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Development of Electronic Student Worksheets Based on TPS Model Assisted by Nearpod on Reaction Rate Material

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ABSTRACT

The rapid development of science and technology requires the education system to adapt in order to improve the quality of education. One effort to enhance educational quality is by utilizing appropriate teaching materials, such as Electronic Student Worksheets. The Electronic Student Worksheets developed in this study employed the Think Pair and Share (TPS) learning model. This research is a Research and Development (R&D) study using the ADDIE model, motivated by the absence of Electronic Student Worksheets in chemistry learning at schools. The objectives of this study were to develop TPS-based Electronic Student Worksheets assisted by Nearpod on the topic of reaction rates, and to evaluate user responses toward the worksheets. The material validation results in the aspects of content, TPS model characteristics, language, presentation, and visual design were 94.65%, 95.84%, 100%, 91.67%, and 96.88%, respectively, categorized as valid. The media validation results for worksheet size, cover design, and content layout were 100%, 100%, and 92.71%, also categorized as valid. User responses from teachers, covering aspects of content and language clarity, TPS model characteristics, attractiveness, and practicality, were 97.8%, 95.8%, 95.8%, and 87.5%, respectively, categorized as very good. Student responses, which assessed the aspects of attractiveness, content and language clarity, and practicality, were 90.3%, 87.3%, and 81.3%, respectively, also falling under the very good category.

Keyword: Electronic Student Worksheets, Nearpod, Think Pair and Share, Reaction.

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INTRODUCTION

The development of science and technology has had a significant impact on various aspects of human life, including the field of education. As science and technology continue to advance, educational systems must adapt accordingly to improve the quality of education. Efforts to enhance educational standards have been reflected in the introduction of the "Merdeka Belajar" (Freedom to Learn) curriculum, whose core concept emphasizes freedom in thinking (Indarta et al., 2022). To meet the challenges of the Merdeka curriculum, appropriate

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teaching materials are needed—one of which is the Student Worksheet (LKPD).

Student Worksheets (LKPD) are teaching materials designed to assist and facilitate learning activities, fostering effective interaction among students and thereby enhancing student engagement and academic performance (Umbaryati, 2016).

Preliminary interviews with chemistry teachers at SMAN 9 Pekanbaru and SMAN 15 Pekanbaru revealed that SMAN 9 Pekanbaru has not yet implemented electronic worksheets (only using printed ones), while SMAN 15 Pekanbaru has not used LKPD at all. The learning materials used in both schools are primarily limited to textbooks and PowerPoint presentations, which have not effectively encouraged active participation from all students. Furthermore, the teachers noted that one of the most challenging topics for students in chemistry is reaction rates, especially in determining rate laws and reaction orders.

This information highlights that the use of printed textbooks and PowerPoint presentations alone is insufficient to actively engage students in the learning process. Moreover, the integration of technology in classroom instruction remains limited and must be improved. As technology continues to evolve, both teachers and students must keep pace with these advancements to avoid falling behind in an increasingly digital era. Therefore, the use of Electronic Student Worksheets (E-LKPD) is considered highly appropriate for teaching the reaction rate topic.

To optimize the development and distribution of E-LKPD to students, various platforms can be used, one of which is Nearpod.

Nearpod is an application that supports both online and offline learning, enabling teachers and students to interact synchronously or asynchronously. Nearpod offers a variety of learning tools such as interactive whiteboards, discussion walls, evaluation questions, interactive simulations, and media formats including 3D objects, virtual reality (VR), and videos (Minalti & Erita, 2021; elisa et al., 2024). A previous study by Khoirunnisa et al. (2023) titled "The Influence of the Two Stay Two Stray Cooperative Learning Model Assisted by Nearpod on Students' Learning Outcomes in the Immune System Topic" found that students taught using this approach achieved a gain score of 0.68, classified as moderate improvement.

E-LKPD integrated with the Nearpod platform can be combined with various learning models, one of which is the Think-Pair-Share (TPS) model. The TPS learning model is a cooperative learning strategy that promotes structured interaction among students (Sari et al., 2018). Cooperative learning involves students working together in small groups to achieve common learning objectives (Salhuteru et al., 2023).

A related study by Anugrah et al. (2022) titled "Development of Student Worksheets Based on the Think-Pair-Share (TPS) Learning Model on the Topic of Stoichiometry in Grade X Senior High School/MA" found that the TPS-based LKPD was deemed valid, with an average validity score of 93.58%.

METHODS

This study was conducted at the Faculty of Teacher Training and Education, Chemistry Education Study Program, University of Riau, and at two high schools:

SMAN 9 Pekanbaru and SMAN 15 Pekanbaru. It employed a Research and Development (R&D) approach using the ADDIE development model. The trial subjects consisted of 20 eleventh-grade students and two chemistry teachers, one from each school. The research instruments used included a material validation sheet, a media validation sheet, and a user response questionnaire.

The development procedure followed the five stages of the ADDIE model: Analyze, Design, Develop, Implement, and Evaluate. In the analysis stage, two types of analysis were conducted: needs analysis and task analysis. The task analysis was divided into four components: structural analysis, conceptual analysis, procedural analysis, and the formulation of learning objectives. In the design stage, the researcher designed a TPS-based Electronic Student Worksheet (E-LKPD) on the topic of reaction rates, based on the data collected in the previous phase. This stage involved format selection, initial worksheet design, and the design of assessment instruments.

The development stage involved realizing the initial design into a complete product ready for expert review. The worksheet was validated by content experts and media experts to ensure it met instructional quality standards. Once the product was deemed appropriate, the implementation stage was carried out by testing the Electronic Student Worksheet with eleventh-grade students and chemistry teachers from SMAN 9 and SMAN 15 Pekanbaru. The testing included one-on-one trials and user response evaluations from both students and teachers.

The final stage was the evaluation phase, which consisted of formative evaluation aimed at identifying improvements and necessary revisions based on feedback and findings from the earlier stages.

RESULTS AND DISCUSSION

The research results were obtained through the stages of the ADDIE development model. In the analysis stage, two types of analysis were conducted: needs analysis and task analysis. The needs analysis was based on preliminary interviews with chemistry teachers at SMAN 9 Pekanbaru and SMAN 15 Pekanbaru. The findings indicated that SMAN 9 had not yet implemented electronic student worksheets (only printed versions), while SMAN 15 had not used student worksheets at all. Furthermore, one of the chemistry topics students found difficult to understand was reaction rates, particularly in determining rate equations and reaction orders. The task analysis was divided into four components: content analysis (focused on reaction rate material), concept analysis (in the form of a concept map), procedural analysis (the steps or syntax of the TPS model), and the formulation of learning objectives.

In the design stage, the Electronic Student Worksheet (E-LKPD) was developed into four meetings. Meeting 1 was titled *"Concept of Reaction Rate"*, meeting 2 was *"Collision Theory and Factors Affecting Reaction Rate (Concentration and Surface Area)"*, meeting 3 was *"Collision Theory and Factors Affecting Reaction Rate (Temperature and Catalyst)"*, and meeting 4 was *"Reaction Order"*. All four worksheets were structured using the TPS (Think-Pair-Share) model. In this stage, the instruments needed were also

designed, including: (1) the material validation sheet, which considered aspects such as content feasibility, TPS model characteristics, language feasibility, presentation feasibility, and graphical quality; (2) the media validation sheet, focusing on worksheet dimensions, cover design, and content layout; and (3) the user response questionnaires for both teachers and students, addressing aspects such as content and language clarity, TPS characteristics, attractiveness, and practicality.

The development stage involved validating the TPS-based E-LKPD assisted by Nearpod. The validation was conducted by both material and media experts. Revisions were made based on the validators' suggestions. Material-related revisions included changing the operational verb "understand" to "explain," linking the content to daily life, relating materials to real-life reaction rate events, adding famous chemists, modifying images in questions, correcting typographical errors, and improving answer spaces. For the media validation, revisions suggested by the media expert included changing the background color, adding class identity, curriculum, and program information, adjusting the layout of the user guide, and correcting typos. Validation criteria were determined based on the total score from the validation questionnaires.

Tabel 1. Percentage of Average Validation Scores for Each Aspect by the Material Validators

Assessment Aspects	First Validation	Second Validation
Content Feasibility	77.23%	94.65%
TPS Model Characteristics	96%	95.84%
Language Feasibility	78.13%	100%
Presentation Feasibility	83.34%	91.67%
Graphical Design	87.50%	96.88%

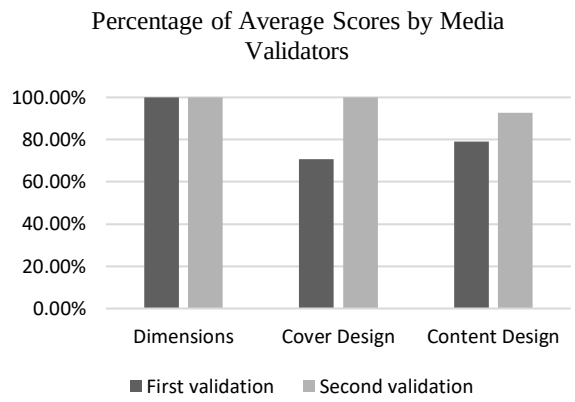

Figure 1. Diagram of the Percentage of Average Scores by Media Validators

Table 1. presents the average percentage of validation scores per aspect by the material expert, while Figure 1 presents the average scores by the media expert. The developed product was declared valid after meeting the "highly valid" category. According to the Ministry of National Education (2008), a teaching material product must be validated in terms of content, presentation, and language before proceeding to further testing.

The next stage was implementation, which included one-on-one testing and user response testing (teachers and students). The one-on-one trial involved six eleventh-grade students from SMAN 9 Pekanbaru with varying ability levels. The average score obtained was 90.2, indicating that students with different ability levels were able to solve the given problems well. Students also actively engaged with the E-LKPD and participated in partner discussions, as required by the TPS model, before presenting their findings. According to Prastowo (2014), a good worksheet can be used effectively by students with high, medium, and low abilities.

In addition to validity, quality teaching materials must also demonstrate practicality, meaning they are easy to use by both teachers and students during instruction (Pazirah & Fitria, 2022). To assess this, both one-on-one trials and user response evaluations were conducted. First, the

teacher response test consisted of four aspects: content and language clarity, TPS characteristics, attractiveness, and practicality. The results showed high percentages: 97.8%, 95.8%, 95.8%, and 87.5%, respectively, all classified as very for revisions. Second, the student response test involved 10 students from SMAN 9 and 10 from SMAN 15 Pekanbaru, covering three aspects: attractiveness, content and language clarity, and practicality. The percentage results were 90.3%, 87.3%, and 81.3%, respectively, all categorized as very good.

CONCLUSION

The TPS (Think Pair and Share)-based Electronic Student Worksheet (E-LKPD) assisted by Nearpod, developed for the reaction rate topic in Grade XI of senior high school or its equivalent, was declared valid by both the material validator and the media validator. User responses from two chemistry teachers and twenty students from SMAN 9 Pekanbaru and SMAN 15 Pekanbaru indicated that the TPS-based E-LKPD assisted by Nearpod met the criteria of being "very good."

REFERENCES

Anugrah, P. S., Rery, R. U., & Erviyenni. 2022. "Pengembangan Lembar Kegiatan Peserta Didik (LKPD) Berbasis Model Pembelajaran Kooperatif Tipe Think-Pair-Share (TPS) pada Pokok Bahasan Stoikiometri di Kelas X SMA/MA". *Jurnal Riset Pendidikan Kimia*, 12(1), 19–23.

Depdiknas. 2008. *Panduan Pengembangan Bahan Ajar*. Jakarta: Direktorat Jenderal Manajemen Pendidikan Dasar dan Menengah.

Elisa, E., Wiratmaja, I. G., & Mardhotillah, B. (2024). Enhancing the Understanding of Fundamental Concepts in Chemical Engineering Through Educational Adventure Games. *Journal of The Indonesian Society of Integrated Chemistry*, *16*(2), 129–135. https://doi.org/10.22437/jisic.v16i2.38205

Indarta, Y., Jalinus, N., Waskito, W., Samala, A. D., Riyanda, A. R., & Adi, N. H. 2022. "Relevansi Kurikulum Merdeka Belajar dengan Model Pembelajaran Abad 21 dalam Perkembangan Era Society 5.0". *Edukatif : Jurnal Ilmu Pendidikan*, 4(2), 3011–3024.

Khoirunnisa, Aulia., Kurniati, Tuti dan Ukit. 2023. "Pengaruh Model Pembelajaran Kooperatif Tipe *Two Stay Two Stray* Berbantukan Nearpod terhadap Peningkatan Hasil Belajar pada Materi Sistem Pertahanan Tubuh". *Bioedutech: Jurnal Biologi, Pendidikan Biologi, dan Teknologi Kesehatan*, 2(2).

Minalti, M. P., & Erita, Y. 2021. "Penggunaan Aplikasi Nearpod Untuk Bahan Ajar Pembelajaran Tematik Terpadu Tema 8 Subtema 1 Pembelajaran 3 Kelas IV Sekolah Dasar". *Journal of Basic Education Studies*, 4(1), 2231–2246.

Pazirah, dan Yanti Fitria. 2022. "Hasil Pengembangan Bahan Ajar Berorientasi Model Project Based Learning di Kelas V Sekolah Dasar". *Journal of Basic Education Studies*. Vol.5, No.1.

Prastowo, Andi. 2014. *Panduan Kreatif Membuat Bahan Ajar Inovatif*. Yogyakarta: Diva Press

Salhuteru, J., Rumahuru, O., Kainama, L., Unitlu, M., & Amanukuany, R. 2023. "Model-Model Pembelajaran Dalam Implementasi Kurikulum Merdeka". *DIDAXEI*, *4*, 536–550.

Sari, M., Habibi, M., & Putri, R. 2018. "Pengaruh Model Pembelajaran Kooperatif Tipe Think-Pairs-Share Dalam Pembelajaran Matematika Terhadap Kemampuan Pemahaman Konsep Matematis dan Pengembangan Karakter Siswa SMA Kota Sungai Penuh". *Edumatika : Jurnal Riset Pendidikan Matematika*, *1*(1), 7–21.

Umbaryati. 2016. Pentingnya LKPD pada Pendekatan Scientific Pembelajaran Matematika. *Prosiding Seminar Nasional Matematika IX 2015*. Universitas Lampung, Bandar Lampung.