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# The effectiveness of Problem Based Learning in increasing students' cognitive outcomes and learning motivation

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## ABSTRACT

*The results of observations at SMA N 10 Semarang, teachers have tried to increase student motivation and learning outcomes by providing assignments and digital-based learning media but the there are still not optimal. The implementation of teacher learning still uses a lot of the conventional learning model. Students consider biology lessons to be just a collection of concepts that must be memorized. Students still do not associate much learning material with phenomena that exist in the surrounding environment. The effect is students are less motivated in learning the material. The purpose of this study was to determine the effectiveness of the Problem Based Learning model in improving cognitive outcomes and student motivation in environmental change material. The research method used in this research is pre-experimental one group pretest-postets. The population used in this study were all students of class X.10 SMA N 10 Semarang with a total of 37 students. The conclusion of the results of this study shows that the Problem Based Learning model has a high category of effectiveness in increasing cognitive outcomes and student learning motivation.*

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**Keywords**
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## INTRODUCTION

Learning motivation is an encouragement that comes from internal and external to an individual who is learning to cause a change in behavior in a better direction (Uno.2009). Learning motivation is very important for students in the learning process because it can help improve student learning outcomes (Orba. al. 2021). Students' learning motivation can be increased by doing several things such as giving praise, giving gifts, giving numbers, giving tests, checking assignment results, providing an appropriate learning model (Sardiman.2014). This *Problem Based Learning* model is a learning model that uses a series of investigations to get to the solution of the problem (Amir etal., 2012). This learning model is very suitable with the characteristics of environmental change material. Environmental problems that arise around students are used as a stimulus to initiate learning activities in the classroom (Sumarmi, 2012).

According to Hosnan (2014), the syntax of PBL is, 1) Problem orientation, explaining learning objectives, explaining the logistics required, motivating students to engage in problem-solving activities, and proposing problems. 2) Organizing students to learn, students are divided into groups, helping students define and organize learning tasks related to the problem. 3) Guiding individual and group investigations. learners gather appropriate information, carry out experiments and investigations to obtain explanations and solve problems. 4) Develop and present work. Learners plan and prepare appropriate work. 5) Analyzing and evaluating the problem-solving process, learners reflect on or evaluate their investigations and the processes they use.

The Problem-Based Learning model is characterized by its emphasis on interesting questions and challenging problems that become the focal point of the learning process. It encourages an interdisciplinary approach, where students are encouraged to explore the connections between different areas of knowledge. Investigative authenticity is a hallmark of this model, as students investigate real-world scenarios and apply their learning to practical situations. This approach fosters a sense of discovery, allowing students to actively explore and discover knowledge, rather than passively receiving information. Collaboration plays an important role in Problem Based Learning, which echoes the idea that knowledge is often co-constructed through social interaction. Students work together, sharing insights, perspectives and solutions, which not only enriches their understanding, but also hones their cooperation and communication skills. By collaborating, students are exposed to diverse viewpoints, allowing them to approach problems from different angles and develop a thorough understanding of the subject matter.

Motivation, as highlighted by Cleopatra (2015), is an important factor in the learning process. Rooted in the Latin word "movere," meaning drive, motivation is the inner drive that prompts a person to take action and work towards their goals. In the context of learning, motivation is as important as the acquisition of skills and knowledge. Without sufficient motivation, even the most ambitious goals will be difficult to achieve, thus emphasizing the crucial role of motivation in achieving success. Emda (2018) underlines motivation as the catalyst that drives individuals or groups to exert effort to achieve desired goals. Motivation acts as a guiding force, directing learners towards active participation and sustained dedication. Motivation energizes students, pushes them through challenges and setbacks, and enables them to persevere in their educational journey. At its core, the Problem-Based Learning Model, with its emphasis on stimulating questions, interdisciplinary exploration, authentic investigation, discovery and collaboration, aligns with the concept of motivation. As motivation is the driving force behind an individual's actions, the Problem-Based Learning Model utilizes this motivation to create dynamic and engaging learning experiences that empower students to discover knowledge, solve complex problems, and ultimately achieve their educational aspirations.

Learning motivation is all things from within students that create the learning process and ensure continuity of the learning process and shows direction in learning activities. teaching activities that ultimately learning objectives can be achieved (Sardiman, 2011). Through real-life problem solving, students become more enthusiastic in the process of gathering information, investigating problems, and solving environmental problems. Students feel interested in learning, in addition to generating interest, attention and participation, students are also passionate about finding solutions to problems that arise in ways provided, the students'

interest produces results that have an effect on improving student learning outcomes which are classified as excellent. Learning motivation can be said to be good if students are able to follow the learning well until it is finished, which is indicated by bringing textbooks, doing homework given by the teacher, paying attention to the teacher's explanation, sitting quietly in their respective seats, and actively interacting in learning (Dayeni, 2017).

The results of observations at SMA N 10 Semarang, teachers have tried to improve the motivation and learning outcomes of students by providing assignments and digital-based learning media but the results are still not optimal. The implementation of learning in the teacher still uses a lot of lecture models, so that students consider biology lessons only a collection of concepts that must be memorized. Students still do not relate much learning material to phenomena in the surrounding environment, so that in its implementation students are less motivated in learning environmental change material. Teachers need to provide direction to students to provide *life-long learning* in their respective schools (Amalia & Hayat. 2021). Teachers play a very important role in organizing learning that can relate learning material to the surrounding environment, so that students will be more motivated to dig deeper into the material being studied. Emphasis on real-world applications in the field of education can support the learning process (Rachmawati & Nurwahyuni.2018). Eggen (2012) states that Problem-Based learning models can be effective for increasing student motivation because they utilize the motivational effects of curiosity, challenge, authentic tasks, engagement, and autonomy, all factors that increase students' motivation to learn. Researchers have found that the ability to increase curiosity and provide a sense of challenge are two characteristics of intrinsically motivating tasks.

Sulfemi (2018) presents important findings through research that states the significant influence of learning motivation on student learning outcomes. This relationship reveals an interesting connection where students who have high levels of motivation show a distinct tendency to channel their energy and efforts into active engagement in the learning process. As a result, their dedication and commitment translate into better academic performance, outperforming their peers who may have lower levels of motivation. This underscores the important role played by motivation in shaping the trajectory of students' educational journey.

Kusnandar (2019) complements this perspective by explaining the constructive impact of the Problem-Based Learning (PBL) model on students' learning motivation. PBL, with its emphasis on real-world problems, collaborative exploration and self-directed inquiry, has the potential to spark student interest and motivation. By actively engaging students in solving authentic challenges, the PBL model taps into their innate curiosity and encourages a proactive approach to learning. As students become more immersed in problem-solving scenarios, their motivation to achieve and explore further increases, reflecting the reciprocal relationship between the learning model and motivational drive. Kusnandar's (2019) statement extends to the idea that the increased learning motivation, fostered by the PBL approach, then drives students' enthusiasm for the learning process itself. This positive spiral underscores the idea that engaged and motivated students will be more likely to approach learning with vigor and enthusiasm. By nurturing this enthusiasm, the PBL model not only improves learning outcomes but also fosters a deeper appreciation for knowledge acquisition

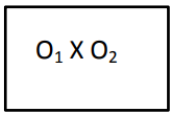
and exploration.

In essence, the research of Sulfemi (2018) and Kusnandar (2019) collectively underscores the symbiotic relationship between learning motivation and the Problem-Based Learning model. As learning motivation drives students' active participation and dedication, the PBL approach acts as a catalyst, igniting and sustaining this motivation through a dynamic and engaging framework. Together, the two form a harmonious interaction that enhances students' learning outcomes and their overall enthusiasm for the learning experience.

## METHOD

The research was conducted at SMA N 10 Semarang during the even semester of the academic year 2022/2023 in Class X. The population used in the study consisted of all students in Class X.10 at SMA N 10 Semarang, totaling 37 students. The research design was descriptive quantitative, aimed at describing the data of students' cognitive outcomes and motivation. The instruments used to measure effectiveness included motivation questionnaires and N Gain pre-test and post-test on the topic of environmental change. The research method employed in the study was a pre-experimental one-group pretest-posttest design. According to Arikunto (2010), the one-group pretest-posttest design is a research approach where a pretest is administered before any treatment is given, and a posttest is conducted at the end after the treatment is applied.

The diagram illustrating the pattern of the one-group pretest-posttest design is as follows:




**(Figure 1. Research pattern chart)**

**Description:**
O1 = Pretest score (before treatment)

X = *Problem Based Learning*

O2 = Post test score (after treatment)

Quantitative descriptive data analysis technique N-Gain test is calculated using Ms. Excel. The results of the N-gain test score will be categorized using the following categories:

**Table 1. N-Gain Score Effectiveness Interpretation Category *Score***

| Percentage (%) | Interpretation |
|---|---|
| <40 | Ineffective |
| 40-55 | Less Ineffective |
| 56-75 | Effective Enough |
| >76 | Effective |

Source : Hake (1999)

Motivation levels were categorize : low, Medium, and high.

**Table 2: Criteria for Student Learning Motivation Level**

| Percentage range (%) | Category |
|---|---|
| 25% < x ≤ 50% | Low |
| 50% < x ≤ 75% | Medium |
| 75% < x ≤ 100% | High |

Source: Arikunto (2002)

## RESULT AND DISCUSSION

Student learning outcomes in the form of pre-test and post-test scores, the data is then analyzed using the N-gain test formula to determine the increase in learning outcomes to determine the difference in pre-test and post-test results.

**Table 4. N-Gain Test Recapitulation Table**

| No. | Aspects | Description |
|---|---|---|
| **1.** | Average pre test score | 44,44 |
| **2.** | Average post test score | 88,61 |
| **3.** | Maximum score | 100 |
| **4.** | Average N-gain score | 0,79/79% |
| **5.** | N-gain criteria | High (Effective) |

The average student pre-test score based on the table above is 44.44 and the post-test score is 88.61. The average N-gain value is 0.79 and is included in the high criteria. This shows that the effectiveness of using the Problem Based Learning learning model has a high effectiveness to improve students' cognitive outcomes in environmental change material. The implication of the application of this problem-based learning model is to encourage students to think creatively, imaginatively, introduce new ideas, and encourage students to gain self-confidence.

The percentage of student learning outcomes that exceeded the KKM was more than 50% of the study population. This is due to the support of the third syntax of the Problem Based Learning model, namely independent and group investigations. Investigation activities through direct contact with the surrounding environment can provide a high value learning experience. Problem Based Learning is a learning model by making confrontation using the provision of problems that also have a real-world context (Kek et al., 2002).

Learning motivation is very influential on a person in the learning process. Learning motivation is an encouragement for students to learn and achieve learning goals, motivation can be influenced by external and internal factors. The results of the student learning motivation questionnaire are presented in the following table. Agree with Suari (2018), where the application of the problem-based learning model has made a major contribution in overcoming student learning difficulties including problems faced by students in learning. The application of learning models that are in accordance with the subject matter being taught including DL and PBL models is highly recommended for teachers.

**Table 5. Recapitulation Table of Student Learning Motivation Questionnaire**

| No. | Indicator | Total Score |
|---|---|---|
| **1.** | Strong will to do | 10 |
| **2.** | Amount of time devote to learning | 9 |
| **3.** | Willingness to leave other obligation or duties | 4 |
| **4.** | Perseverance in doing task | 8 |
| **5.** | Tenacious in the face of adversity | 8 |
| **6.** | Show interest in a wide range of people's problems adults | 9 |
| **7.** | Prefer to work independently | 9 |
| **8.** | Can defend his/her opinion | 10 |
| Total Score | | 67 |
| Presentage | | 89,33% |
| Criteria | | High |

Based on the result above, the student learning motivation score obtained out of total is 67 score of 75 in the category included in the high category. This means that the Problem Based Learning learning model to increase student learning motivation. Through solving real-life problems, students become more enthusiastic in the process of gathering information, investigating problems, and solving environmental problems. This is in line with the research of Setyowati (2022) that the Problem Based Learning model can increase student learning motivation and this increased motivation is also in line with the increase in cognitive learning outcomes. The National Department of Education (2008), states that effective means there is an effect (consequence, influence, impression). Anggraini & Mukhadis (2013) offer insight into the transformative impact of combining the PBL model with Geogebra.

This synergistic approach appears to trigger a surge in students' motivation to learn. Geogebra, a dynamic mathematical software, lends itself as a powerful tool for visualizing and exploring mathematical concepts, which aligns with the problem-solving emphasis of the PBL model. By combining PBL and Geogebra, students are exposed to an interactive and hands-on learning environment that stimulates curiosity and active engagement. This, in turn, encourages students to be more enthusiastic and committed to their learning journey. The study by Fauzan et al. (2017) reinforces this premise by corroborating the positive impact of the PBL-Geogebra blend on students' learning motivation. Through this innovative combination, students are provided with a unique avenue to investigate mathematical problems, thus fostering a sense of ownership and empowerment over their learning. The visual and experiential aspects of Geogebra not only make complex concepts easier to understand, but also strengthen students' motivation to explore and master the subject matter

Based on these findings, Wulandari & Surjono (2013) contributed to the discourse by asserting that the PBL model, when associated with Geogebra, not only transformed students' learning outcomes but also catalyzed a shift in their learning motivation in a more positive direction. This transformative effect underscores the potential of the PBL-Geogebra approach to not only

improve academic achievement but also to instill deeper and longer-lasting learning motivation. As a synthesis, the collective research by Anggraini & Mukhadis (2013), Fauzan et al. (2017), and Wulandari & Surjono (2013) showcases the dynamic synergy between the Problem-Based Learning model and Geogebra integration. This collaborative approach changes the learning landscape, encouraging increased motivation through interactive experiences and engagement. By harnessing the power of Geogebra to complement the problem-solving nature of PBL, educators are provided with a powerful strategy to invigorate students' learning journeys, igniting a genuine passion for exploration, understanding and achievement.

## CONCLUSION

Based on data analysis and discussion, it can be concluded that the Problem Based Learning learning model is proven effective in improving students' cognitive learning outcomes in the high category. Moreover, the impact of the PBL model goes beyond the realm of cognitive progress, as it emerged as a key driver in raising students' learning motivation to an equally remarkable high category. The immersive and participatory nature of PBL ignites a fire of curiosity and enthusiasm in students, instilling in them a strong drive to explore, understand and achieve. This heightened motivation not only invigorates their learning experience, but also encourages them to go beyond conventional boundaries, embarking on a journey of knowledge acquisition with passion and dedication.

## REFERENCES

Amalia, I. R., & Hayat, M. S. (2021). The Urgency of Life-Long Learning for Students in Biology Learning. *Jurnal Mangifera Edu*, *6*(1), 20-28.https://doi.org/10.31943/mangiferaedu.v6i1.127

Amir, M. T. (2010). Inovasi Pendidikan Melalui Problem Based Learning : Bagaimana pendidikan memberdayakan pemelajar di era pengetahuan. Jakarta : Kencana Prenada Media Group.

Anggraini, V. D., & Mukhadis, A. (2013). Problem Based Learning, Motivasi Belajar, Kemampuan Awal, dan Hasil Belajar Siswa SMK. Jurnal Ilmu Pendidikan, 19(2), 187–195.

Arikunto, S. (2010). *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta: Rineka Cipta Sugiyono. 2010. *Metodologi Penelitian Administrasi*. Jakarta : CV. Alfabeta.

Cleopatra (2015). Pengaruh gaya hidup dan motivasi belajar terhadap prestasi belajar matematika.Formatif: JurnalIlmiah Pendidikan MIPA,5(2).

Departemen Pendidikan Nasional . 2008 . Peraturan Menteri Pendidikan Nasional Nomor 27 Tahun 2008 Tentang Standar akademik dan Kompetensi Konselor. Tersedia : http//www.bnspindonesia.org/document.php?id=44

Dayeni, F., Irawati, S., & Yennita, Y. (2017). Upaya Meningkatkan Motivasi Dan Hasil Belajar Siswa Melalui Model Problem Based Learning. *Diklabio: Jurnal Pendidikan Dan Pembelajaran Biologi*, *1*(1), 28–35. https://doi.org/10.33369/diklabio.1.1.28-35

Emda, A. (2018). Kedudukan Motivasi Belajar Siswa Dalam Pembelajaran. Lantanida Journal, 5(2), 172. https://doi.org/10.22373/lj.v5i2.2838

Eggen, p., & Kauchak, D. (2012). Strategi dan model pembelajaran mengajarkan konten dan keterampilan berpikir. Jakarta: PT Indeks

Fauzan, M., Gani, A., & Syukri, M. (2017). Penerapan Model Problem Based Learning Pada Pembelajaran Materi Sistem Tata Surya Untuk Meningkatkan Hasil Belajar Siswa. Jurnal

Pendidikan Sains Indonesia (Indonesian Journal of Science Education), 5(1), 27–35.

Hake, R, R. (1999). Analyzing Change/Gain Scores. AREA-D American Education Research Association's Devision.D, Measurement and Reasearch Methodology.

Hosnan. (2014). Pendekatan Saintifik Dan Konseptual Dalam Pembelajaran Abad 21. Bogor: Ghalia Indonesia.

Kek Yih Chyn., Wee, L., & Neo, K. (2002). Authentic Problem Based Learning Rewriting Business Education. *Prentice Hal. Singapore*.

Kusnandar. (2015). *Penilaian Autentik (Penilaian Hasil Belajar Peserta didik berdasarkan kurikulum2013) suatu pendekatan Praktis disertai dengan contoh*. Jakarta: Rajawali pers.

Maryanti, I., Wahyuni, S., & Panggabean, E. M. (2017). Pengaruh Hasil Belajar Mahasiswa Menggunakan Model Pembelajaran Berbasis Masalah Di Fkip Umsu. Matematics Paedagogic, 2(1), 83–89.

Meltzer, D.E . (2002). The Relationship Between Mathematics PreparationAnd conceptual learning gain in physics:A possible inhidden Variablei in Diagnostic pretest scores.Ames:Department ofphysics and Astronomy,Lowa State University.

Orba, M.S., Mardani, M., & Aslan, A. (2021). The Effectiveness of Al-Quran Memorization Methods for Millennials Santri During Covid-19 in Indonesia. *Nazhruna: Jurnal Pendidikan Islam*, *4*(2), 195-207. https://doi.org/10.31538/nzh.v4i2.1334

Orozco, J. A., & Yangco, R. T. (2016). Problem-Based Learning : Effects on Critical and Creative Thinking Skills in Biology. *Asian Journal of Biology Education*. (Vol.9, 1–10)

Pradipta, Anangga Widya; Sofyan, Herminarto. Implementasi Pbl Untuk Meningkatkan Motivasi, Kreativitas Dan Pemahaman Konsep. *Jurnal Inovasi Teknologi Pendidikan*, [S.l.], v. 2, n. 1, p. 32-48, apr. 2015. ISSN 2460-7177. Available at: <https://journal.uny.ac.id/index.php/jitp/article/view/5202/4508>. Date accessed: 07 aug. 2023. doi:https://doi.org/10.21831/tp.v2i1.5202.

Rachmawati, R. C., & Nurwahyuni, A. (2018). Pengembangan Media Pembelajaran Keanekaragaman Hewan. *Pancasakti Science Education Journal*, 9- 17.

Sardiman, A.M. (2014). *Interaksi dan Motivasi Belajar Mengajar*. Jakarta: Rajawali Pers

Setyowati, A. (2022). Pengaruh Model Problem Based Learning Terhadap Motivasi Dan Hasil Belajar Siswa. *Journal of Teacher Professional*.

Suari, N.P. (2018). Penerapan Model Pembelajaran Problem Based Learning Untuk Meningkatkan Motivasi Belajar IPA. Jurnal Ilmiah Sekolah Dasar, 2(3), 241–247. https://doi.org/10.23887/jisd.v2i3.16 138

Sumarmi. (2012). Model-Model Pembelajaran Geografi. Malang: Aditya Media Publishing

Sulfemi, B.W. (2018) Hubungan Motivasi dan hasil belajar IPS di kabpaten Bogor. *Jurnal Ilmiah Edutecno*. (Vol.18, 1-12)

Uno, H. (2009). *Profesi Kependidikan (Problema, Solusi, dan Reformasi Pendidikan di Indonesia*. Jakarta: PT. Bumi Aksara.

Wulandari, B., & Surjono, H. D. (2013). Pengaruh problem-based learning terhadap hasil belajar ditinjau dari motivasi belajar PLC di SMK. Jurnal Pendidikan Vokasi, 3(2), 178–191. https://doi.org/10.21831/jpv.v3i2.1600

Yasmini, I. G. K. (2021). Penerapan Model Pembelajaran Problem Based Learning untuk Meningkatkan Motivasi Belajar IPA. *Journal of Education Action Research*, *5*(2), 159–164. https://doi.org/10.23887/jear.v5i2.33603