International Journal of Computer Applications Technology and Research
Volume 12–Issue 06, 01-07, 2023, ISSN:-2319–8656
DOI:10.7753/IJCATR1206.1001

Preparing Atomic Structure and Periodical System Android Based-Teaching Media using Funchem Smart Apps Creator Program

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Abstract: Learning media is one of the developments in information technology that has an impact on the world of education. As a result, the education sector must be able to use technology to create multimedia-based learning media that are more appealing, interactive, and comprehensive. The purpose of this research and development is to describe the preparation step, feasibility (validity), effectiveness, and improvement of student learning interest through learning media using an Android-based teaching model developed in general chemistry learning of atomic structure and periodic system elements material using the 4D development model. Thisresearch and development resulted Android based learning applications with a capacity of 28.3 MB "Funchem" that has been declared valid (appropriate) with the goal of creating learning applications that are accurate and concise for usage by students. Validity is met based on the assessment of the validators of material experts and media experts with the feasibility level for media eligibility is 87.5% and for material eligibility is 85.6%, putting it in the highly feasible category for both media and material.

Keywords: Learning Media, General Chemistry, Atomic Structure, Periodic System Elements, Android based Learning, Smart Apps Creator.

1. INTRODUCTION

Education is an attempt to prepare the next generation to welcome and face the global era. Technological advancements have an impact on education. The media, methods, motivation, and interest in learning are all inextricably linked to the learning process. Media can be used to deliver educational materials to students delivered by teachers. While the learning method governs how teaching materials and delivery strategies are organized. [1]

Today, it is impossible to avoid the impact of science and technology on the world of education, so the world of education must constantly adapt technological developments to efforts to improve educational quality. [2]

The shape of the module is developing in tandem with technological advancement, which has a favorable impact.The module's development begins with a printed module and progresses to an E-module. E-modules, as instructional resources, can include interactive experiments and simulations, as well as images, videos, and animations. [3]

Learning media is one of the developments in information technology that has an impact on the world of education. As a result, the education sector must be able to use technology to create multimedia-based learning media that are more appealing, interactive, and comprehensive. Visual media such as pictures, floor plans, maps, and diagrams, as well as audio visuals such as videos and sound slides, are excellent choices for improving educational quality. Learning media can also be very useful and beneficial for students if they are directly involved in its use. learning media is critical because it has a significant impact on classroom teaching activities. Relevance, convenience, attractiveness, and usefulness are four important factors in good learning media. [4]

The use of appropriate media in the classroom can improve the learning process. Because the use of media in learning canhelp educators' limitations in conveying information and the limitations of class hours, the more relevant a media is, the more interesting and useful the use of media will be. [5]

One type of ICT-assisted learning media that can be used is learning media that is operated on a smartphone device running the Android operating system. Currently, the Androidoperating system is the most popular and widely used by the public, particularly among high school students. In Indonesia, Android users accounted for 65.9% of all smartphone users as of June 2015. [6]

The creation of Android-based learning media meets the requirements of the 2013 Curriculum. The incorporation of Information Technology (IT) into all subjects is one of the changes in the 2013 Curriculum. IT is no longer a subject in and of itself, but rather a vehicle for all other subjects. This means that teachers in various subject areas, including chemistry, must initiate widespread and effective use of IT. With the advancement of mobile learning media, students will be able to access and learn from anywhere and at any time. This means that students will take a more active role in their learning, in line with the learning mandate in the 2013 Curriculum, which emphasizes students as the center of learning. [7]

Chemistry is one of the sciences that evolves in parallel with technological advancement. Chemistry is abstract, interconnected, and demands excellent thinking skills in its application. [8] Chemistry is difficult for students to understand because it is a subject that has facts, procedures, and concepts, and Chemistry is more than just solving problems; students must also learn descriptions such as chemical facts, chemical rules, and the material studied in chemistry is extensive. [9]

A periodic table of elements is well-known in chemistry education. The periodic table of elements is a table that lists the names of chemical elements and categorizes them based on how similar their properties are. The elements in the periodic table are divided into eight major groups, namely groups I A to VIII A, and transition groups, namely groups I B to VIII B. These elements are also classified into three types: solid, liquid, and gaseous.

Students are expected to memorize and understand many elements during the teaching and learning process, as this will be useful when they learn the next material. Even though the periodic table introduced to students by the teacher is still in the form of a manual that only contains the names of chemical compounds and their groups with no additional information. This is certainly inconvenient for students and even makes them lazy when studying chemical elements. If students are lazy and lack interest to learn chemical elements, they will become tired of studying further material related to the periodic table of elements, because the periodic table of elements is the foundation for studying chemical elements in the following lesson. Media assistance will be very beneficial for students' thinking processes in order for them to correctly understand the material. [10]

Based on observations made at SMAN 5 Medan, it was discovered that the majority of chemistry teachers have yet to use, let alone develop, interactive multimedia-based learning media in the process of teaching and learning activities. Most teachers continue to use traditional methods of instruction in the classroom. If a teacher continues to deliver subject matter using traditional methods, students' absorption of the subject matter is not optimal. If this is done repeatedly without any variation in learning methods, students will quickly become bored in subsequent lessons, resulting in low student interest in learning, so that students often prefer to play android, such as opening social media, rather than using android to help the learning process. Furthermore, students at these schools are permitted to bring androids or other communication devices to school. As a result, it is not surprising that many students fail assignments or daily tests.

In a study on chemical bonding materials conducted by Sary and Iis Siti Jahro, it was concluded that the feasibility of developing interactive multimedia based on the Lectora Inspire based on BSNP criteria assessment categorized as "Very Feasible" with the results of media validation from 3 validators categorized as "Very Feasible" because the average percentage of validation results from 3 validators was above 90%, namely 95.33%; 91.7% and 100%. For the results of material validation from 3 validators categorized as "Very Feasible" too, because the average percentage of validation results from 3 validators was above 95%, namely 97%; 97%
and 95.7%. [11]

While Mastur's research obtained validation results from material experts, media experts, and chemistry teachers, the percentages were 74%, 87.6%, and 79%, respectively. The implementation of students through a questionnaire resulted in a 96% presentation in the very good category. Overall, it is possible to conclude that interactive media on reaction rate learning is appropriate for use as a learning media in high school. [12]

Based on the problems and previous studies described, the development of learning media is required to be able to overcome problems in the learning process and increase student interest in learning, with one form of media development that is comfortable and interesting for students, such as learning media based on Android. Learning media will be created in this study using the Android-based Smart Apps Creator software. The researcher chose Smart Apps Creator because it can be used offline, which means students do not need a data package to use it. Furthermore, if there is an error in the preparation of the media, this application canbe repaired and is simple to use.

Based on the aforementioned facts and descriptions, it is important to develop learning media based on android, assisted by smart app creator, on atomic structure and periodicsystem elements material, which is expected to support the implementation of an effective and efficient learning process. The use of learning media-based android, assisted by smart app creators, is also projected to increase student interest in learning chemistry, particularly atomic structure and periodic system elements material.

2. METHOD

The 4-D (Four D) research model was used in this study. Sivasailam Thiagarajan, Dorothy S. Semmel, and Melyn I. Semmel created this model. This research is based on Sivasailam Thiagarajan's procedure and development of instructional materials. This model is ideal for conducting product research and development. In this case, the researcher wishes to create learning media to aid students in their study of atomic structure and the periodic system of elements. The developed learning media will be tested for feasibility using product validity and media trial use. The 4D model-based development process is divided into four stages, as shown in the figure below:

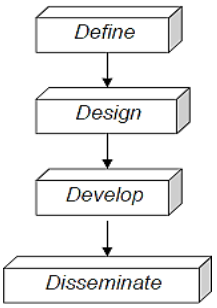


Figure 1. 4D development model flow

(a) Define stage, were the stage of needs analysis. Researchers in product development must refer to the development requirements, analyze, and collect information on the extent to which development must be carried out. Defining or analyzing needs can be accomplished through an examination of previous research and literature studies, a syllabus, or interviews with teachers/ informant.

(b) Design stage, The goal of this stage is to create android-based learning media with the Smart Apps Creator application. The following are the procedures that will befollowed: (1) Media Selection, this stage is carried out toidentify learning media based on student needs so that basic competencies are expected to be achieved by students. (2)

Format Selection, this stage is carried out to design learning content, learning resources such as the use of images and writing. (3) Initial design, the initial design was a version of the learning media before it was validated. This design is based on the results of the analysis that has been done.

(c) Develop stage, this stage of development aims to create android-based learning media on the material of atomic structure and the periodic system of elements using the Smart Apps Creator application. Experts performed media validation and material validation at this stage. The validator will provide input that will assist in the creation of learning media.

(d) Disseminate stage. At this point, the developed media is ready for distribution. Students and teacher will receive media in the form of apps delivered via social media platforms such as WhatsApp.

Non-test instruments were used to collect data in this study. The non-test instrument was used to analyze the android-based media used, its validity, and to determine students' interest in learning. The non-test instruments used in this study include (a) Questionnaire, It will be used in this study tocollect data on the feasibility of the developed android-based media, and a student response questionnaire was used to collect student response data. (b) Android-based Media Validation Questionnaire, the questionnaire used in this study was based on the Badan Standar Nasional Pendidikan (BSNP) of Indonesia's assessment of teaching materials for media. In this study, a Likert scale with four alternative answers in the form of a checklist was used. Feasibility studies, language feasibility, graphic feasibility, and presentation feasibility are examples of alternative answers that are scored using aspects from the media standardization questionnaire. (c) Interview, this interview aims to observe learning conducted in the classroom with a chemistry teacher including the applicable curriculum, the learning media used, the characteristics ofstudents' grades, facilities in the school, methods and syllabus as well as the learning design used.

This study employs qualitative data analysis techniques, with descriptive analysis performed on qualitative data, which includes a media feasibility assessment sheet completed by a validator, a student response questionnaire sheet for learning media, and a student learning interest questionnaire sheet.This data was analyzed to determine the impact of the developed learning media. Product quality assessment data were obtained from the results of questionnaires by media experts, material experts, student's interest and response. According to the 4-D research model were used, only the define and design stage will be reporting in this article.

3. RESEARCH RESULT

This research and development resulted in a product in the form of Android-based learning media on the topic of atomic structure and periodic system elements with the application name FunChem. The Research and Development (R&D) method and the 4D development model are used in this study. The 4D development model used in this study is divided into four parts: (1) Define stage, (2) Design stage, (3) Develop stage, and (4) Disseminate stage. However, in writing this journal, the researcher only included the results of the research which were published only up to the design stage so that it could be clearly stated how the process of making Android-based Funchem learning media was carried out with the help of the Smart Apps Creator.

3.1 Define Stage

At this stage analysis is carried out in the form of needs analysis, learning material analysis, and environmental analysis.

(1) Needs Analysis, it aims to identify the resulting product to suit the needs. Mrs. Duma Roida Tampubolon, S.Pd., M.Pd., one of the Chemistry teachers at SMA Negeri 5 Medan, was interviewed face to face and the researcher asked 11 questions related to needs analysis. Table 1 shows an analysis of the development of learning media conducted by interviewing Chemistry teachers.

Table 1. Learning Media Development Need Analysis by Interview with one of Chemistry Teacher at SMA Negeri 5 Medan.

Nu	Question	Answer
1.	What is the curriculum used in SMAN 5 Medan?	Merdeka Mandiri
2.	What is the KKM score for chemistry at SMAN 5 Medan?	78
3.	What are the learning outcomesof class X students regarding atomic structure and periodic system elements?	Good
4.	How is the student's interest in chemistry lessons, especially material on atomic structure and periodic system elements?	Not Good
5.	Is the atomic structure and periodic system elements included in the category of difficult materials?	Not really (Intermediate)
6.	What difficulties are encountered in teaching the atomic structure and periodic system elements?	Students still have difficulty memorizing existing material. There are also elements that have exception atomic numbers so that misconceptions often occur.
7.	How is the chemistry learning process at SMAN 5 Medan?	Good
8.	What media have been used for chemistry learning process at SMAN 5 Medan?	Power Point
9.	What are the advantages and disadvantages of the media that has been used?	Advantages: more interesting. Disadvantages: Students are less likely to seek information because almost all of the material is summarized in PowerPoint.
10.	Have you ever used android-based media in learning the atomic structure and periodic system elements?	No
11.	What do you think about the use of Android-based learning media to study chemistry, especially material on atomic structure and the periodic system of elements?	Really good

As shown in table 1, students' interest in learning Chemistry, particularly atomic structure and periodic system elements, remains low. The teacher notices that there is a lot of material that is summarized in one chapter, making it difficult for students to remember the topics being taught and giving students saturation. The use of the provided PowerPoint media has both advantages and disadvantages for the learning process. The advantage is that PowerPoint media can be designed to be as appealing as possible in order to piquechildren's interest. Meanwhile, because the media can provide many material summaries, students are less interested in finding learning resources from other media sources such as books and journals.

According to the findings of an interview with one of the teachers at SMA Negeri 5 Medan, the learning process for atomic structure and periodic system elements is still not optimal. This occurs because the teacher summarizes that students are still uninterested in independent learning and only use one medium provided by the teacher. Furthermore, there are many topics in the atomic structure and periodic system elements material that students do not always understand and quickly become bored with.

On the other hand, every student has a mobile phone, and X-MIPA 4 students are more likely to have an Android-based phone and be able to use it. Even though the learning process is said to be smooth, Android is still not being used effectively. Teachers continue to rely on a few applications that serve as a repository for students' assignments. WhatsApp and Zoom meetings are two applications that teachers use (theuse of these applications is rarely used). In addition, the school does not provide any applications to aid in the learning process.

The researcher also distributed a questionnaire to students in class X-MIPA 4 to measure their interest in studying Chemistry, particularly the topics of atomic structure and periodic system elements. To gauge students' interest, 20 questions were asked. The questionnaire distributed consisted of 10 statements. The research instrument uses a Likert scale, namely by giving a score of 1 (strongly disagree), 2 (disagree), 3 (agree), and 4 (strongly agree). Table 2 shows the results of the questionnaire in terms of measuring student interest. The table obtains an overall percentage of 67.5%, indicating that many students disagree with the positive statements provided. This can lead to the conclusion that students are uninterested in comprehending and learning about Chemistry.

Table 2. Result of student interest questionnaire in measuring the need for learning media based on Android by Google Form for 33 students.

Nu	Statement	Result	
		Average Value	Percentage (%)
1.	I do my chemistry assignment seriously	2,64	65,9
2.	I finished my chemistry assignment on time	2,52	62,9
3.	I care about the results I get	2,52	62,9
4.	If my chemistry score is bad, I will continue to study hard so that my grades will get better	2,52	62,9
5.	If I got a bad grade in chemistry, I would review the exam questions and look for the right answers	2,64	65,9
6.	I will be satisfied if I can work on chemistry problems by getting good grades	2,18	54,5
7.	I listened carefully to teacher's explanation	2,76	68,9
8.	I asked the teacher about material that I did not understand	2,64	65,9
9.	I did the chemistry assignments given by the teacher myself	2,85	71,2
10.	In doing assignments and chemistry questions, I try to do them with the help of learning media independently.	2,64	65,9
11.	I never copy a friend's answer because I believe in my answer	3,03	75,8
12.	I like studying chemistry because teacher uses media in learning (learning videos, quizzes, etc.)	2,67	66,7
13.	I like studying chemistry because the teacher uses games in learning	2,52	62,9
14.	I never feel bored in studying chemistry	2,88	72,0
15.	I give my opinion during the discussion	2,64	65,9
16.	If there is a different opinion, I will give my respond	2,67	66,7
17.	I'm sure I can get the best grades because I do my chemistry assignments well	2,58	64,4
18.	If my answer is different from my friend's, I still won't change my answer to have the same answer	2,88	72,0
19.	I am challenged to work on chemistry problems that are considered difficult by friends	2,85	71,2
20.	I prefer to do difficult questions than easy questions	2,79	69,7
Overall Percentage (%)			67,5
Category			**DISAGREE**

Based on the findings of an interview with one of the chemistry teachers at SMAN 5 Medan and the results of a questionnaire administered to class X MIPA 4 students, it is possible to conclude that the development of researchproducts in the form of Android-based learning media assisted by Smart Apps Creator is feasible to implement because it has many advantages, including the ability to package the materialbeing taught as attractively as possible to attract students'interest in learning. There are practice questions accompanied by discussion in chemistry, particularly in atomic structure and periodic system elements material, as well as ease ingetting the material being taught because it has been summarized as accurately as possible. Furthermore, because itdoes not require an internet connection to use, Android-based learning media can be accessed at any time and from any location.

(2) Analysis of Learning Materials, is a step in determining learning materials that are aligned with the curriculum in SMA and also meet the needs of the students. The researcher continues to determine the sub-materials that will be summarized in the development of Android-based learning media applications after the formulation of core competencies and achievement indicators of competence. The particles that comprise the atom, atomic number and mass number,isotopes, isobars, isotones, development of atomic models, electron configurations, orbitals, quantum numbers, anddevelopment of the Periodic System of Elements are interpretations of sub-materials.

(3) Environmental analysis, is performed in order to determine the environment, which includes how the teacher delivers the material to students and how to boost student interest. Based on the findings of the environmental analysis observations, it is clear that no student worksheets are used during learning and that the teacher solely concentrates on one source of learning, namely textbooks, resulting in students' lack of enthusiasm in learning about Chemistry. Instructors also do not create visually appealing Power Pointpresentations and merely utilize Power Point to save timewhen instructing (There is no attractive color combination andthe screen is filled with letters without any animation and few pictures and tables are used.) This influences the learningprocess. Several children use cellphones behind their backs and do not pay attention to the learning process. Based on the observations made by the researcher while the teacher and students were carrying out the learning process, the researcher concludes that a student-centered learning process using Android-based learning media is required so that students can increase their interest in learning, particularly in atomic structure and periodic system elements material.

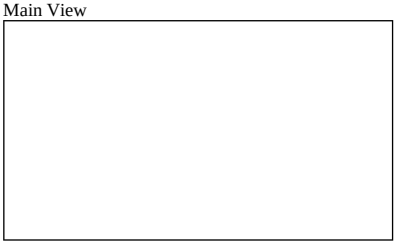
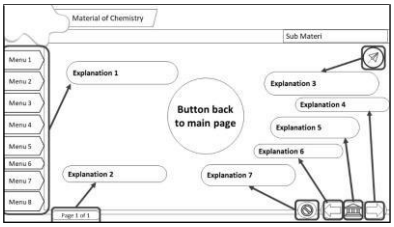
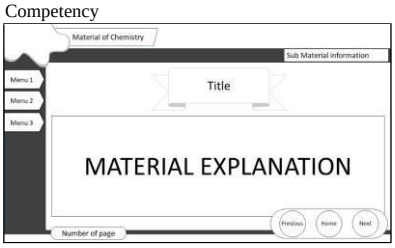
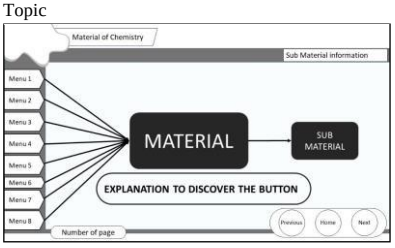
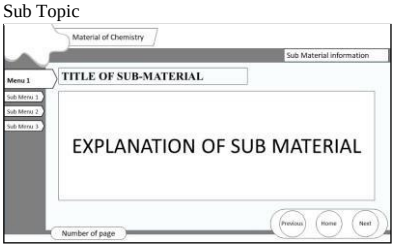
3.2 Design Stage

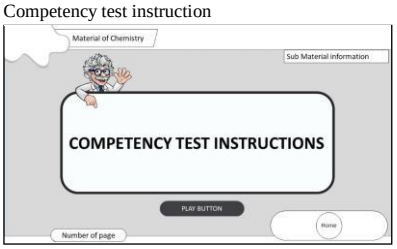
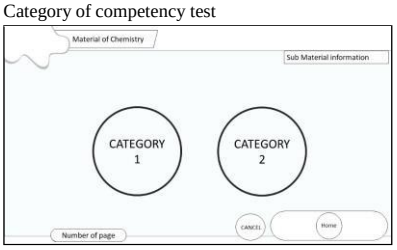
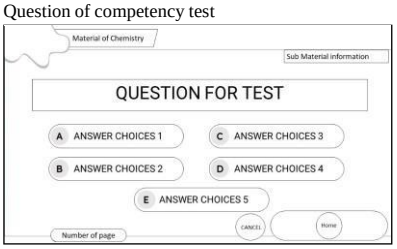
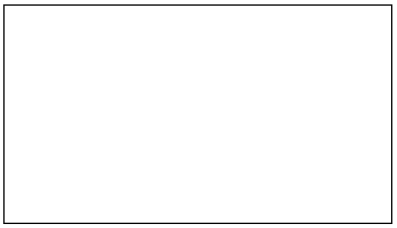
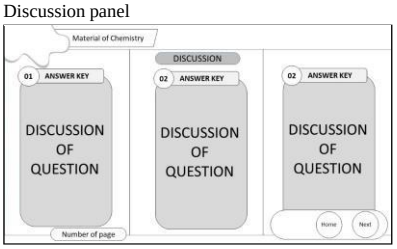
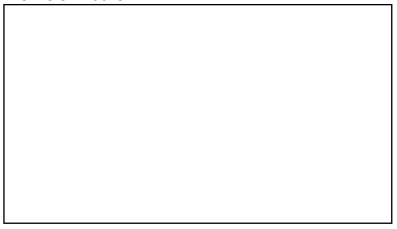
During the design stage, instructional media is created through a careful and planned process. In the context of creating an Android-based learning media application for Chemistry, researchers collaborated with the subject teacher and supervisor in advance to determine the necessary resources, menus, and perspectives that should be included. The focus of this stage is to collect data and develop various elements such as models, objectives, and display color combinations, which are all crucial in creating an effective learning media application that caters to the needs of both teachers and students.

Based on the research, relevant data on atomic structure and periodic system elements is gathered to assist in creating an Android-based learning media. The application is designed to

incorporate five functional features, namely media introduction, competency, material, competency exam, and Author profile. These features are specifically included to facilitate students in comprehending the topic effectively. In short, the Android-based learning media is developed by integrating important data related to atomic structure and periodic system elements, while also ensuring that students have access to multiple features for a better experience. Following the design step, the content preparation stage is carried out in order for it to be included in the application. The main design is created initially in Power Point. Table 3 shows the storyboard and content of the "FunChem" application feature.

Table 3. "Funchem" app design

Nu	Story Board	Information
1.	Main View 	In the main view, there are 5 features in particular, namely atomic structure and periodic system elements also the UNIMED logo.
2.	Media Introduction 	The media introduction menu is intended for students to understand how to run using the media that has been developed.
3.	Competency 	Basic competencies, indicators and learning objectives are arranged based on the lesson plan and syllabus.
4.	Topic  Sub Topic 	The material is separated into 8 sections which can make it easier for students to explore the material in depth per each topic and Sub-topics will appear if students choose topics to study.

Nu	Story Board	Information
5.	Competency test instruction  Category of competency test  Question of competency test  Score Board  Discussion panel 	The practice questions are divided into 2 categories, namely atomic structure and the Periodic System of elements. The questions in the application are structured in such a way as to summarize the learning objectives that must be achieved by students. There is also a discussion that can help students to study the questions asked and a scoreboard to be able to assess student achievement, whether the student understands and achieves the learning objectives properly.
6.	Profile of Author 	This section contains a profile of the researcher

3.3 Product Feasibility

The researchers' application idea is implemented by experts who use the Smart Apps Creator to create learning applications with a capacity of 28.3 MB that can be installed on Android. "FunChem" is the name given to the developed application. Because there is no requirement for the internet to run this application, it can be accessed offline.

Applications that are developed in accordance with the design are then validated by two material experts and two media experts. Mr. Dr. Marudut Sinaga, M.Sc as a UNIMED chemistry professor, Dr. Bajoka Nainggolan, M.S as a UNIMED chemistry lecturer, and Ms. Duma Tampubolon, S.Pd., M.Pd as a chemistry teacher at SMA Negeri 5 Medan were the validators. The validation results show that the application developed fits the eligibility criteria.

1. Material Expert Validation

This instrument was given to one UNIMED chemistry lecturer (D1) and one chemistry teacher at SMAN 5 Medan (G1). The results of material validation of learning media in the form of Android applications developed on atomic structure and periodic system elements can be seen in table 4

Table 4. The results of the material feasibility test by the material expert validator

Nu	Assessment Component	Assessment Percentation		Average of percentation (%)
		D1 (%)	G1 (%)	
1.	Material feasibility	85	80	82,5
2.	Evaluation feasibility	91,7	91,7	91,7
3.	Language feasibility	90	75	82,5
Total Average				**85,6**
Research analysis validation criteria				**VERY WORTH IT**

Based on table 4, the assessment by the material expert validator includes the feasibility of the material, evaluation, and language. The material validation assessment by one UNIMED lecturer and one chemistry teacher at SMAN 5Medan for the developed media obtained an average of 85.6%so that it was categorized as very worth it / feasible.

2. Media Expert Validation

This instrument was handed to one UNIMED chemistry lecturer (D1) and one SMAN 5 Medan chemistry teacher (G1). Table 5 shows the results of media validation of learning media in the form of Android applications created on atomic structure and periodic system elements.

Table 5. The results of the media feasibility test by the media expert validator

Nu	Assessment Component	Assessment Percentation		Average of percentation (%)
		D1 (%)	G1 (%)	
1.	Influence on learning	85	85	85
2.	Software engineering	90	95	92,5
3.	Visualization	80	90	85
Total Average				**87,5**
Research analysis validation criteria				**VERY WORTH IT**

Based on Table 5, the assessment by the media expert validator includes aspects of the quality of learning, software engineering, and visualization. The media validation assessment by one UNIMED lecturer and one chemistry teacher at SMAN 5 Medan for the media developed obtained an average of 87.5% so it is categorized as very worth it / feasible.

4. CONCLUSION

The following conclusions were reached based on data and questionnaire calculations gathered from research for the creation of android-based learning media on atomic structure and periodic system elements. (1) The results of the media needs analysis at SMA Negeri 5 Medan are high because the results of a questionnaire that measures student interest are 67.5% with the "disagree" category of the 20 positive statements given by researchers, as well as the results of teacher interviews and environmental analysis. (2) The Smart Apps Creator assists in the developed Android-based learning media, which comprises five components, including media introduction, competencies, resources, competency tests, and Author profiles, with the goal of creating applications that are accurate and concise for usage by students. (3) Based on validator validation results, the feasibility level for media eligibility is 87.5% and for material eligibility is 85.6%, putting it in the highly feasible category for both media and material.

5. ACKNOWLEDGMENTS

Thank to the Rector Unimed and Head of LPPM who has funded this research through Unimed PNBP fund by Applied Research Scheme for the 2023 Fiscal Year. We also thanks to the Dean of FMIPA Unimed, Head of Chemistry Deparment Unimed, Head of SMA Negeri 5 Medan and their Teacher of Chemistry, validators for providing our research, and indeed all respondents who had been supporting this research.

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International Journal of Computer Applications Technology and Research
Volume 12–Issue 06, 08-11, 2023, ISSN:-2319–8656
DOI:10.7753/IJCATR1206.1002

An Aspect-Level Sentiment Analysis Approach Based on BERT and Attention Mechanism

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Abstract: In recent years, with the rapid increase in the number of comment texts on social media, more and more researchers have been studying the emotional tendencies in texts. In traditional sentiment analysis methods, there are still problems such as weak semantic dependency relationships and loss of semantic information caused by one-way networks. The paper proposes a sentiment classification method based on BERT and attention mechanism, which uses BERT as the word embedding model to obtain word vectors containing more semantic information, there by mitigating the impact of semantic sparsity , the feature extraction layer uses bidirectional gated units to extract hidden vector information. The bidirectional network avoids the loss of forward semantics. The semantic interaction layer models the aspect words and context at the same time, and enhances the semantic dependency relationship between texts through interactive attention based on constructing global semantics. The experimental results show good performance.

Keywords: BERT; sentiment classification; attention mechanism; global semantics; semantic interactive

1. INTRODUCTION

In recent years, deep learning has been widely applied in the field of natural language processing. Bengio et al.[1]were the first to introduce neural networks into language models. Zhang and his colleagues et al.[2] transformed the input of convolutional neural networks into high-dimensional text data, and introduced the bag-of-words model into the convolutional layer of the neural network to obtain the Bow-CNN and Seq-CNN models. Kim et al. [3] proposed the Test -CNN text classification model, which trained the model using different types of word embeddings. Nguyen et al. [4] conducted sentiment analysis on comment text using RNNs. Liu et al. [5] proposed three information sharing mechanisms based on RNNs, respectively modeling specific text classification tasks and the shared layers. Wang et al. [6] argued that the sentiment polarity of a sentence should not be determined solely by its content , but is highly related to aspect words in the sentence. Akhter et al.[7] proposed a new deep learning architecture that uses CNNs to obtain sentiment word embeddings. Bahdanau et al.[8] introduced an attention mechanism in text translation. Peng et al.[9] used a multi-level attention mechanism to capture sentiment features that are far away in the text, while paying attention to semantic information of multiple aspect words. Ma [10] employed an attention mechanism to process textual information, which can automatically learn the importance of different parts of the text and conduct sentiment analysis based on their importance.

2. RELATED WORK

In this paper, we propose a BERT-based aspect-level sentiment analysis model with attention mechanism, as shown in Figure 1.

The model architecture consists of a word embedding layer, feature extraction layer, semantic interaction attention layer, and output layer.

2.1 Word Embedding

The word embedding layer utilizes the pre-trained BERT model to transform the input context text $S^t = \{S_1^t, S_2^t, \ldots, S_m^t\}$and aspect word $S^t = \{S_1^t, S_2^t, \ldots, S_m^t\}$into word vectors $W^c = \{W_1^c, W_2^c, \ldots, W_n^c\}$ and $W^t = \{W_1^t, W_2^t, \ldots, W_n^t\}$.

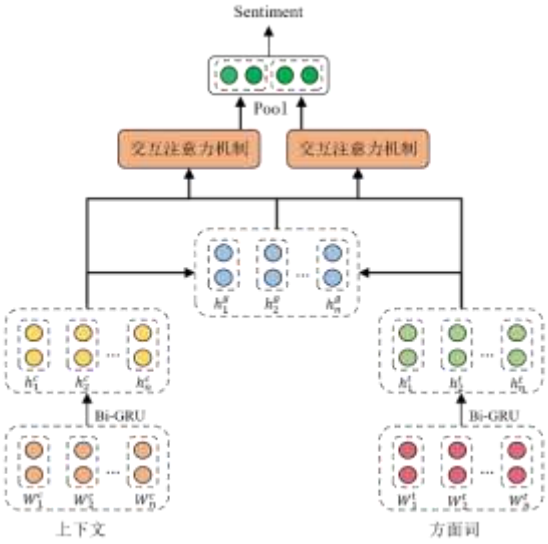


Figure.1 The semantic interaction model based on BERT and attention mechanism.

2.2 Feature Extraction

After obtaining the word vectors for the context text and aspect words, it is necessary to extract the implicit feature information in the word vectors. The word vectors $W = \{W_1, W_2, \ldots W_n\}$generated by the pre-trained BERT model [11] can be used as the input of the Bi-GRU network. As shown in the figure, the GRU [12] network encodes the input vectors in two directions, forward and backward, to obtain the forward hidden state encoding $\overrightarrow{h} = \{\overrightarrow{h_1}, \overrightarrow{h_2}, \ldots \overrightarrow{h_n}\}$ and the backward hidden state encoding $\overleftarrow{h} = \{\overleftarrow{h_1}, \overleftarrow{h_2}, \ldots, \overleftarrow{h_n}\}$.Finally, the two directions' sequences

are concatenated to obtain the final representation of the hidden state $h = \{h_1, h_2, \ldots h_n\}$, which is calculated as follows:

$$\vec{h}_i = \overrightarrow{\mathrm{GRU}}(x_i) \quad (3\text{-}1)$$

$$\overleftarrow{h}_i = \overleftarrow{GRU}(x_i) \quad (3\text{-}2)$$

$$h_i = \{\vec{h}_i; \overleftarrow{h}_i\} \quad (3\text{-}3)$$

2.3 Feature Extraction

The interactive attention module consists of three parts. The semantic vectors of the context and aspect words are used as the Key part of the attention mechanism, and the concatenated global semantic vector is used as the Query part of the attention mechanism. The relevance between Q and K is computed to represent which part of the context and aspect words is more important to the global semantic representation. Then, the attention values of each part are obtained by multiplying and summing them with the corresponding Value in the attention mechanism. Finally, they are concatenated, linearly transformed, and fed into the classification function to obtain the final sentiment polarity.

Firstly, the vector matrices of the context and aspect words are concatenated and averaged separately to obtain the global semantic vector and the initial representations of both.

$$e^g = \{e^t; e^c\} \quad (3\text{-}4)$$

$$v^c = \frac{e_i^c}{n} \quad (3\text{-}5)$$

$$v^t = \frac{e_i^t}{m} \quad (3\text{-}6)$$

Secondly, the attention mechanism is used to learn the attention between global semantic vector and context/aspect words. The initial representations v^t, v^c of the vector, and the hidden state vector e^g are taken as inputs to obtain the probability matrix of e^g for v^t and v^c which is the attention distribution. The calculation formula is as follows:

$$\alpha_i \frac{\exp(f_s(e_i^g, v^c))}{\sum_{j=1}^{n} \exp(f_s(e_j^g, v^c))} \quad (3\text{-}7)$$

$$\beta_i \frac{\exp(f_s(e_i^g, v^t))}{\sum_{j=1}^{m} \exp(f_s(e_j^g, v^t))} \quad (3\text{-}8)$$

In the formula, $f_s()$ is an addition function in attention mechanism, which calculates the correlation between Query and Key. There are multiple forms of addition functions in attention mechanism, and we choose the dot-product model here, which is expressed as:

$$f_s(k_i, q_i) = \tanh([k_i; q_i], W_s) \quad (3\text{-}9)$$

After obtaining the weight coefficients of $Value_i$ namely α_i and β_i, the attention representations of the two can be obtained by weighted summation:

$$a_l = \sum_{i=1}^{n} a_i e_i^g \quad (3\text{-}10)$$

$$b_l = \sum_{i=1}^{m} \beta_i e_i^g \quad (3\text{-}11)$$

Concatenating the attention obtained by the interaction between global text and context and aspect words, the resulting attention representation is:

$$h_l = \{a_l; b_l\} \quad (3\text{-}12)$$

The concatenated matrix vector is projected to the target matrix space of class C through a fully connected layer, and the final representation of the global semantic interaction layer is obtained:

$$o = W_o^T h_l + b_h \quad (3\text{-}13)$$

3. EXPERIMENTS

3.1 Setup

In the experiment, publicly available datasets SemEval2014 Task 4 and Twitter were used for aspect-level sentiment analysis task. The number of data samples in the training set and test set are shown in Table 3-2.

Table3-2 Data sample statistics

Datasets	Positive		Neural		Negative	
	Train	Test	Train	Test	Train	Test
Restaurant	2164	728	637	196	807	196
Laptop	994	341	464	169	870	128
Twitter	1561	173	3127	346	1560	173

The evaluation metrics for the experimental results were accuracy and F1 score. Accuracy refers to the proportion of correctly classified samples in all classification samples of the sentiment analysis model. F1 is the harmonic mean of precision and recall, which is mainly used to evaluate the overall performance of the sentiment analysis model. The

International Journal of Computer Applications Technology and Research
Volume 12–Issue 06, 08-11, 2023, ISSN:-2319–8656
DOI:10.7753/IJCATR1206.1002

Table 3-6: Experimental results comparison of various models on the datasets.

Model	Restaurant		Laptop		Twitter	
	Acc (%)	F1(%)	Acc (%)	F1(%)	Acc (%)	F1(%)
LSTM	74.30	-	66.50	-	66.50	64.72
TD-LSTM	75.60	-	68.13	-	70.80	69.00
ATAE-LSTM	77.20	-	68.70	-	-	-
IAN	78.60	-	72.10	-	-	-
MGAN	81.25	71.94	75.39	72.47	72.54	70.81
BERT-BASE	82.66	74.13	79.04	73.02	73.02	71.43
Clove-GSIA	81.52	70.89	78.87	72.93	73.41	70.79
BERT-GSIA	**83.04**	**74.83**	**80.03**	**75.79**	**74.28**	**72.42**

The accuracy and F1 values of the benchmark model in the table are taken from the original text, where the "-" symbol indicates that the relevant parameter was not mentioned in the original article.

higher the F1 score, the better the performance of the model. The calculation formula is as follows:

$$Acc = \frac{TP + TN}{TP + TN + FP + FN} \quad (3\text{-}16)$$

$$F1 = \frac{2 \times pression \times recall}{pression + recall} \quad (3\text{-}19)$$

3.2 Experimental Result and Analysis

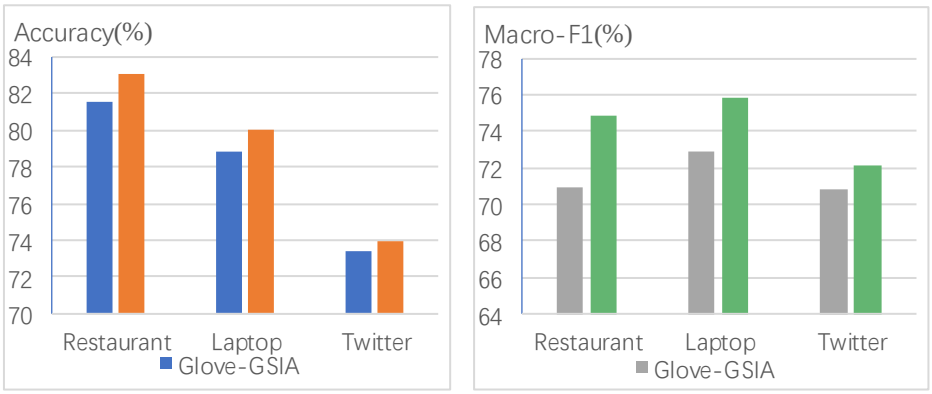
This experiment was conducted under the PyTorch deep learning framework. The model learning rate was set to 2e-5, the regularization coefficient was set to 1e-5, the maximum sentence length was 85, and the batch size for input samples was 16.

The experimental results of the global semantic interaction algorithm model based on BERT and attention mechanism proposed in this chapter are compared with those of related models as follows3-6:

Based on the Glove word embedding model, it performs well. The reason for this is that the bidirectional gated units are used in the feature extraction layer to obtain the forward semantic information lost in the unidirectional network, and introducing the fusion of aspect word and context semantic features into the interactive attention mechanism can enhance the correlation between aspect words and texts, enabling the aspect words and target sentiment words to capture each other's dependency information and gain more weight. In terms of accuracy improvement, there is a significant improvement on the Laptop dataset because it contains more implicit expression sentiment samples, while the Restaurant dataset has more surface-level emotions, proving that the proposed model can better mine deep-seated information.

The BERT-BASE benchmark model performs better than the Glove-GSIA on the Restaurant and Laptop datasets, but has poorer accuracy on the Twitter dataset. The reason for this is that the multi-layer Transformer mechanism in BRET can capture more semantic information to convert into word vectors and perform classification. On the other hand, BERT-GSIA uses BERT as a word embedding model, and its performance on all three datasets is better than the BERT-BASE model, proving that the model can effectively utilize the bidirectional network to obtain semantic information and enhance the correlation between context and aspect words through semantic interaction attention mechanism in downstream tasks such as sentiment analysis. The comparison of different word embedding models is shown in the following figure2:

3.3 Attention Visualization



(a) (b)

Figure 3-9 The impact of different word embedding models on the model.

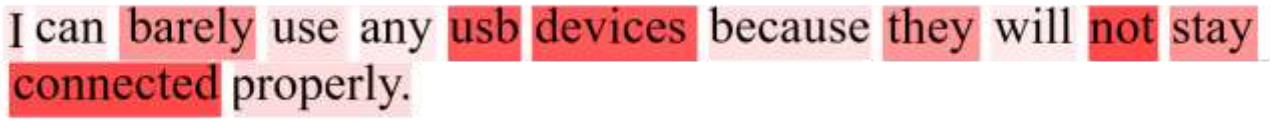


Figure 3-11 Attention Weight Visualization

From the figure, it can be seen that when analyzing the sentiment of the aspect term, more weight coefficients are assigned to the corresponding target sentiment words, which also have a greater impact on the polarity judgment of the sentiment. The colors of "not" and "connected" in the text are darker than other words, indicating that the attention mechanism pays more attention to the target sentiment words of the aspect term and assigns more weight. However, the polarity of "connected" is ultimately negated by "not", which enables the model to reasonably judge the sentiment orientation of "usb devices". This also demonstrates the effectiveness of the attention mechanism in the model.

4. CONCLUSIONS

In this paper, we propose a new method for aspect-based sentiment analysis. By obtaining more word vector information, we model the aspect term and context separately, and construct global semantic information to achieve interaction between the information, enhancing the connection between semantics. Through comparison, our proposed method outperforms relevant baseline models.

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International Journal of Computer Applications Technology and Research
Volume 12–Issue 06, 12-19, 2023, ISSN:-2319–8656
DOI:10.7753/IJCATR1206.1003

Canva-Based Learning Media: Improving Creative Economy Learning Outcomes in Integrated Social Sciences for Junior High School Students

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Abstract: This study aims to determine the feasibility of Canva-based learning media and determine the effectiveness of Canva-based learning media on student learning outcomes. The stages of this research are the needs analysis stage, the planning stage for Canva-based learning media (design), the development stage, and the trial stage (validation). The results of this study indicate (1) The expert test on creative economy material is in very good qualification (90.45%), (2) The learning design expert test is in very good qualification (94%), (3) Individual trials are in the qualification very good (94.81%), (4) Small group trials are in very good qualifications (96.06%), (5) Field trials are in very good qualifications (99.52%). The results of hypothesis testing prove that there is a significant difference between the learning outcomes of students who do not use Canva-based learning media and those who use Canva-based learning media. This is indicated by the results of data processing t count = 15.78, at a significance level α = 0.05 t table = 1.69. It was concluded that the developed Canva-based learning media is feasible and effective for improving integrated social studies learning outcomes.

Keywords: social studies learning outcomes; instructional Media; creative economy; canva

1. INTRODUCTION

The Integrated Social Sciences (IPS) subject is an integration of four subjects, namely geography, economics, sociology, and history. These four subjects are integrated by the concept of space and the interaction between spaces and their influence on human life in economic, social, cultural, and educational aspects. Like other subjects which are subjects that are not tested in the national exam, the Integrated Social Sciences subject is one of the subjects that is considered not too important for students. This can be seen from the many students who take it for granted so that student achievement scores do not reach the KKM. This statement regarding the condition of the problem was strengthened after observations and interviews were carried out with an Integrated Social Sciences Subject teacher conducted at SMP Negeri 1 Raya, while the school's computer and internet network facilities were supportive and not being utilized optimally.

Based on the results of observations and observations made at the research school for Integrated IPS subject learning, especially Social Studies subjects with creative economy material, they still use the lecture learning model and do not utilize computer laboratories for learning. The term creative economy develops from the concept of creativity-based capital which can potentially increase economic growth in an area. According to President Susilo Bambang Yudhoyono in Pascasuseno [1], "the creative economy is the 4th wave economy which is a continuation of the third wave economy with an orientation towards creativity, culture, and cultural and environmental heritage".

According to Rochmat [2] Creative economy is a concept to realize sustainable economic development based on creativity. Utilization of resources that are not only renewable but even unlimited, namely ideas, ideas, talents or talents, and creativity. The economic value of a product or service in the creative era is no longer determined by raw materials or production systems like in the industrial era, but rather by the use of creativity and the creation of innovations through increasingly advanced technological developments. Industry can no longer compete in the global market by relying solely on price or product quality but must compete based on innovation, creativity, and imagination.

The results of a questionnaire filled out by 3 teachers at SMP Negeri 1 Raya show that 100% of teachers need instructional media so that the learning process is more effective. The results of interviews with social studies teachers for class IX specifically show that teachers use conventional learning methods and simple media so that students tend to be passive during learning. They admit that it is difficult to obtain effective learning media for social studies lessons in schools so learning activities are less effective and students find it difficult to understand the material presented, in line with Gilmore's findings [3] that education is sometimes little more precisely used to refer to those experiences from which we do learn. From the results of observations it was found that the learning of Integrated IPS Subjects at SMP Negeri 1 Raya still had many obstacles faced by teachers, including; (1) learning outcomes (social studies subject scores) in the form of assignments/practices or exercises are generally low; (2) teaching aids that are still lacking; (3) materials/teaching materials that are still difficult to obtain in the library; (4) inadequate facilities to accommodate 32 students at once; (5) the activity of students who are still low in learning; (6) teachers are less creative and innovative and develop learning outcomes; (7) the time and frequency of learning is only 2 hours of lessons/week. The facts above have an impact on not achieving the expected learning objectives.

The use of Canva in producing learning media plays a role in presenting learning media that can visualize Creative

Economy learning material more concretely. Various graphic designs on Canva help researchers present interesting learning media for students and can help provide a stimulus for students. Canva is currently continuing to innovate to help support the learning process through the Canva for Education program. The Canva for Education program is presented to support the online learning process with live broadcast features featuring learning media and discussion rooms for students.

Against this background, the researcher also reviewed several relevant studies, such as Sutarno and Mukhidin [4] in their research entitled "Development of Measurement Interactive Multimedia-Based Learning Models to Improve Learning Outcomes and Independent Learning for Junior High School Students in the City of Bandung". From this study, it was concluded that with an interactive multimedia-based learning model students' interest in learning is increasing, the learning process is also felt interesting and not boring because students are actively involved in learning to improve student learning outcomes. Saselah [5] in his research entitled "Development of professional interactive multimedia based on Adobe Flash CS6 in chemical balance learning". From this study it was concluded that learning using multimedia makes lessons more interesting and not boring and can be seen by the acquisition of student responses of 96.7%, this is supported by the opinion of several experts that learning chemistry with multimedia can increase students' understanding and motivation. The results of the positive response of students in the limited trial amounted to 88.2% and after experiencing several revisions, in the expanded test the student response became 97.8% which is included in the very good category.

1.1 The Nature of Integrated Social Science Learning Outcomes

Santrock [6] defines learning as a relatively permanent influence on behavior, knowledge, and thinking skills that arise through experience. Similar to the opinion of Carter and Seifert [7] argued that Learning is a lasting change in knowledge and/or behavior as a consequence of experience. It was explained that learning is a change that occurs in knowledge and behavior as a consequence of experience.

Gagne [8] divides into five categories of learning outcomes, namely (a) intellectual skills, (b) cognitive strategies, (c) verbal information, (d) motor skills, and (e) attitudes. Meanwhile, Reigeluth [9] classifies learning outcomes into 3 aspects, namely: (1) learning effectiveness, (2) learning efficiency, and (3) learning attractiveness. The aspect of learning effectiveness is measured by the level of student achievement in predetermined learning objectives, efficiency is measured by the ratio between effectiveness and the amount of time and/or cost used, while the aspect of learning attractiveness is measured by the tendency of students to stay or continue learning [10].

Integrated IPS Subjects are subjects that discuss integrated or integrated subjects from the social sciences and humanity so that they can develop the ability to become good citizens. IPS in schools is a subject that systematically combines disciplines such as anthropology, archeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, just as well as the humanities, mathematics, and natural sciences. The objectives of Integrated IPS according to Supardi [11] are as follows: First, provide knowledge to make students good citizens, aware as God's creatures, aware of their rights and obligations as citizens of the nation, are democratic, and have national pride and responsibility, have an identity and national pride. Second, developing critical thinking and inquiry skills to be able to understand, identify, analyze, and have social skills to participate in solving social problems. Third, practicing independent learning, in addition to practicing building togetherness, through more creative and innovative learning programs. Fourth, develop intelligence, habits, and social skills. Fifth, Integrated IPS learning can also be expected to train students to live up to good and commendable values of life including morals, honesty, justice, etc, so that they have noble morals. Sixth, develop awareness and concern for society and the environment.

At the junior high school level, the objectives of the Integrated Social Sciences subject are: Getting to know concepts related to people's lives and their environment. Have the basic ability to think logically and critically, curiosity, inquiry, problem-solving, and skills in social life. Have a commitment and awareness of social and human values. Have the ability to communicate, cooperate and compete in a pluralistic society, at the local, national, and global levels. The scope of social studies subjects at the junior high school level includes several aspects, namely: (a) people, place, and environment, (b) time, continuity, and change, (c) social and cultural systems, and (d) economic behavior and welfare.

1.2 The Nature of the Creative Economy

1) Quoting from the 2021 Creative Economy Blueprint, the creative economy is the creation of added value (economic, social, cultural, environmental) based on ideas born from the creativity of human resources (creative people) and based on the utilization of knowledge, including cultural and technological heritage. Creativity is not only based on art and culture but also based on science and technology, engineering, and telecommunications. There are 3 main points that form the basis of the creative economy, including creativity, innovation, and invention.
2) Creativity. Creativity is the capacity or ability to produce or create something unique, fresh, and generally acceptable. Creativity can also generate new or practical ideas as a solution to a problem or do something different from what already exists. Someone who has creativity can create and produce something that is himself or others.
3) Innovation. Innovation is a creative idea or idea by utilizing existing inventions to produce a product or process that can be added value and is useful and produces a higher and more useful selling value.
4) Invention. The invention is the creation of something that has never existed before and can be recognized as a work that has a unique function. Such as applications based on Android and IOS which are inventions based on technology and information to make it easier for humans to carry out their daily activities. In general, the creative economy has several aspects, namely creativity, intellectual property rights, symbolic meanings of use value or symbolic goods, and production methods.

There are many perspectives or understandings of the creative economy:

1) The Ministry of Trade explains that the creative economy is an economy that originates from the utilization of individual creativity, skills, and talents to

International Journal of Computer Applications Technology and Research
Volume 12–Issue 06, 12-19, 2023, ISSN:-2319–8656
DOI:10.7753/IJCATR1206.1003

create prosperity and employment by generating the individual's creativity and inventiveness.

2) Howkins explains that the creative economy is an economy that has superior characteristics on the creative side in producing various creative designs attached to the goods or services produced.
3) The Institute for Development Economy and Finance explains that the creative economy is a process of increasing economic value from the exploitation of intellectual property in the form of individual creativity, expertise, and talent into a product that can be sold.

1.3 Learning Media with the Canva Application

According to Pelangi [12] canva is an online design program that provides various kinds of designs, namely social media designs, presentations, videos, marketing prints, offices, photo collages, book covers, magazine covers, calendars, posters, and worksheets, reports, agendas, comics, proposals, ebook covers, and many other designs. In this Canva provides features that are used for education, marketing, advertising, and so on. By utilizing Canva, you can produce a creative and attractive design that will produce media, of course. According to Faiza [13] the types of presentations available in the Canva application, namely: presentations on education, marketing, sales, advertising, and so on. According to Rahmayanti [14] the use of Canva media can increase teacher creativity in preparing media and simplify the process of delivering learning material. The media can also make it easier for students to understand learning material or deliver messages in the form of text or video. Not only that, learning media using Canva can help make it easier for students to be more interested and motivated by the lessons conveyed in the media.

Figure 1. Canva View

Figure 2. Canva Design Page

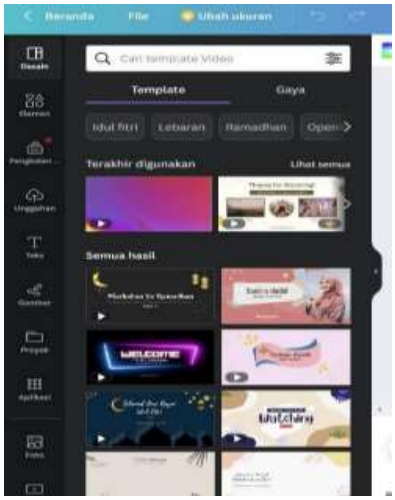

Figure 3. Edit View

Figure 4. Display Go to Video Templates in Canva

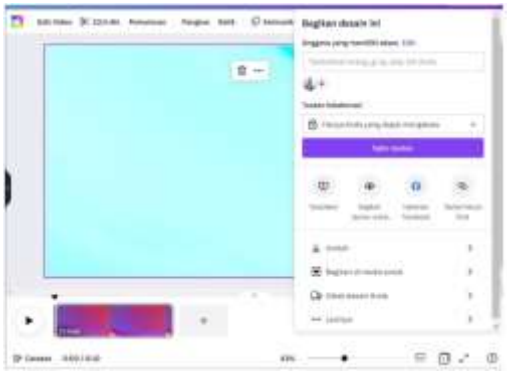

Figure 5. Display of Saving Canva Video Results

1.4 Development of Canva-Based Learning Media for Integrated IPS Subjects

In the development of Canva-based learning media, the ADDIE product development model is used [15]. Research and development (R & D) in the field of education is a process used to develop and validate products in the field of education. The steps in this process are generally known as the R & D cycle, which consists of reviewing the results of previous research related to the validity of the components in the product to be developed, developing it into a product, testing the designed product, and reviewing and correcting the product based on test results. This is an indication that the

product findings from the development activities carried out have objectivity. The ADDIE development model is a learning design model that is based on an effective and efficient system approach and an interactive process, namely, the results of the evaluation of each phase can bring learning development to the next phase. The result of a phase is the initial product for the next phase. This model consists of 5 main phases or stages, namely: (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation [16] as shown in Figure 6.

Figure 6. ADDIE Development Model [17]

Review of the stages of the ADDIE model according to Chaeruman [18] are as follows:

1) Analysis phase: a process of defining what the learner will learn. So to find out or determine what to learn, we must carry out several activities, including conducting a needs assessment, identifying problems (needs), and conducting a task analysis. Therefore, the output that we will produce is in the form of characteristics or profiles of prospective study participants, identification of gaps, identification of needs, and detailed task analysis based on needs.
2) Design stage: this stage is also known as designing. Like a building, before it is built a blueprint on paper must exist first. In this design stage what is done is (1) formulating learning objectives. (2) compiling a test, where the test must be based on the learning objectives that have been formulated earlier. (3) determine what the right learning strategy should be like to achieve that goal. In this case, there are many choices of combinations of methods and media that can be selected and determined as the most relevant. Besides that, also consider other supporting sources, for example, relevant learning resources, what kind of learning environment should be
3) Development stage: development is the process of making the blueprint or design a reality. If the design requires software in the form of learning multimedia, then this multimedia must be developed, or if printed modules are needed, then these modules need to be developed. Likewise, with other learning environments that will support the learning process, everything must be prepared at this stage. One important step in the development stage is testing before implementation. This trial phase is indeed part of one of ADDIE's steps, namely evaluation. More precisely formative evaluation, because the results are used to improve the learning system that is being developed.
4) Implementation phase: concrete steps to implement the learning system that we are creating. That is, at this stage everything that has been developed is set in such a way according to its role or function so that it can be implemented. For example, if you require certain software then that software must already be installed. If the arrangement of the environment must be certain, then the environment is made certain and must also be arranged. Only then is it implemented according to the initial scenario or design?
5) Evaluation stage: evaluation is a process to see whether the learning system being built is successful, according to initial expectations or not. The evaluation stage can occur at any of the four stages above. Evaluation that occurs at each of the four stages above is called formative evaluation because its purpose is for revision needs. For example, at the design stage, maybe we need a form of formative evaluation, an expert review to provide input on the design being made. At the development stage, it may be necessary to try out the product we are developing or may need a small group evaluation.

The research problem is formulated as follows: (1) is Canva-based learning media developed on creative economy material appropriate for use to improve student learning outcomes at Raya 1 Public Middle School, Simalungun Regency?; (2) is the Canva-based learning media developed on creative economy material effectively used to improve learning outcomes at Raya 1 Public Middle School, Simalungun Regency?.

2. METHOD

This research is Research and Development (R & D) development research. Research methods are used to produce certain products and test the effectiveness of these products. According to Sugiono [19], to be able to produce certain products, research that needs analysis is used to test the effectiveness of these products so that they can function widely in society. The model used in development research is the ADDIE development model, namely Analysis, Design, Development or Production, Implementation or Delivery, and Evaluations.

According to Branch [20], the steps for developing Canva-based learning media from the stages of development are as follows: (1). Conducting preliminary research, which includes: (a) analyzing learning needs and determining subject competency standards, (b) conducting learning analysis, (c) identifying the characteristics and initial behavior of students, d) writing basic competencies and their indicators, (e) writing benchmark reference tests, (f) developing learning strategies, and (g) developing learning materials. (2) Making a design, which includes: (a) making a learning media script, (b) making a learning media storyboard, and (c) making a flowchart view of learning media; (3) Collection of learning media materials, which includes: (a) creation and collection of images and animations of learning media. (b) Designing learning media products; (c) validating learning media designs; (d) Reviewing trying to try out learning media products; (e) Product effectiveness test.

The trial design stages are as follows: (a) Validation of social studies learning material experts, (b) validation of media experts or (c) design validation (d) conceptual analysis, (e) development revision (stage I), based on the assessment in the

form of input, criticism or suggestions from 2 material experts and 2 design experts for improvement, (f) trials on students (individuals and small groups), (g) conceptual analysis, (h) development revision (stage II), based on assessment in the form of input, criticism or suggestions from 3 Class IX students who have high, medium and low scores, (i) small group trials. Assessment of this program is based on a questionnaire that has been filled out by 9 Class IX students, (j) conceptual and product analysis, (k) product revision (stage III), (l) field trials on 15 students Class IX at SMP Negeri 1 Raya, (m) assessment of product attractiveness and feasibility, (n) empirical analysis (stage IV), (o) minor revisions, and (p) product effectiveness trials.

Learning media development products require trials in the framework of formative evaluation. The test results were obtained from the subjects consisting of 2 design experts 2 learning material experts and product users, namely Class IX students at SMP Negeri 1 Raya from 3 Class IX students for one-on-one trials, 9 students Class IX for small group trials and 15 Class IX students for field trials.

Figure 1. ADDIE Model Process Flow [21]

Research and development (research and development) is a series of processes or steps to develop new media or improve existing media so that it can be accounted for [22].

Table 1. Expert Validation Questionnaire Assessment Qualification Criteria, and Student Response Instruments to Canva-based learning media on the subject of the creative economy

Percentage of Achievement Level	Eligibility	Description
81,26% ≤ X < 100%	Very good/Valid	No need for revision
62,6% ≤ X < 81,25%	Good/Valid	No Revision Required
43,76% ≤ X < 62,25%	Invalid	Revision
25% ≤ X < 39 %	very Invalid	Revision

Source: (Akbar, [23])

Based on the quantitative data from the results of the validator by material experts, media experts, and student response questionnaires, the next step is to analyze the data and calculate the percentage level of achievement based on the formula:

$$P = \frac{\sum x}{\sum xi} \times 100\ \%$$

Information:
x : The answer score from the validator
x_i : Score the highest answer
P : Presentation of eligibility level

The feasibility and effectiveness criteria achieved for use in media development are described in the following table 2.

Table 2. Media Eligibility Criteria

No	Score in Percentage (%)	Eligibility Category
1	80 ≤ P < 100	Very Eligible
2	60 ≤ P < 80	Eligible
3	40 ≤ P < 60	Adequate
4	21 ≤ P < 40	Inadequate
5	P < 21	Very Inadequate

Canva-based learning media on the subject of the creative economy that is developed gets a positive response from students if the percentage obtained from the student response questionnaire reaches a score of ≥ 60%, then the learning media is categorized as feasible and effective.

Product Effectiveness Test Data Analysis Techniques. The effectiveness test aims to obtain information about whether or not the product development being tested is effective in the learning process.

Based on the formulation of the first problem, namely whether Canva-based learning media on the subject of the creative economy that is being developed is feasible to use. Canva-based learning media on the subject of the creative economy can be said to be feasible to use based on the results obtained from expert validation regarding suggestions and improvements related to Canva-based learning media on the subject of the creative economy being developed. The next step is to do an individual trial of 3 students, and a small group test of 9 students to find out the response to Canva-based learning media on the subject of the creative economy made.

Based on the formulation of the next problem, namely whether Canva-based learning media on the subject of the creative economy that is being developed is effective for improving social studies learning outcomes. Learning is said to be effective if there are significant differences in learning outcomes between classes that are given treatment in classes that are not given treatment. The hypothesis uses the mean difference test or t-test. The t-test is the average difference to find out whether there is a significant difference at the 0.05 significance level with Microsoft Excel 19.

The hypothesis formulated is:
Ho: $\mu 1 = \mu 2$ (no meaningful difference exists between the treated and untreated classes).
Ha: $\mu 1 \neq \mu 2$ (there is an average difference between the treated and untreated classes).

Decision-making Ho is accepted if the significance is greater than 0.05. The following is the calculation using the 2nd difference test for the population average according to Sudjana [24]:

$$t = \frac{\bar{X}1 - \bar{X}2}{s\sqrt{\frac{1}{n1} - \frac{1}{n2}}}$$

Where:
$\bar{X}1$ = total average score of the experimental class sample
$\bar{X}2$ = total average score of the control class sample.

s = standard deviation

3. RESULTS AND DISCUSSION

3.1 RESULTS

The results of the assessment by media experts, material experts, individual trials, small group trials, and limited field trials for all aspects of the assessment are determined by the average score. The results of the assessment were then analyzed and determined whether or not it was appropriate to develop Canva-based learning media on the subject of the creative economy on creative economy material. The average percentage of the results of the assessment of media experts, material experts, individual trials, small group trials, and field trials is as follows:

Table 3. Average Percentage of Assessment Results for Canva-based learning media on the subject of the creative economy on creative economy Material

No	Categorization	Percentage of average score %	Criteria
1.	Material Expert Validation	89,00	very feasible
2.	Media Expert Validation	97,87	very feasible
3.	Individual Trial	96,74	very feasible
4.	Small Group Trial	93,90	very feasible
5.	Field Test	97,61	very feasible
Average		95,02	very feasible

Canva-based learning media on the subject of the creative economy on creative economy material from the validation of experts and trials shows a percentage of 97.87% in media validation, 89.00% in material validation, 96.74% in individual trials, 93.90 % in small group trials, 97.61% in field trials. Overall, the average percentage is 95.02% in the "Very Eligible" category, which means that the use of Canva-based learning media on the subject of the creative economy on creative economy material meets the needs of students.

Based on the data obtained, it can be seen that the score of Integrated IPS learning outcomes before using Canva-based learning media at SMP Negeri 1 Raya obtained the lowest score of 16 and the highest score of 35. The average score is 25.68, the mode is 25, the median is 25 and the standard deviation is 24. 22. To see student scores, interval class is used, namely the score between absolute frequency, namely the number of students who have learning achievement scores, and relative frequency, namely the number percent of learning achievement scores. An overview of the learning outcomes of students before using the Canva-based Integrated IPS learning media is shown in Table 4 below.

Table 4. Description of Learning Outcome Data Before Using Canva-Based Learning Media

Class	Interval Class	F. Absolut	F. Relatif %
1	16 - 19	5	10,50
2	20 - 23	9	19,87
3	24 - 27	10	31,26
4	28 - 31	5	23,87
5	32 - 35	3	14,50
	Amount	32	100

Based on the data obtained, it can be seen that the score for Integrated IPS learning outcomes after using Canva-based learning media obtained the lowest score of 38 and the highest score of 57. The average score is 49.53, the mode is 47.12 and the median is 47.66. The interval class is used to see student scores, namely the score between absolute frequency, namely the number of students who have learning achievement scores, and relative frequency, namely the number percent of learning achievement scores. An overview of Integrated IPS learning outcomes using Canva-based learning media is shown in Table 5 below:

Table 5. Student Learning Outcomes Using Canva-based learning media on the Subject of the creative economy

Class	Interval Class	F. Absolut	F. Relatif %
1	38 - 41	3	9,37
2	42 - 45	5	15,63
3	46 - 49	11	34,30
4	50 - 53	6	18,75
5	54 - 57	7	21,88
Amount		32	100

The analysis requirements test performed is the normality and homogeneity tests. Testing was carried out using the Liliefors test. A summary of the normality of the two samples can be seen in Table 6 below:

Table 6. Summary of Data Normality Test with Liliefors

Class		L_{count}	L_{table}	Conclusion
I (Pre-test)	Class IX student learning outcomes using Canva-based learning media on the subject of the creative economy	0,061	0,156	Normal
II (Post-test)	Class IX student learning outcomes without using Canva-based learning media on the subject of the creative economy	0,082	0,156	Normal

Thus the pre-test values for the experimental class and control class Lcount < Ltable, while the post-test values for the experimental class and control class Lcount <Ltable, it is synthesized that the two sample group data are normally distributed.

Homogeneity test analysis using the F test is to prove the largest variance and the smallest variance with the formula:

$$F = \frac{Varian\ terbesar}{Varian\ terkecil} = \frac{S_1^2}{S_2^2}$$

A summary of the homogeneity of the two samples is shown in Table 7 below:

Table 7. Summary of Data Homogeneity Test

No.	Class	F_{count}	F_{table}	Conclusion
1	Class IX student learning outcomes using Canva-based learning media on the subject of the creative economy	1,11	1.81	homogenous
2	Class IX student learning outcomes without using Canva-based learning media on the subject of the creative economy			

So it can be seen that Fcount < Ftable at a significant level of α = 5% states that the data of the two samples have homogeneous variances and it is concluded that the research data meets the requirements for hypothesis testing.

Testing the hypothesis using the t-test with the formula namely:

$$t = \frac{\bar{x}1 - \bar{x}2}{s\sqrt{\frac{1}{n1} + \frac{1}{n2}}}$$

The following is the formulation of this statistical hypothesis, namely:
Ho : μA1 ≤ μA2
Ha : μA1 > μA2

Information:
μA1 : average student learning outcomes taught using Canva-based learning media on the subject of the creative economy
μA2: average student learning outcomes taught without using Canva-based learning media on the subject of the creative economy

The t-test is used as a hypothesis-testing tool because the research data is normally distributed and homogeneous. The hypothesis in the research is:
Ho: Canva-based learning media is not effective in improving creative economy learning outcomes.
Ha: Canva-based learning media is effective in improving creative economy learning outcomes

From the results of testing the hypothesis obtained t count = 15.78 and t table 1.67 so that t count = 15.78 > t table 1.67, so that Ho is accepted, it is concluded that there is a significant difference in the learning achievement of class IX students using learning media based on canva on the subject of the creative economy compared without using canva-based learning media on the subject of the creative economy.

3.2 DISCUSSION

Based on the validation results, Canva products were declared eligible to continue in field trials. The developed Canva meets standards based on the design of Canva development standards and learning material standards.

In the results of the questionnaire submitted to learning media experts, 89% responded that Canva was suitable for use because it was designed in such a way and met learning design standards. Learning materials experts gave a response of 87% that Canva is suitable for use because it contains material and delivery criteria that meet the requirements for delivering messages to students. By looking at the guidelines and assessment criteria according to Sugiyono [25], it can be concluded that the data above proves that the use of Canva-based learning media is very appropriate for use by students in Integrated Social Studies subjects.

From the results of research data processing conducted, there are differences in Integrated IPS learning outcomes between students who are taught using Canva-based learning media and students who are taught without Canva-based learning media. Experimental class students were taught with Canva-based learning media, namely the average Integrated Social Sciences learning outcomes of 20.68 students who were taught using Canva-based learning media with a higher average compared to student learning outcomes in the control class with average results learning IPS Integrated students of 16.81 which are learned without using Canva-based learning media. So, the Canva-based learning media that has been produced is feasible and effective for use in learning.

This is in line with the results of Wood's research [26] which states that the advantage of using media in learning is that as expressed by the use of learning media it has the potential to increase learning. This is similarly expressed by Sutrisno [27] that the learning process using media can improve students' high-level thinking skills and students' critical thinking skills, give responses and test the correctness of their opinions when they give responses in general. The teacher's ability to act as a motivator and elevator also greatly influences student learning outcomes because in Canva-based learning students must be motivated to take full responsibility for their learning assignments. As an elevator, the teacher must always be consistent in providing feedback at the right time.

4. CONCLUSION

Canva-based learning media with creative economy material is suitable for use with presentation validation by material experts 90.45% is in the "very good" category, 84.70% of media expert validation is in the "very good" category, 94% is in the learning design expert validation category "very good". Individual trials obtained a presentation of 94.81% included in the "very good" category, the results of the small group trials obtained a presentation of 96.10% included in the "very good" category and the results of field trials obtained a percentage of 99.52% included in the category " Very good".

Canva-based learning media has an effectiveness of 96.06% higher than the effectiveness without using Canva-based learning media, namely 49.82%. There are differences in students' reading interests before and after using Canva-based learning media.

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International Journal of Computer Applications Technology and Research
Volume 12–Issue 06, 20-23, 2023, ISSN:-2319–8656
DOI:10.7753/IJCATR1206.1004

The Effectiveness of Developing E-Book Learning Media on Bilingual Learning Course

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Abstract: The purpose of this study was to determine the effectiveness of e-book learning media that was developed. The type of this research is research and development with ADDIE model. The subject of this research is test subject. The data collection technique is test. The result of this research and development is the increase in college students' cognitive learning outcomes is in the medium category. This shows that the use of e-book learning media can improve college students' cognitive learning outcomes.

Keywords: E-Book Learning Media, Bilingual Learning Course, Students' Cognitive Learning Outcomes

1. INTRODUCTION

Education in Law Number 20 Year 2003 is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills they need, society, nation and state [1]. Therefore, the efforts that can be made to achieve the definition of education can be pursued through a good and planned educational process. The educational process according to Regulation of the Minister of Education and Culture Number 59 Year 2014 is a process that provides opportunities for students to develop their potential into rational thinking skills and academic brilliance by giving meaning to what they see, hear, read, and learn to apply in everyday life [2]. However, based on observation on Bilingual Learning course at Primary School Teacher Education, Faculty of Science Education, Universitas Negeri Medan which has been taught, it was found that Bilingual Learning is dominated by power point learning media so that college students feel bored and less enthusiastic when learning takes place which causes the learning process to be ineffective and learning objectives are not achieved.

For this reason, the development of students' self-potential, the use of innovative, varied, interesting, contextual learning media and according to the level of student needs to be held. With this learning media, it can trigger a fun learning process, so that an effective learning process will be created and learning objectives can be achieved. According to Hamidjojo (in Azhar, 2003:4) that media are all forms of intermediaries used by humans to convey or spread ideas, thought or opinions so that the ideas, thought or opinions expressed reach the recipient properly [3]. Meanwhile, Miarso (2011:458) that learning media are everything that is used to channel messages and can stimulate the thoughts, feelings, attention, and willingness of students so that it can encourage a deliberate, purposeful, and controlled learning process [4]. Therefore, the development of learning media needs to be carried out at Primary School Teacher Education, Faculty of Science Education, Universitas Negeri Medan on

Bilingual Learning course. One of the optimization efforts that can be done by lecturers is to hold an e-book that is packaged in an attractive way.

Based on the background of the study described above, how is the effectiveness of e-book learning media on Bilingual Learning course as the problem in this research. The purpose of this study is to determine the effectiveness of e-book learning media on Bilingual Learning course.

2. METHOD

This research is a type of research and development. According to Sugiono in Wanto, et al., the definition of Research and Development (R&D) is often interpreted as a process or steps to develop a new product or improve an existing product [5]. Furthermore, according to Effendi & Hendriyani in Wanto, et al., research on model development with interactive media can also be done online. One type of research that can be a link or breaker of the gap between basic research and applied research is research and development. Research and Development is a type of research that aims to produce a certain product and test the quality of the product [6]. This research and development uses descriptive analysis techniques. Descriptive analysis techniques are carried out to analyze data by describing the data that has been collected from the results of development. This research will be carried out in the department of Primary School Teacher Education State University of Medan for 11 months, starting from January to November 2021. The product that will be produced in this study is an e-book learning media on Bilingual Learning course in the department of Primary School Teacher Education State University of Medan. While there are several elements of research subject, such as:

a) Material expert

This research requires a material expert as a validator or giver of advice or comments regarding aspects of content and learning.

b) Media expert

Media expert has the right to validate e- books developed in terms of appearance, media elements and grammar.

c) Test subject

The selection of the subject will be carried out randomly with the hope that it can become a source of data from representatives of the department of Primary School Teacher Education State University of Medan college students in semester III of the 2021/2022 academic year.

The data collection techniques in this study are observation, validation sheets and test. Observation will be carried out to find out the character of the college students and the technology used by the college students so that the product to be developed is in accordance with the result of the observation. Validation sheets were used to collect data on material expert validation and media expert validation regarding the developed product. Test is used to collect data about the increase of the college students' cognitive learning outcomes before and after participating in learning using e-book learning media. The development model used in this study is the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. This paper only explains the effectiveness of the developed product because the feasibility of develop product have been published in the previous article.

3. RESULT AND DISCUSSION

3.1 Result

After the developed product is declared feasible by material and media experts, proceed to the field trial. The trial was carried out in learning using e-book learning for the Primary School Teacher Education department college students in class F 2021. The data from the results of this field trial were used to determine the increase in college students' cognitive learning outcomes. The results of the field trial are presented in the following table.

Table 1. Pre-Test Result

Respondents	Items															Correct	Score
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	14	93,3
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	100,0
3	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	14	93,3
4	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	12	80,0
5	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	13	86,7
6	1	0	0	0	1	1	1	0	1	0	0	1	0	0	0	6	40,0
7	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	13	86,7
8	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	12	80,0
9	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	13	86,7
10	1	1	1	1	1	1	0	0	1	0	1	1	1	1	1	12	80,0
11	0	1	1	1	0	1	1	1	1	1	1	0	1	1	0	11	73,3
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	100,0
13	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	14	93,3
14	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	14	93,3
15	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	14	93,3
16	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	13	86,7
17	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	13	86,7
18	0	1	1	1	1	1	1	0	1	1	1	1	0	1	1	12	80,0
19	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	13	86,7
20	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	14	93,3
21	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	13	86,7
22	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	100,0
23	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	100,0
24	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	13	86,7
25	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	14	93,3
26	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	100,0
27																0	0,0
28	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	14	93,3
29	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	13	86,7
30	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	14	93,3
31	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	13	86,7
32	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	13	86,7
33	0	1	1	1	1	1	1	1	1	1	1	0	1	1	0	12	80,0
34	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	14	93,3

Based on the table, it can be seen that in the pre-test used 14 items and 34 college students as respondents who answered the items but one of them was not present during the pre-test.

International Journal of Computer Applications Technology and Research
Volume 12–Issue 06, 20-23, 2023, ISSN:-2319–8656
DOI:10.7753/IJCATR1206.1004

Table 2. Post-Test Result

Respondents	Items															Correct	Score
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	100,0
2	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	14	93,3
3	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	14	93,3
4	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	13	86,7
5	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	12	80,0
6	1	0	1	1	1	1	1	0	1	1	1	0	1	1	1	12	80,0
7	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	13	86,7
8	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	13	86,7
9	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	13	86,7
10	1	1	1	1	1	1	0	1	0	1	1	1	0	1	1	12	80,0
11	0	1	1	1	1	1	1	1	1	1	0	1	0	1	1	12	80,0
12	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	14	93,3
13	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	14	93,3
14	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	14	93,3
15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	100,0
16	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	13	86,7
17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	100,0
18	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	13	86,7
19	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	14	93,3
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	100,0
21	1	1	0	1	1	1	0	1	1	1	1	1	1	0	1	12	80,0
22	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	14	93,3
23	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	14	93,3
24	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	13	86,7
25	1	1	0	1	1	1	1	1	0	1	0	1	0	1	1	11	73,3
26	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	14	93,3
27																0	0,0
28	1	1	0	1	1	1	0	1	1	1	1	1	1	0	1	12	80,0
29	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15	100,0
30	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	14	93,3
31	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	13	86,7
32	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	14	93,3
33	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	14	93,3
34	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	14	93,3

Based on the table, it can be seen that in the pre-test used 14 items and 34 college students as respondents who answered the items but one of them was not present during the post-test.

Table 3. Gain Analysis Of College Students' Cognitive Learning

Subject	Total Pre-test Score	Total Post-test Scores	Std Gain
1	93,3	100	1,0000
2	100	93,3	0,0000
3	93,3	93,3	0,0000
4	80	86,7	0,3350
5	86,7	80	-0,5038
6	40	80	0,6667
7	86,7	86,7	0,0000
8	80	86,7	0,3350
9	86,7	86,7	0,0000
10	80	80	0,0000
11	73,3	80	0,2509
12	100	93,3	-1,0000
13	93,3	93,3	0,0000
14	93,3	93,3	0,0000
15	93,3	100	1,0000
16	86,7	86,7	0,0000
17	86,7	100	1,0000
18	80	86,7	0,3350
19	86,7	93,3	0,4962
20	93,3	100	1,0000
21	86,7	80	-0,5038
22	100	93,3	0,0000
23	100	93,3	0,0000
24	86,7	86,7	0,0000
25	93,3	73,3	-2,9851
26	100	93,3	0,0000
27			0,0000
28	93,3	80	-1,9851
29	86,7	100	1,0000
30	93,3	93,3	0,0000
31	86,7	86,7	0,0000
32	86,7	93,3	0,4962
33	80	93,3	0,6650
34	93,3	93,3	0,0000
Total Score	2900,0	3053,3	0,307
Score Average	85,3	89,8	0,306
Lowest Score	0,0	0,0	
Highest Score	100,0	100,0	
Gain Category			Sedang

Based on the table, it can be seen that the total pre-test score was 2900, the total post-test score was 3053.3, the average pre-test score was 85.3, the average post-test score was 89.8, the lowest pre-test score was 0, the lowest post-test score is 0, the highest pre-test score is 100, the highest post-test score is 100 and the gain score is 0.307. If seen from the gain score obtained, the increase in college students' cognitive learning outcomes is in the medium category. This shows that the use of e-book learning media can improve college students' cognitive learning outcomes.

3.2 Discussion

The Dick and Carey's ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) is used in this research and development. The results show that the total pre-test score was 2900, the total post-test score was 3053.3, the average pre-test score was 85.3, the average post-test score was 89.8, the lowest pre-test score was 0, the lowest post-test score is 0, the highest pre-test score is 100, the highest post-test score is 100 and the gain score is 0.307. If seen from the gain score obtained, the increase in college student cognitive learning outcomes is in the medium category. Based on the results, the research that has been done proves that college students' cognitive learning outcomes can be improved through the development of e-book learning media.

4. SECTIONS

Based on the results, the research that has been done proves that college students' cognitive learning outcomes can be improved through the development of e-book learning media because the gain score obtained is 0.307 which is included in the medium category.

5. ACKNOWLEDGMENTS

Special thanks to Prof. Dr. Baharuddin, M.Pd. for the funds that have been given through the Community Service Institute of State University of Medan, may you always be blessed by God Almighty in your work, health, long life and all elements of life.

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