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The Effectiveness of Discovery Learning-Based Electronic Pocket Book Media to Improve Student Learning Outcomes on Chemical Bonding Materials

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Abstract: This research aims to develop an electronic pocket book media based on Discovery Learning on class X chemical bond materials at SMA Negeri 1 Tanjung Morawa. Discovery learning was chosen because it encourages students to be actively involved in the learning process through exploration. The development model used in this study is the ADDIE model, which includes five stages, namely: analysis, design, development, implementation, and evaluation. The results of the study showed that the discovery learning-based electronic pocket book media had very good validity with a material feasibility percentage of 94.5% and 97.5% media feasibility based on expert assessments. In terms of effectiveness, it has proven to be quite effective with an N-Gain percentage of 74%. In conclusion, the discovery learning-based electronic pocket book media on chemical bonding materials is considered valid, effective, and practical in improving understanding of chemical concepts and student learning outcomes.

Keywords: ADDIE Model; Chemical Bonding; Discovery Learning; Media development; Media implementation

Introduction

Education is one of the components in human life which is the process of growing a person's personality throughout a lifetime to receive influence and develop themselves to produce a better generation (Simbolon et al., 2024). Because the purpose of education is to educate and develop the potential of the nation's children and have noble character (Insaf, 2023). In the world of education, communication aids or media are used interchangeably or as a substitute for the term Educational Media (Learning) (Daniyati et al., 2023). Learning as a student learning system or process that is planned, implemented and evaluated systematically to ensure that goals are achieved, namely active, effective and creative (Julita & Dheni., 2022).

One of the causes of students having difficulty learning chemistry is the lack of interest and attention of students during the learning process, lack of readiness of students to accept new concepts, lack of emphasis on important prerequisite concepts, instilling less depth of concepts, and learning strategies (Prayunisa, 2022).

Based on the observation of Wijayanto & Budi (2020), when the learning process students did not respond to the teacher's questions about the lessons that had been explained in the previous meeting, students were not enthusiastic about the lesson, and talked a lot with their friends when the teacher explained the material. This microscopic material is related to the explanation of the structure and processes that occur at the particle level, which then explains the phenomena that we can see (Musa et al., 2023).

Students need a constructivist learning model to develop students' scientific thinking processes (Khoiriyah & Fachrurrozie, 2022). The construction and creation of knowledge by students is essential for constructivist learning activities to respond to the educational environment. Students are taught using the Discovery Learning model which is a teaching approach. During the learning process in this method, the teacher only plays the role of one of the supervisors and assists students in exploring concepts, propositions, processes or algorithms (Erlinda, 2020).

Therefore, discovery learning makes students increase their mastery of a subject material, improve

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critical thinking skills, be more creative, and increase creativity to the maximum (Sunarto, 2022). To attract students' interest in learning, appropriate and suitable learning media is needed (Moto, 2019). Digital learning resources are considered effective and efficient to improve student understanding (Yana, 2019). In this case, Discovery learning also has weaknesses, namely: 1) this method raises the assumption that there is a readiness of the mind to learn, 2) it is not efficient for teaching a large number of students, because it takes a long time to help students find theories for problem solving, 3) discovery learning teaching is more suitable for developing understanding, 4) It does not provide opportunities for thinking that will be found by students because they have been selected in advance by the teacher (Oliveira et al., 2023).

Teaching materials in the form of pocket books can be used as an alternative to innovative and interesting teaching materials, including Chemistry teaching materials (Chairudin & Retno, 2021). Electronic pocket books are simple teaching materials that can be carried anywhere, contain information in the form of text or images that are displayed on digital screens and if they look attractive, will make students feel at home learning the material (Yusuf, 2022). Digital books that have the same effect as physical books are called flipbooks, are interactive and more interesting than books that are only in PDF format (Puspita, 2024). Flipbook is a digital book that can display text, images, sound and video that is designed to be as attractive as possible to increase students' enthusiasm and understanding of the teaching and learning process (Sari et al., 2024). Websites as a container for e-books have been widely developed by various IT experts because their use is quite easy and simple for all groups (Wahyuni dkk., 2022).

Method

This research will be conducted at SMA Negeri 1 Tanjung Morawa which is located at Jl. Batang Kuis Pasar VII No 151, Kec. The research time will be carried out in the even semester of 2024/2025. The population in this study is all students of class X of SMA Negeri 1 Tanjung Morawa which totals 12 classes with a total of 300 students.

The sample of this study amounted to one class. The Sampling Technique of this study was carried out using the Random Sampling Technique, which is taking classes as a sample with the aim of improving student learning outcomes.

This research is at the implementation stage using a one group pretest – posttest design. In the implementation of learning using Discovery Learning-based Electronic Pocket Book media. This design was chosen because it only used one group (class) that was a sample and there was no control class as a comparison. The research design at the implementation stage uses the One Group Pretest-Posttest Design.

The variables in this study are 1) the independent variables in this study are electronic pocket book media and discovery learning models on chemical bonding materials, and 2) the bound variables in this study are the increase in student learning outcomes (N-Gain).

The instruments used in this study are in the form of test and non-test instruments. The test instrument in this study is in the form of an objective test consisting of five answer options a, b, c, d, and e developed based on the indicators of chemical bonding material in the curriculum. The instrument test is composed of 30 questions which will then be standardized in content by experts. And for non-test instruments, namely 1) Teacher Interview Question Sheet in the field of study, 2) Questionnaire sheet for student needs analysis, 3) Validation Sheet by Material Experts and Media Experts. The data analysis in this study is the analysis of the feasibility data of electronic pocket books, and the improvement of student learning outcomes.

Result and Discussion

This research was carried out in several stages, namely needs analysis by conducting interviews, learning media analysis by researchers, student needs analysis, design and development of learning media, media validation based on BSNP indicators by lecturers, and the effectiveness of pocket book media on learning media used in the chemistry learning process in schools. The following are the results of research that has been conducted by researchers.

The analysis was carried out to find out the problems that arose during the activity. Based on the results of the needs analysis, the researcher developed an electronic pocket book media based on discovery learning, because all students use mobile phones and most students get a score below the KKTP, which is 78. Furthermore, student analysis was conducted by distributing student needs analysis questionnaires, 75% of students said that the learning media used were also rarely used by students, one of which was PPT, this was because the focus on the school was still very limited.

After a needs analysis is carried out, the next stage is the preparation of an initial draft of electronic pocket book media. The draft media of electronic pocketbook media is an initial design or concept with the size of the paper-sized pocket book developed is A6 or 10.5 x 14.8 cm. According to research (Suryanda et al., 2019) which developed the BIOMAP pocket book, it obtained a score of 100% in terms of media size. This pocket book is prepared in accordance with BSNP with integrated development, namely discovery learning. After the

preparation stage, the electronic pocket book media was developed in the form of an online flipbook.

The development stage of electronic pocket book media, after the electronic pocket book media is designed, it is continued with the media validation process by the validator. In line with the research of Mukholifah et al., (2020) that the product that has been completed must be validated by validators using the designed instrument.

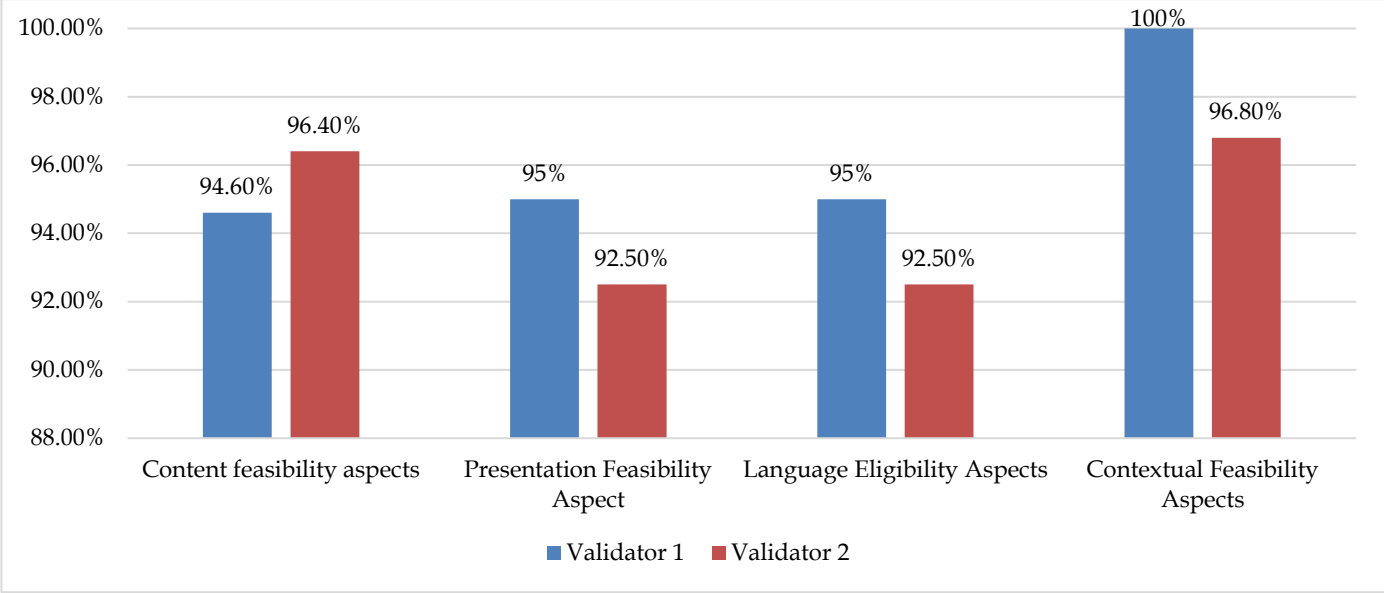

Figure 1. Expert validator material validation

Based on the table above, it can be seen that the validation percentage results of validators 1 and 2 are 95% and 94%. In addition, the percentage of validation assessment results in each aspect is 95.55% for the content feasibility aspect, 93.75% for the presentation feasibility aspect, 93.75% for the language feasibility aspect, and 98.43% for the contextual feasibility aspect. Based on the feasibility test data of electronic pocket book media by material experts based on the BSNP standard, the average percentage was 94.5% so that it can be concluded that this electronic pocket book media is valid or suitable for use and the percentage criteria in the category are very high.

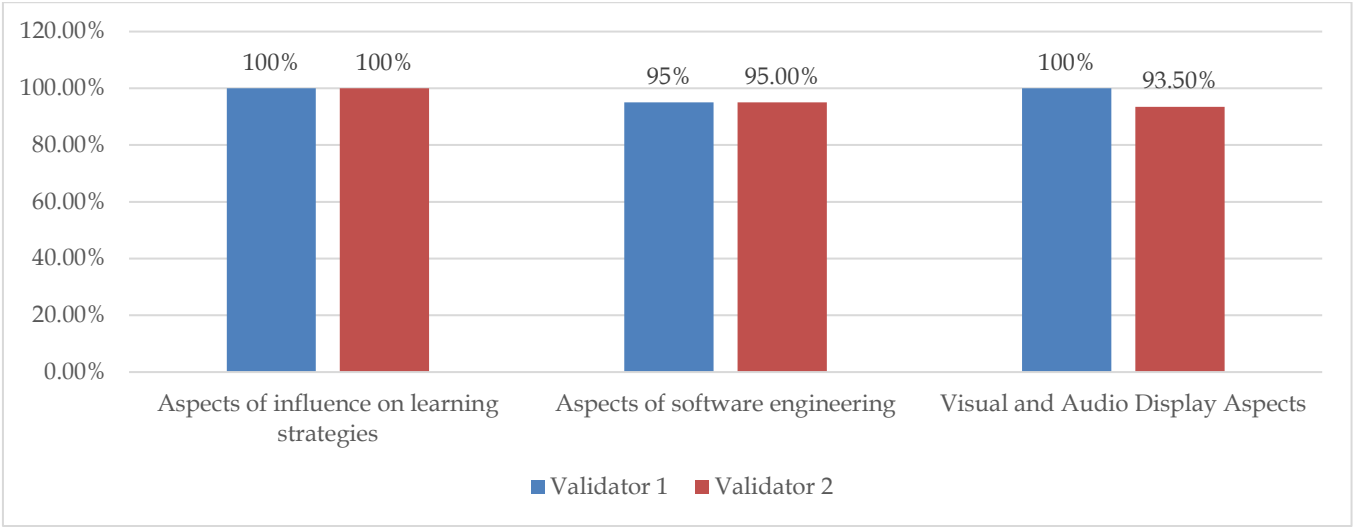

Figure 2. Expert validator media validation

Based on the table above, it can be seen that the validation percentage results of validators 1 and 2 are 98% and 96%. In addition, the percentage of validation assessment results in each aspect is 100% for the aspect of strategic influence on Learning, 100% for the Software Engineering aspect, and 96.87% for the Visual and Audio

Display aspect. Based on the data of the feasibility test of electronic pocket book media by media experts based on the BSNP standard, the average percentage was obtained at 97,5%.

From the results of the electronic pocket book media feasibility test data by media and material experts, the average percentages were obtained namely 94.5% and 97,5% so that it can be concluded that this electronic pocket book media is valid or suitable for use and the percentage criteria in the category are very high. From the average percentage, it shows that the electronic pocket book media based on discovery learning on chemical bonding materials is categorized as "valid/feasible" in accordance with the BSNP criteria.

The next stage carried out by the researcher is the Implementation of electronic pocket book media. To obtain the results of improving student learning, the researcher held a pretest before the learning process using the media of electronic pocket books based on discovery learning on chemical bonding materials.

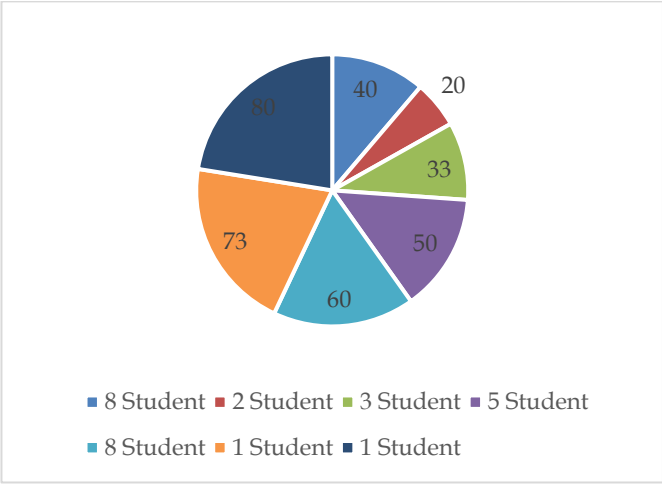

Figure 3. Pretest scores of grade X high school students Scores

In the provision of pretest to 28 students of X SMA there are values obtained and the average is below KKTP. there are 8 students who get a score of 40, 2 students get a score of 20, for 3 students as many as 33, 5 students get a score of 50, 8 students get a score of 60, 1 student gets 73 and finally 1 student gets a score of 80. from the diagram above it can be seen that only 1 student gets a score above the average with a score of 80.

After that, students are given teaching for 2 weeks, namely the 1st and 2nd meetings. After being taught with the media of electronic pocket books on chemical bonding materials, the students' ability tests were carried out again, namely with a posttest.

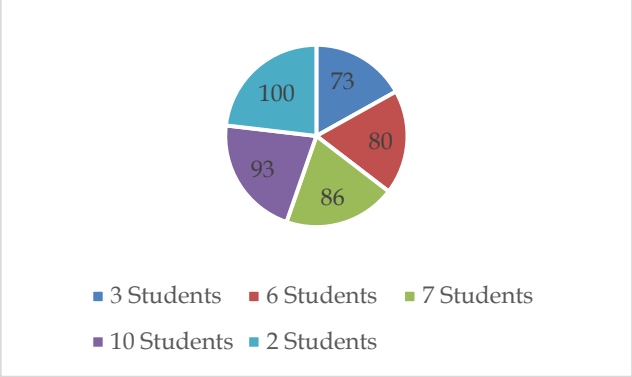

Figure 3. Student Scores after Posttest Administration Score

From the diagram above, it can be seen that the results of students after being taught are very different during the pretest. It is known that as many as 3 students got a score of 73, then for 6 students got a score of 80, then 7 students with a score of 86, and 10 students got a score of 93 and there were students who got a score of 100 with a total of 2 students. From these results, it is known that the improvement in student learning outcomes is quite rapid.

To see the magnitude of the increase in student learning outcomes by using the electronic pocket book media based on discovery learning on chemical bonding materials by 28 students in the experimental class, the researcher conducted an N-Gain test related to student learning outcomes (pre-tests). The N-Gain result obtained was 74% (0.74) stated with the criterion of "High". So the high word in this test, namely, in the learning process using the electronic pocket book media based on discovery learning, a high increase in learning outcomes was obtained.

So the high word in this test, namely, in the learning process using the electronic pocket book media based on discovery learning, a high increase in learning outcomes was obtained. This is in line with previous research that stated that mind-mapping electronic pocket book media can increase students' interest and learning outcomes research Sudibyo, (2024) on the development of mind-mapping electronic pocket book media on intermolecular style materials to increase student interest and learning outcomes. Agreeing with the results of this study, Utami et al., (2021) conducted a study on students' learning interests and concluded that the application of pocket book media has a positive effect on chemistry learning interest and effectively improves student learning outcomes. Thus, it can be said that the use of electronic pocket book media based on discovery learning in bonding materials can significantly improve student learning outcomes.

Thus, it can be said that the use of electronic pocket book media based on discovery learning in bonding

materials can significantly improve student learning outcomes.

Conclusion

It can be concluded that the results of the analysis of students' needs for electronic pocket book media based on discovery learning on the material of Chemical Bonds show that most students obtained scores below the Learning Objective Achievement Criteria (KKTP), namely 78. Discovery learning-based electronic pocket book media for class X students on Chemical Bond materials has met the eligibility criteria according to BSNP standards. This can be seen from the average percentage, which is 94.5% for materials and 97.5% for media, so that this electronic pocket book media is valid or suitable for use and the percentage criteria in the category are very high. The N-Gain result obtained was 74% (0.74) stated with the criterion of "High". it can be stated that there is an increase in student learning outcomes towards the use of discovery learning-based electronic pocket book media on chemical bonding materials in class X Merdeka High School.

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Author Contributions
all authors have significant contributions in completing this

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Conflicts of Interest
The authors declare no conflict of interest.

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