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The Effectiveness of Electronic Student Worksheet with Problem-Based Learning (PBL) to Increasing Learning Interest

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Abstract: Increasing students' interest in learning is a key factor in achieving effective and optimal educational outcomes. One approach that can enhance students' learning interest is through the use of electronic student worksheets, which encourages students to actively engage in the learning process. This study aims to evaluate the effectiveness of electronic student worksheet based on Problem Based Learning (PBL) to enhancing students' learning interests. This research uses a one-group pretest-posttest design involving 27 students from the XI MIPA class at SMAN 1 Jetis, selected through random sampling. IBM SPSS 25 was used to analyze the data using the Wilcoxon test and N-gain. Following the intervention, students' interest in learning increased significantly, according to the study's findings, with an average pretest score of 48.11 and a posttest score of 64.15. The results of the Wilcoxon test indicated a significant difference between the pretest and posttest scores, with a significant value of 0.000 ($p < 0.05$). In addition, the N-gain results show an average percentage increase of 56.46%, which falls into the quite effective category.

Keywords: Effectiveness; Electronic students' worksheet; Learning interest; Problem based learning

Introduction

Education plays a crucial role in shaping a quality and competitive generation. Through education, every individual can optimally develop their inherent potential (Situmorang & Siahaan, 2019). According to Herpratiwi & Tohir (2022), nearly all skills, knowledge, habits, and attitudes are developed through the learning process. In this case, effective learning becomes the key, where students are not just passive recipients but also actively involved in developing their understanding and skills. Effective learning is demonstrated by students' interest and focus throughout the learning process. (Suparni, 2022)

One important element in the learning process is the interest to learn (Aisyah et al., 2022). Interest is a strong desire to engage with certain content, involving interaction between an individual's personal characteristics and the environment (Palmer, 2019). Sirait et al. (2023) state that interest is an internal drive within a person to like something or an activity without being influenced by others. The interest that a person possesses will motivate them to strive towards achieving their desired goals (P., 2019).

Interest in learning plays a crucial role in a student's success (Fajri et al., 2021; Nuraisyah et al., 2021). Students who exhibit interest in learning are drawn to and enthusiastic about learning activities, they also recognize the value of learning and actively participate in them, which makes the learning process more effective and efficient (Suparni, 2022). Furthermore, Mulyani et al. (2021) added that students' learning results would be influenced by how interested they are in a subject. A high interest in learning drives students to engage actively, understand the material, and create effective learning activities (Ismiyanti et al., 2022). Students who have a strong interest in learning are usually more engaged and active in discussions.,

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respond well to learning, seek answers to questions, and ask when they encounter difficulties (Arlianty, 2017; Hasanati & Purwaningsih, 2021).

Low learning interest might make it more difficult to meet learning objectives meant to improve a person's cognitive, emotional, and psychomotor abilities (Friantini & Winata, 2019). The low interest in learning can occur, especially with material that is considered difficult for students, one of which is biology. This is because a significant portion of biology material has high complexity and requires a lot of memorization, which becomes a barrier in learning (Murni & Sari, 2022; Oktavian & Aldya, 2020). The complexity of this material poses a challenge for students in understanding the content, which ultimately can diminish their interest in learning. Students also feel that some lessons in biology tend to be boring, which makes them less interested in studying (Adlini et al., 2023; Husamah et al., 2018).

The interest in learning does not grow on its own; rather, it arises from a sense of necessity (Friantini & Winata, 2019). This leads to the fact that not all students have the same interest in a subject, but it can develop, in part, due to the engaging presentation of the material (Firdaus, 2019). To address this issue, innovation is needed to create a learning environment that can engage students actively, one of which is through student worksheets. Student worksheets is a teaching material that plays a crucial role in enhancing student involvement in the teaching process, helping students acquire information, and providing opportunities for exploration (Lase & Zai, 2022). In addition, student worksheets can also be used to increase students' interest in learning (Sládek et al., 2011).

Along with the development of technology, student worksheets has now evolved into an electronic format that not only presents material in text form but also includes images and videos. To maximize the use of electronic student worksheets, its preparation can be combined with a learning model that can facilitate students' interest in learning, one of which is Problem Based Learning (PBL). Problem Based Learning is a learning model where students are confronted with real-world problems to be solved collaboratively (Munawaroh et al., 2022). According to Kamala et al., (2022), PBL is an instructional approach that uses problem-solving exercises to motivate students to participate more actively in the learning process.

This purpose of this study is to determine the effectiveness of using electronic student worksheets with Problem Based Learning in increasing students' interest in learning. As educational technology continues to advance and the urgency for improving the quality of learning grows, the development of electronic student worksheets with PBL (Project-Based Learning) is expected to serve as an effective alternative in increasing student interest, providing a more engaging learning experience, and encouraging active student participation in the learning process.

Method

This research was conducted at SMAN 1 Jetis with 27 students from the XI MIPA class as the research subjects, selected through random sampling techniques. This research uses a one group pretest-posttest design, where there is only one group that receives the treatment without a control group. In this research design, measurements were taken before and after the treatment to observe the use of electronic student worksheets with PBL on students' learning interest.

Data was collected using a learning interest questionnaire based on a 1-4 likert scale.. This questionnaire is used to measure learning interest before and after the treatment, consisting of several statements developed based on the indicators of learning interest presented in Table 1.

Table 1. Learning interest indicators

No.	Indicator
1.	Excitement
2.	Interest
3.	Attention
4.	Involvement

The research process begins with a pretest measurement to determine students' learning interest before the treatment. After being treated with the use of electronic student worksheets through Problem Based Learning (PBL), students were given a post-test after the learning process. The data gathered from the pretest and posttest were analyzed through statistical tests. In addition, the effectiveness calculation was conducted using the N-gain test, referring to the percentage N-gain categories by Sukarelawan et al. (2024) and is presented in Table 2.

Table 2. Interpretation of N-gain Score Percentage

Persentage (%)	Category
>76	Effective
56-76	Quite Effective
40-55	Less Effective
< 40	Not Effective

Result and Discussion

Students' interest in learning is measured before and after the learning activities on the topic of the endocrine system. After obtaining the results of the interest in learning before and after the learning

activities, a descriptive analysis is then conducted. Table 3 below shows the outcomes of the descriptive analysis.

Tale 3. Result of Student Learning Interest

	Min	Max	Mean	Std. dev
Pretest	42	55	48.11	4.41
Postest	55	68	64.15	3.17

Table 3 shows an increase in students' interest in learning. Before the treatment was given, the pretest results indicated that the average pretest score for learning interest was 48.11, and after the treatment in the form of using electronic student worksheets, the posttest results showed an increase with an average posttest score of 64.15.

To determine whether the pretest and posttest data are normally distributed, The Shapiro-Wilk test was used to perform a normalcy test.. The results of the normality test indicate that the significance values for both the pretest and posttest are < 0.05, indicating that the distribution of the data is not normal. Table 4 displays the results of the normality test.

Table 4. Result of N-gain Analysis of Student Learning Interest

	Statistics	Sig.	Category of Normality
Pretest	0.018	0.05	Not normally distributed
Postest	0.039	0.05	Not normally distributed

Since the data are not normally distributed, the subsequent analysis was conducted using the Wilcoxon test. The Wilcoxon test findings reveal a significant difference between the pretest and posttest scores of students' learning interest, with a Z value of -4.545 and a significance value of 0.000 ($p < 0.05$). Table 5 displays this outcome.

Table 5. Result of Wilcoxon Test

	Post-Pre
Z	-4.545
Asymp.Sig. (2-tailed)	.000

Next, to evaluate the effectiveness of the electronic student worksheets used, an N-gain calculation was performed. The N-gain test is conducted to determine how effective the electronic student worksheets based on PBL is in increasing students' interest in learning. The results of the N-gain analysis show an average percentage of 56.46% with an N-gain value of 0.56, which falls into the category of fairly effective. This indicates that the use of electronic student worksheets has a significant impact on increasing students' interest in learning. The results of the N-gain analysis are shown in Table 6.

Table 6. Result of N-gain Analysis of Student Learning Interest

Average percentage	N-gain	Criteria
56.46%	0.56	Quite Effective

The results indicate that the integration of Problem Based Learning through electronic student worksheets can capture students' attention and enhance their interest in learning. The increase in post-test results and the calculation of N-gain, which falls into the quite effective category, indicates that this method has good potential in enhancing the quality of learning, particularly in terms of student interest in learning. In addition, the results of the Wilcoxon test reinforce the conclusion that the difference in learning interest before and after the treatment is statistically significant.

Students' interest in learning is measured by several indicators, including feelings of enjoyment, curiosity, attention, and engagement. Students' interest in learning can be observed from the engagement they show during the learning process using electronic worksheets. The emergence of this interest is partly due to the electronic student worksheets used in learning activities based on the problem-based learning syntax, which presents issues closely related to everyday life, such as health problems related to diabetes. The increasing prevalence of diabetes among teenagers has become a topic of concern that can attract students' interest in learning. This is because the topic is relevant to students' daily lives and has a direct impact on their health. This aligns with the statement by Filice et al. (2023), that topics related to human health can attract greater learning interest and enhance engagement and understanding in learning. When students see how this issue affects their lives and those around them, they will become more interested in learning. In addition, using real-world problems allows students to engage in learning and discussion activities because they are discussing topics they consider important to study. Furthermore, Baden & Major (2004) state that one way to present problems to engage students is by providing issues that stem from real-life situations, because if they are given problems that are unrealistic or irrelevant, it will be more difficult to illustrate how the knowledge gained can be applied in real life.

The electronic student worksheets developed is also supported and equipped with images, videos, and articles that explain the issues related to the endocrine system material. This can encourage students' interest in participating in every learning activity effectively. This aligns with the research by Sari et al. (2019) which states that electronic student worksheets can include materials supplemented with videos and images, thereby capturing students' attention in learning and helping them understand the material. Furthermore, Nurhayati

et al. (2014) state that the availability of images and videos presented can enhance students' interest or motivation in learning the material. Features such as images and videos used in electronic student worksheets help visualize abstract concepts that are are challenging to comprehend with only textual explanations. For example, images showing the structure of the pancreas and insulin hormones, as well as videos demonstrating the physiological processes of the body in regulating blood sugar, can assist students in visually grasping how the endocrine system functions within the body. This feature also helps students understand situations relevant to the material on the endocrine system, such as videos showcasing cases of diabetes patients, especially among teenagers. The availability of videos can provide a clearer picture of how diabetes can occur.

The electronic student worksheets designed encourages student engagement through discussion activities. The interactions that occur among students during the learning process allow them to share ideas and opinions with each other, enabling them to view problems from different perspectives and assisting them in understanding the material. Discussion activities also encourage students to collaborate in solving the problems presented. This finding aligns with the statement by Yamin (2022) that a rise in students' interest in learning through discussion activities. The discussion activities conducted make the learning process more focused, allowing students to easily understand the material (Kurniawati et al., 2019).

The increase in learning interest is also influenced by the school learning environment, where the school environment supports the use of electronic student worksheets with the developed PBL, such as the availability of internet access at school and the use of smartphones in the classroom. This is consistent with the by Nurida et al. (2022) that the school environment, which includes physical aspects such as facilities and infrastructure, is one of the factors that influence students' interest in learning.

Conclusion

It is possible to draw the conclusion that electronic student worksheets combined with PBL is successful in raising students' interest in learning based on the study findings and discussion. This is evidenced by the increase in post-test results compared to the pre-test, as well as the N-gain calculations that indicate it is quite effective. In addition, the results of the Wilcoxon test reinforce the conclusion of a significant difference between students' learning interest before and after the use of electronic student worksheets, indicating a positive impact on students' learning interest.

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Author Contributions
Eka Mustika Sari: Conceptualization, methodology, formal analysis, resources, data curation, writing—original draft preparation. Evy Yulianti.; writing—review and editing.

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Conflicts of Interest
The authors declare no conflict of interest.

References

Adlini, M. N., Iskandaria, W., Manalu, S. N. A. B., Tambunan, S. P. R., Khairanti, D., & Shaharani, A. (2023). Analisis Aspek yang Mempengaruhi Ketertarikan Siswa SMA dalam Pembelajaran Biologi. *Jurnal Biologi Dan Pembelajarannya (JB&P)*, *10*(2), 188–194. https://doi.org/10.29407/jbp.v10i2.20409

Aisyah, L. S., Anggraeni, A., & Pratama, A. P. (2022). Learning interest of class X students in english subjects in one of senior high schools in Bandung. *PROJECT (Professional Journal of English Education)*, *5*(4), 693–696. https://doi.org/10.22460/project.v5i4.p693-696

Arlianty, W. N. (2017). An analysis of interest in students learning of physical chemistry experiment using scientific approach. *International Journal of Science and Applied Science: Conference Series*, *1*(2), 109–116. https://doi.org/10.20961/ijsascs.v1i2.5130

Baden, M. S., & Major, C. H. (2004). *Foundations of problem-based learning*. Open University Press.

Fajri, Z., Baharun, H., Muali, C., Shofiatun, Farida, L., & Wahyuningtiyas, Y. (2021). Student's Learning Motivation and Interest; the Effectiveness of Online Learning during COVID-19 Pandemic. *Journal of Physics: Conference Series*, *1899*(1). https://doi.org/10.1088/1742-6596/1899/1/012178

Filice, D. C. S., Riedy, J. J., Heidemann, M. K., Smith, J. J., & White, P. J. T. (2023). Evaluating introductory biology student perceptions surrounding the use of integrative cases related to human health for evolution education. *Evolution: Education and Outreach*, *16*(1), 1–9. https://doi.org/10.1186/s12052-023-00185-7

Firdaus, C. B. (2019). Analisis Faktor Penyebab Rendahnya Minat Belajar Siswa Terhadap Mata Pelajaran Matematika di MTs Ulul Albab. *Journal on Education*, *2*(1), 191–198.

https://doi.org/10.31004/joe.v2i1.298

Friantini, R. N., & Winata, R. (2019). Analisis Minat Belajar pada Pembelajaran Matematika. *JPMI (Jurnal Pendidikan Matematika Indonesia)*, *4*(1), 6–11. https://doi.org/10.26737/jpmi.v4i1.870

Hasanati, A., & Purwaningsih, E. (2021). Influence of interest in learning and how to learn on understanding concepts: work and energy cases. *Jurnal Pendidikan Sains Indonesia*, *9*(2), 305–316. https://doi.org/10.24815/jpsi.v9i2.19203

Herpratiwi, & Tohir, A. (2022). Learning Interest and Discipline on Learning Motivation. *International Journal of Education in Mathematics, Science and Technology*, *10*(2), 424–435. https://doi.org/10.46328/ijemst.2290

Husamah, Fatmawati, D., & Setyawan, D. (2018). OIDDE learning model: Improving higher order thinking skills of biology teacher candidates. *International Journal of Instruction*, *11*(2), 249–264. https://doi.org/10.12973/iji.2018.11217a

Ismiyanti, W., Santosa, C. A. H. F., & Rafianti, I. (2022). Minat belajar, efikasi diri, dan kemampuan berpikir kritis berpengaruh terhadap hasil belajar matematika siswa. *Jurnal Educatio FKIP UNMA*, *8*(3), 943–952. https://doi.org/10.31949/educatio.v8i3.2847

Kamala, I., Idayanti, Z., & Ulfah, T. T. (2022). Increasing Student Participation in Science Learning Through Problem Based Learning Models. *Jurnal Penelitian Pendidikan IPA*, *8*(4), 2362–2370. https://doi.org/10.29303/jppipa.v8i4.1850

Kurniawati, T., Pargito, & Rosana. (2019). Penggunaan metode diskusi untuk meningkatkan minat belajar dan hasil belajar siswa pada mata pelajaran geografi. *Jurnal Penelitian Geografi*, *1*(2), 14. https://jurnal.fkip.unila.ac.id/index.php/JPG/article/view/5851

Lase, N. K., & Zai, N. (2022). Pengembangan lembar kerja peserta didik (LKPD) berbasis contextual teaching and learning pada materi sistem ekskresi manusia di kelas VIII SMP Negeri 3 Idanogawo. *Jurnal Pendidikan MINDA*, *3*(2), 99–113. http://www.ejurnal.universitaskarimun.ac.id/index.php/mindafkip/article/view/462%0Ahttp://www.ejurnal.universitaskarimun.ac.id/index.php/mindafkip/article/download/462/412

Mulyani, K., Sumarmin, R., Ahda, Y., Alberida, H., & Razak, A. (2021). Analysis of the Relationship of Multiple Intelligences and Learning Interests with Biology Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, *7*(4), 531–536. https://doi.org/10.29303/jppipa.v7i4.774

Munawaroh, Setyani, N. S., Susilowati, L., & Rukminingsih. (2022). The Effect of E-Problem Based Learning on Students' Interest, Motivation and Achievement. *International Journal of Instruction*, *15*(3), 503–518. https://doi.org/10.29333/iji.2022.15328a

Murni, M., & Sari, N. F. (2022). Analysis of Interest in Learning Biology Maple in Class X Students of Class Cross Interest At Sman 1 Bilah Hilir. *Budapest International Research and Critics Institute Journal (BIRCI-Journal)*, *5*(1), 5052–5060. https://doi.org/10.33258/birci.v5i1.4207 5052

Nuraisyah, S., Harahap, R. D., & Harahap, D. A. (2021). Analysis of Internet Media Use of Student Biology Learning Interest During COVID-19. *Jurnal Penelitian Pendidikan IPA*, *7*(2), 213–217. https://doi.org/10.29303/jppipa.v7i2.624

Nurhayati, S., Ifriany, A., & Lestari, I. (2014). Pengaruh video-animasi terhadap hasil belajar siswa kelas XI SMAN 5 Pontianak pada Materi Kesetimbangan Kimia. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa*, *3*(6), 1–10. https://doi.org//10.26418/jppk.v3i6.6058

Nurida, W., Tetelepta, E. G., & Manakane, S. E. (2022). Pengaruh lingkungan sekolah terhadap minat belajar siswa Di SMA negeri 7 Seram Bagian Barat Kecamatan Huamual Belakang Kabupaten Seram Bagian Barat. *Jurnal Pendidikan Geografi Unpatti*, *1*(3), 227–232. https://doi.org/10.30598/jpguvol1iss3pp227-232

Oktavian, R., & Aldya, R. F. (2020). Integrasi Pemanfaatan Media Pembelajaran Berbasis Adobe Flash dengan Lingkungan untuk Meningkatkan Minat Belajar Biologi. *Inteligensi : Jurnal Ilmu Pendidikan*, *3*(1), 40–46. https://doi.org/10.33366/ilg.v3i1.1823

P., A. A. (2019). Pengembangan Minat Belajar dalam Pembelajaran. *Idaarah*, *3*(2), 205–215. https://doi.org/10.24252/idaarah.v3i2.10012

Palmer, D. (2019). Situational Interest and Actualized Individual Interest: Two Problematic Constructs. *Journal of Advances in Education Research*, *4*(3), 110–112. https://doi.org/10.22606/jaer.2019.43002

Sari, I. P., Samiha, Y. T., Habisukan, U. H., Wigati, I., & Hapida, Y. (2019). Review : Pengembangan Bahan Ajat Elektronik Lembar Kerja Peserta Didik (E-LKPD) menggunakan Model ADDIE. *Prosiding Seminar Nasional Pendidikan Biologi 2019*, 68–75. http://proceedings.radenfatah.ac.id/index.php/semnaspbio/article/view/479/283

Sirait, R., Yudha, C. B., & Dwiprabowo, R. (2023). Analysis Of Factors Causing Low Interest In Learning Mathematics After The Covid-19 Pandemic. *International Conference on Education-02*, 172–179. https://doi.org/10.37640/ice.02.532

Situmorang, A. S., & Siahaan, F. B. (2019). Desain Model Pencapaian Konsep Belajar Mahaiswa Fkip Uhn. *Jurnal Penelitian Bidang Pendidikan*, *25*(1), 55–61.

https://doi.org/10.24114/jpbp.v25i1.15533

Sládek, P., Milér, T., & Benárová, R. (2011). How to increase students' interest in science and technology. *Procedia - Social and Behavioral Sciences*, *12*, 168–174. https://doi.org/10.1016/j.sbspro.2011.02.024

Sukarelawan, M. I., Indratno, T. K., & Ayu, S. M. (2024). *N-Gain vs Stacking: Analisis perubahan abilitas peserta didik dalam desain one group pretest- posttest*. Suryacahya.

Suparni, A. S. (2022). Improvement of Biology Learning Interest on High School Cross-Interest Program by Rangkapantas. *Journal of Biology Education*, *11*(2), 171–180. https://doi.org/10.15294/jbe.v11i2.59605

Yamin, M. (2022). Meningkatkan Minat Belajar Siswa Dengan Menggunakan Metode Dikusi Pada Mata Pelajaran Akidak Akhlak Kelas VII MTs NW Suralaga. *Jurnal Manajemen Dan Budaya*, *2*(1), 53–61. https://doi.org/10.51700/manajemen.v2i1.280