting problems, making hypotheses, designing experiments, conducting experiments, analyzing data, and making conclusions (Utomo, 2014). Further explained by (Zubaidah, 2016), that problem solving skills include other skills, such as: identification and the ability to search, select, evaluate, organize, and consider various alternatives and interpret information. Seeing the role of problem-solving skills, it is necessary to apply problem solving skills in learning activities.

According to Matlin as cited by (Herlambang, 2013), problem solving is needed when we want to achieve a certain goal, but the way to solve it is not clear. In other words, if a student is trained to solve a particular problem, then the student becomes well skilled in generating appropriate information, analyzing information, and realizing how necessary it is to re-examine the results obtained. Therefore, this study aims to determine the application of the Problem Based Learning (PBL) learning model in practicing problem solving skills in terms of gender differences.

Problem solving strategies can be influenced by gender differences, so that it also affects the critical thinking process. (Leach, 2011), in his research shows that gender and college, the main significantly affect the average ability of critical thinking, meaning that a person's strategy or problem-solving skills can be influenced by gender differences. Based on the formulation of the problem above, this study aims to describe the application of the Problem Based Learning

(PBL) learning model to students' problem-solving skills in terms of gender differences.

Method

This research is qualitative descriptive research. A qualitative approach is an approach that emphasizes more analysis on deductive and inductive inference processes and on analyzing the dynamics of relationships between observed phenomena, using logic (Sugiyono, 2014). The population in this study were students of class VIII A SMPN 19 Bengkulu Selatan in the 2022/2023 academic year, totaling 25 students. While the sample in this study were 20 students from 25 students of class VIII A SMPN 19 Bengkulu Selatan. Sampling in this study used purposive sampling, meaning a sampling technique in which the researcher relies on his own judgment when selecting members of the population to participate in the study, both for male students and female students.

This research was conducted at SMPN 19 Bengkulu Selatan, South Bengkulu Regency. The determination of the research site was based on the location of the school, and the students' problem-solving skills in the school were still low. The research instrument was in the form of a problem-solving skills test assessment sheet in the form of a description. This test is used to measure the ability of junior high school students in solving problems. The data collection method compiled in this study is using tests. The test method is used to measure or determine the improvement of problem-solving skills. The test was conducted in two stages, namely: pretest and posttest in accordance with the indicators and objectives developed by the researcher. The test must be done by students individually. Data analysis of problem-solving skills was carried out based on the scores obtained by students before and after learning using the Problem Based Learning (PBL) learning model. Then, to calculate the improvement of problem-solving skills in terms of gender, N-Gain analysis of students from both research classes was conducted.

Result and Discussion

The results of the pretest and posttest scores of the problem-solving skills profile of male students and female students are presented in Table 1. Scores obtained by students.

Table 1: Score Results of Male Students and Female Students

Male Student Score		Female Student Score	
pretest	posttest	pretest	posttest
58.5	73.5	47	72.5

Based on Table 1 In the initial test, male students scored 58.5 and female students scored 47. All of these students were assessed before the application of the Problem Based Learning (PBL) learning model. While in the posttest, male students scored 73.5 and female students scored 72.5. All of these students were assessed after the application of the Problem Based Learning (PBL) learning model.

The data shows that, the average pretest scores of male students and female students. This shows that, before the application of the learning model All of these students were assessed before the application of the Problem Based Learning (PBL) learning model and after the application of the learning model All of these students were assessed with the application of the Problem Based Learning (PBL) learning model, male students experienced an increase in indicator completeness compared to female students.

Based on the results of the analysis using N-Gain, it was found that the data on the problem-solving skills scores of male students and female students during the learning process using the Problem Based Learning (PBL) learning model showed a difference. For more details, it is presented in Table 2.

Table 2: Comparison of male and female students' scores using N-Gain.

Male student	category	Female student	category
0.36	Medium	0.48	Medium

Table 2 above shows that, there are differences in the problem-solving skills of male students and female students, it can be seen from the pretest and posttest scores. In the initial ability test before applying the Problem Based Learning (PBL) learning model, female students experienced more improvement than male students. The average N-gain for male students was 0.36 with a high category, and female students were 0.48 with a high category.

Based on the results of research at SMPN 19 Bengkulu Selatan, it proves that the application of the Problem Based Learning (PBL) learning model to problem solving skills in terms of gender differences is different. This is shown by paying attention to the results of the N-Gain test which is continued by describing the abilities of male students and female students. From the results of the pretest and posttest, the average score obtained is seen. Based on research (Sumartini, 2016) also shows that, with the application of the Problem Based Learning (PBL) learning model causes student motivation and learning activities to increase. In the initial ability test activities before applying the Problem Based Learning (PBL) learning model, female students experienced more improvement than male students.

After applying the Problem Based Learning (PBL) learning model, the completeness of the indicators increased for female students compared to male students.

The highest increase in problem solving skills is female students, because it is suspected that the difference in the level of seriousness, prudence, and accuracy between men and women in solving a problem has a positive impact on their problem-solving skills. This is in line with the results of research (Saraswati, 2015) which states that male students and female students are different. People often see a person's gender as an important predictor of a person's ability. Some teachers treat male students and female students differently. The terms gender is often interchanged and considered the same. Gender refers to the biological differences between men and women, while gender is the psychosocial aspects of men and women.

Gender equality is a world priority in the welfare of society, especially in terms of education. In this case, it is because by providing a problem model that really arouses the enthusiasm of male students and female students in the learning process, here also students are faced with real learning that makes students more active. In addition, it can also improve problem solving skills in everyday life. This is in line with the results of research conducted by Zheng (2007), which states that differences in problem solving are influenced by gender differences, differences in experience, and differences in education. Biological, psychological, and environmental variables appear to contribute to gender differences. Based on the results of the average N-gain score of male students and female students, the average N-gain score of male students was 0.36 with a moderate category, and female students were 0.48 with a moderate category, but lower than male students. It can be seen from the results of the average N-gain score that female students have increased compared to male students.

Conclusion

There is a difference in the profile of problem-solving skills between male students and female students through the application of the Problem Based Learning (PBL) learning model, in terms of gender differences.

Acknowledgments

The author would like to thank all those who have helped in this research, especially parents, lecturers of the study of science in living systems.

Author Contributions

The author's contributions include Putri Ameliasari: conducting validation tests, and writing original drafts; Insih

Wilujeng: focus on methodology, supervision, and review of writing; Putri Ameliasari and Insih Wilujeng: guidelines for writing scientific papers.

Funding

Not a source of funds

Conflict of Interest

The authors declare no conflict of interest.

References

- Arikunto, S. (2010). *Prosedur Penelitian Suatu Pendekatan Praktik*. Rineka Cipta.
- Baig, M., Ali, S. K., Ali, S., & Huda, N. (2014). Evaluation of Multiple Choice and Short Essay Question Items in Basic Medical Sciences. *Pakistan Journal Medical Science*, 30(1), 3–6. <https://doi.org/10.12669/pjms.301.4458>
- Chao, J. Y., Tzeng, P. W., & Po, H. Y. (2017). The Study of Problem Solving Process of E-book PBL Course of Atayal Senior High School Students in Taiwan. *Journal of Mathematics Science and Technology Education*, 1001-10012. <https://doi.org/10.12973/EURASIA.2017.00654A>
- Damopolii, I., Yohanita, A. M., Nurhidaya, N., & Murtijani, M. (2018). Meningkatkan keterampilan proses sains dan hasil belajar siswa melalui pembelajaran berbasis inkuiri. *Jurnal Bioedukatika*, 22-30. <http://dx.doi.org/10.26555/bioedukatika.v6i1.8029>
- Gok, T. (2014). Students' Achievement, Skill and Confidence in Using Stepwise Problem-Solving Strategies. *Eurasia Journal of Mathematics, Science & Technology Education*, 617-624. Retrieved <https://doi.org/10.12973/EURASIA.2014.1223A>
- Greif, S., Holt, D. V., & Funke, J. (2013). Perspectives on Problem Solving in Educational Assessment: Analytical, Interactive, and Collaborative Problem Solving. *The Journal of Problem Solving*, 71-91. <https://dx.doi.org/10.7771/1932-6246.1153>
- Hadi, S., & Radiyatul. (2014). Metode Pemecahan Masalah Menurut Polya Untuk Mengembangkan Kemampuan Siswa Dalam Pemecahan Masalah Matematis Di Sekolah Menengah Pertama. *Jurnal Pendidikan Matematika*, 53-61. <https://dx.doi.org/10.20527/edumat.v2i1.603>
- Henderson, C., Heller, K., Heller, P., Kuo, V. H., & Yerushalmi, E. (2001). Instructors' Ideas about Problem Solving Setting Goals. *Physics Echratation Research Conference*. <https://doi.org/10.1119/perc.2001.pr.006>
- Herlambang. (2013). Analisis Kemampuan Pemecahan Masalah Matematika Siswa Kelas VII-A SMP Negeri 1 Kepahiang tentang Bangun Datar Ditinjau

- dari Teori Van Hiele. *Universitas Bengkulu*. Retrieved <http://repository.unib.ac.id/id/eprint/8426>
- Hestiana, H., & Rosana, D. (2020). The Effect of problem based learning based sosio-scientific issues on scientific literacy and problem-solving skills of junior high school students. *Journal of Science Education Research*, 4(1), 15-21. <http://dx.doi.org/10.21831/jser.v4i1.34234>
- Juliyanto, E. (2017). Model Pembelajaran Ipa Dengan Pendekatan Inkuiri Berbasis Proyek Untuk Menumbuhkan Kompetensi Menyelesaikan Masalah. *Indonesian Journal of Science and Education*, 36-42. <https://dx.doi.org/10.31002/ijose.v1i1.419>
- Kimianti, F., & Prasetyo, Z. K. (2019). Pengembangan e-modul ipa berbasis problem based learning untuk meningkatkan literasi sains siswa. *Kwangsan: Jurnal Teknologi Pendidikan*, 7(2), 91-103. <https://doi.org/10.31800/jtp.kw.v7n2.p91--103>
- Kubiszyn, T., & Borich, G. D. (2013). *Educational Testing and Measurement: Classroom Application and Practise* (10th ed.). NJ: Willey.
- Lawi, S., & Putra, S. H. (2020). Efektivitas Model Pembelajaran Problem Based Learning dan Number Head Together Terhadap Keterampilan Proses Sains dan Hasil Belajar Siswa Kelas VII SMP Santa Maria Maumere. *Jurnal Biologi dan Pendidikan Biologi*. <https://doi.org/10.55241/spibio.v1i2.11>
- Leach, B. T. (2011). *Critical thinking skills as related to university students' gender and academic discipline* (Doctoral dissertation, East Tennessee State University). Retrieved Critical Thinking Skills as Related to University Students Gender and Academic Discipline. (core.ac.uk)
- Majid, A. (2013). *Strategi Pembelajaran*. Bandung: Pemaia Rosdakarya.
- Mardiyana, I. H. (2018). *Keterampilan Proses Sains Sekolah Dasar*. Surabaya: Pondok Pesantren Jagad 'Alimussirry.
- Aljarallah, B. M. (2011). Evaluation of modified essay questions (MEQ) and multiple choice questions (MCQ) as a tool for assessing the cognitive skills of undergraduate medical students. *International journal of health sciences*, 5(1), 39. Retrieved Evaluation of Modified Essay Questions (MEQ) and Multiple Choice Questions (MCQ) as a tool for Assessing the Cognitive Skills of Undergraduate Medical Students - PubMed (nih.gov)
- Nurhudayah, M., Lesmono, A. D., & Subiki. (2016). Penerapan Model Inkuiri Terbimbing (Guided Inquiry) Dalam Pembelajaran Fisika Sma Di Jember (Studi pada Keterampilan Proses Sains dan Keterampilan Berpikir Kritis). *Jurnal Pembelajaran Fisika*, 82-88. Retrieved <http://repository.unej.ac.id/handle/123456789/77355>
- Pritasari, A. C., & Jumadi, J. (2018). Development of science learning tool based on problem based learning with Google Classroom to improve argumentation skill. *Biosaintifika: Journal of Biology & Biology Education*, 10(2), 348-355. <https://doi.org/10.15294/biosaintifika.v10i2.14320>
- Redhana, I. W. (2019). Mengembangkan Keterampilan Abad Ke-21 Dalam Pembelajaran Kimia. *Jurnal Inovasi Pendidikan Kimia*, 2239-2253. <https://doi.org/10.15294/jipk.v13i1.17824>
- Rismawati, Yus, I., Sino, I. L., & Widyaningsih, S. W. (2017). Penerapan Model Pembelajaran Inkuiri Terbimbing (Guided Inquiry) terhadap Keterampilan Proses Sains Peserta Didik di SMK Negeri 02 Manokwari. *Lectura: Jurnal Pendidikan*, 8, 11-25. <https://doi.org/10.31849/lectura.v8i1.267>
- Riwayani, R., Perdana, R., Sari, R., Jumadi, J., & Kuswanto, H. (2019). Analisis kemampuan argumentasi ilmiah siswa pada materi optik: Problem-based learning berbantuan edu-media simulation. *Jurnal Inovasi Pendidikan IPA*, 5(1), 45-53. <http://dx.doi.org/10.21831/jipi.v5i1.22548>
- Saraswati, E. (2015). Perbedaan Hasil Belajar Siswa Laki-laki dan Perempuan Perbedaan Hasil Belajar Siswa Laki-laki dan Perempuan Pecahan di SD Negeri Se-Desa Caturharjo, Kecamatan Sleman, Kabupaten selem. Universitas Negeri Yogyakarta. <http://eprints.uny.ac.id/id/eprint/28348>
- Sugiyono. (2014). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, dan R&D*. Bandung: Alfabeta.
- Sumartini. (2016). Peningkatan Kemampuan Pemecahan Masalah Matematis Siswa melalui Pembelajaran Berbasis Masalah. *Mosharafa: Jurnal Pendidikan Matematika*, 148-158. <https://doi.org/10.31980/mosharafa.v5i2.270>
- Saputro, A. D., Irwanto, Atun, S., & Wilujeng, I. (2019). The Impact of Problem Solving Instruction on Academic Achievement and Science Process Skills among Prospective Elementary Teachers. *Elementary Education Online*, 496-507. <http://dx.doi.org/10.17051/ilkonline.2019.561896>
- Suyadi. (2013). *Strategi Pembelajaran Pendidikan Karakter*. Bandung: PT. Remaja Rosdakarya.
- Saputri, A. A., & Wilujeng, I. (2017). Developing Physics E-Scaffolding Teaching Media to Increase the Eleventh-Grade Students' Problem Solving Ability and Scientific Attitude. *International Journal of Environmental and Science Education*, 12(4), 729-745. Retrieved <https://eric.ed.gov/?id=EJ1144754>
- Saputro, A. D., Atun, S., Wilujeng, I., Ariyanto, A., & Arifin, S. (2020). Enhancing Pre-Service Elementary

- Teachers' Self-Efficacy and Critical Thinking Using Problem-Based Learning. *European Journal of Educational Research*, 9(2), 765-773. <https://doi.org/10.12973/eu-jer.9.2.765>
- Tumanggor, A. M. R., Jumadi, J., Wilujeng, I., & Ringo, E. S. (2019). The profile of students' physics problem solving ability in optical instruments. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, 5(1), 29-40. <https://doi.org/10.21009/1.05104>
- Utomo, T. W. (2014). Pengaruh Model Pembelajaran Berbasis Masalah (*Problem Based Learning*) terhadap Pemahaman Konsep dan Kemampuan Berpikir Kreatif Siswa (Siswa Kelas VIII Semester Gasal SMPN 1 Sumbermalang Kabupaten Situbondo Tahun Ajaran 2012/2013). *Jurnal Edukasi*, 5-9. <http://dx.doi.org/10.31949/jee.v6i1.4729>
- Zubaidah, S. (2016). Keterampilan Abad Ke-21: Keterampilan yang Diajarkan melalui Pembelajaran. In Conference: Seminar Nasional Pendidikan dengan Tema "Isu-isu Strategis Pembelajaran MIPA Abad 21" (pp. 1-17). sitang, Indonesia: Program Studi Pendidikan Biologi, STKIP Persada Khatulistiwa Sintang.