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The Effectiveness of Digital Teaching Materials Based on Google Education to Improve Student's Critical Thinking Ability

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Abstract: *This research aims to develop digital teaching materials based on Google education on physics subjects to improve students' critical thinking skills in Kalam Kudus Christian Junior High School Surakarta. This research method used was research and development to ADDIE development models, including the Analysis, Design, Development, Implementation, and Evaluation stages. The subject of this study was class VIII students of Kalam Kudus Christian Junior High School, with 60 students. Teaching materials and critical thinking skills tests were conducted on class VIII Kalam Kudus Christian Junior High School Surakarta students. The design of this research trial was a one-group pre-test-post-test design. The results showed that the average percentage of material expert validation value was 81%, media expert validation value was 84.5, and critical thinking skills instruments were 80.8%, with very feasible criteria. In limited trials, Google-based digital teaching materials users got an average score from teachers and learners of 80.50% with very practical criteria. Google-based digital teaching materials' effectiveness in improving critical thinking skills was characterized by differences in learners' critical thinking test results from 65.6 to 80. These results indicate that the digital teaching materials based on Google education developed had valid, practical, and effective criteria to improve learners' critical thinking skills.*

Keywords: *Google Education, Teaching Materials, Critical Thinking.*

Abstrak: *Penelitian ini bertujuan untuk mengembangkan bahan ajar digital berbasis Google edukasi pada mata pelajaran fisika sebagai upaya meningkatkan kemampuan berpikir kritis siswa SMP Kristen Kalam Kudus Surakarta. Metode penelitian ini menggunakan penelitian dan pengembangan (Research and Development) mengacu pada model pengembangan ADDIE meliputi tahap Analysis, Design, Development, Implementation, Evaluation. Subjek penelitian ini adalah siswa kelas VIII SMP Kristen Kalam Kudus sebanyak 60 siswa. Pengujian bahan ajar dan tes keterampilan berpikir kritis dilakukan pada siswa kelas VIII SMP Kristen Kalam Kudus Surakarta. Desain uji coba penelitian ini menggunakan One Group Pretest-Posttest Design. Hasil penelitian menunjukkan bahwa persentase rata-rata nilai validasi ahli materi sebesar 81 %, validasi ahli media sebesar 84,5 dan instrumen keterampilan berpikir kritis sebesar 80,8% dengan kriteria sangat layak. Penggunan bahan ajar digital berbasis Google edukasi pada uji coba terbatas mendapatkan nilai rata-rata dari guru dan peserta didik sebesar 80.50% dengan kriteria sangat praktis. Bahan ajar digital berbasis Google edukasi efektif dalam meningkatkan kemampuan berpikir kritis ditandai adanya perbedaan hasil tes berpikir kritis peserta didik dari 65,6 ke 80. Hasil ini menunjukkan bahwa bahan ajar digital berbasis Google edukasi dikembangkan memiliki kriteria valid, praktis dan efektif untuk*

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meningkatkan keterampilan berpikir kritis peserta didik.

Kata Kunci: *Google Edukasi, Bahan Ajar, Berpikir Kritis*

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INTRODUCTION

In the 21st century, competition in various fields of life is tight. People are faced with demands for the importance of quality human resources and being able to compete. Quality human resources, produced by quality education, can be a major force in overcoming the problems faced in education (Ristekdikti, 2018). To improve the quality of human resources, education through educational technology continues to strive to improve the quality of education. Educational technology has the potential to improve the quality of Indonesian human resources because it involves various processes of structuring, planning, and using resources that aim to carry out educational missions efficiently and effectively (Widhy, 2013) (Huang R, J. Michael Spector, 2019).

Various new concepts and insights about the teaching and learning process in schools have emerged and developed along with the rapid development of science and technology. One science that must be studied at the education level is physics. Physics is one of the subjects that play an essential role in the educational process. In that context, physics is not just a way of working, seeing, and thinking, but science as a way of knowing, meaning that physics as a process can also include attitudes/action tendencies, curiosity, thinking habits, and a set of procedures (Kemendikbud, 2014). Thus, the direction of the development and use of technology in physics learning should help students become a superior, innovative generation and compete in all fields (Kemendikbud, 2014). According to Ufairiah & Laksanawati (2020), critical thinking skills are needed to acquire this knowledge. Critical thinking is reflective and reasonable thinking that focuses on deciding what to do or believe (Aizikovitsh-Udi & Cheng, 2015). Ennis stated that critical thinking is a skill not only contained in the intellectual aspect but also reflects behavior. Furthermore, Ennis divided critical thinking into skill dispositions and abilities (Ennis, 1989).

According to Rodrigues A. & Oliveira (2008), physics lessons have a relationship with critical thinking. Learning physics can improve the performance of a student's critical thinking, and students who have critical thinking will increase the academic value of the subject. However, the reality proves that the students' critical thinking results in physics subjects have decreased. Recorded in the Education Assessment Center data Puspendik (2019), the average physics lesson in Indonesia's junior high school level in the 2018/2019 academic year was 48.79. This figure increased by 0.74 from the previous academic year, but compared to the previous two years, namely the 2016/2017 school year, this figure decreased by 3.57 points. The average achieved by students, in general, reveals that physics lessons are still far from what is expected. The same thing happened at the Kalam Kudus Christian Junior High School, Surakarta. From the initial observation results through interviews with integrated science subject teachers at the Kalam Kudus Christian Junior High School, Surakarta, the school has implemented the 2013 curriculum, and the competencies that students must master in the curriculum are developing creativity, curiosity, and the ability to formulate questions to form critical thinking so that it is necessary to live intelligently and learn for life (Permendikbud, 2013).

However, in reality, the competencies demanded by the 2013 curriculum have not been achieved properly. Another obstacle faced is the lack of balance in mastering the theoretical and practical competencies. It happens because learning activities are more focused on theory and some practice. The lack of innovative learning strategies can construct students' ideas and knowledge and optimize the delivery of material completely so that students can learn independently.

The teacher's lack of creativity also impacts students' low critical thinking achievement, as evidenced by the fact that many passive students still have not been able to solve problems independently. In addition, students' low critical thinking ability is evidenced by student learning outcomes that are still not maximal below the KKM (minimum mastery criteria) value. According to Santika, Putra, Dwisarini & Putri (2015); Insani (2016); Maulana et al. (2019), the low critical thinking ability of students in physics subjects is caused by the use of less innovative learning media so that they are unable to meet the learning needs of students. Therefore, schools and teachers must accommodate students with learning difficulties by providing many alternative methods and learning media innovations to achieve better learning outcomes (Zein, 2016). According to Shah et al. (2019), innovative media in the digital technology era needs to be developed to change the traditional teaching paradigm, particularly the methods and learning media teachers often use. The use of media is a decision-making process based on the specifications of the instructional design that serves as a communication tool or intermediary that will be used in the learning process to stimulate the thoughts, feelings, and abilities of students so that effective and efficient learning is achieved (Seels, B & R Richey, 1994; Risnawati, Amir, Z. & Sari, 2018). It is supported by the study results conducted by Insani on junior high school students. It was found that 77% of students who used internet media for learning physics were easier to understand to improve their learning achievement (Insani, 2016).

Moreover, one of the efforts to overcome the above problems is developing digital teaching materials based on Google education. Putria, Akhyar, & Sutimin (2017) revealed that the use of digital teaching materials could integrate sound shows, graphics, images, animations, and movies so that the information presented is richer than in conventional books. It is also the case with research results by Aprilia, Sunardi, & Djono (2017) that the media of digital books (E-books) in the science learning process has enormous benefits, one of which is a simplification of abstract material. These teaching materials are packaged in such a way with the help of Google education. Google education is one medium that can be used in the learning process. Google education has been developed by a giant company from America (Google, 2019), which emphasizes innovation and productivity of education. This internet-based product aims to complement and encourage students to have knowledge and skills in accordance with the times. It has been proven by Shaharanee, Jamil, & Rodzi (2016) that digital teaching materials with the help of Google education are effective for students to learn. In addition, the role of Google education in this teaching material is to make the learning process more productive and meaningful (Ventayen, RJ, Estira, KL, Guzman, MJ, Cabaluna, CM, & Espinosa, 2017). Heggart & Yoo's (2018) research stated that Google education could increase student engagement in learning. According to Teknowijoyo (2020), these teaching materials make it easier for students to learn independently and are presented clearly, contain questions designed to be meaningful and interesting, and stimulate students in critical thinking, thereby increasing understanding of the material and competencies that students in the learning process must master to improve learning outcomes.

Furthermore, Google education is considered part of the solution to the problems in education, namely helping students learn according to their style, collaborating with others online, and becoming beings who have critical thinking in solving problems (Ruwaidah et al., 2017). Based on the problem description above, the authors took the initiative to develop Google-based digital teaching material for education in physics subjects to improve students' critical thinking at the Kalam Kudus Christian Junior High School, Surakarta. It is hoped that the existence of web-based teaching materials can stimulate students' critical thinking so that they can solve the problem of low student achievement in physics subjects.

RESEARCH METHODS

This study applied research and development, a strategy that contains processes or steps to develop a new product or improve an existing product, which can be accounted for (Sukmadinata, 2016). The subjects of this study were 60 students of class VIII Kalam Kudus Christian Junior High School Surakarta. Data collection techniques used observation, interviews, questionnaires, and tests. The trial design of this study used the one-group pre-test-post-test design.

The product developed was digital learning resources based on Google education to improve students' critical thinking skills. The development of digital teaching materials based on Google education was carried out based on the need analysis results of teachers and students. The development of digital learning resources based on Google education in this study refers to the ADDIE development model, including analysis, design, development, implementation and evaluation (Dick, W., Carey, L., & Carey, J, 2009). The product of digital teaching materials based on Google education was validated by experts. The validation data from the expert team was then analyzed qualitatively as input to improve the product being developed. Meanwhile, the expert response questionnaire results related to the development of product feasibility were analyzed by transforming the average of all aspects observed into a qualitative one. The criteria are shown in Table 1.

Table. 1. Feasibility Criteria for Digital Teaching Materials

Earnings Scale	Category
80 – 100	Very Feasible
66 – 79	Feasible
56 – 65	Feasible Enough
40 – 55	Less Feasible
30 – 39	Not Feasible

Source: (Ernawati & Sukardiyono, 2017)

Data analysis of critical thinking skills was divided into two parts: analysis of critical thinking skills on each indicator and analysis of critical thinking skills as a whole. The categories for assessing critical thinking skills are presented in the table below.

Table 2. Critical Thinking Assessment Category

Earnings Scale	Category
>81.25 - 100	Very Critical
> 62.50 - 81.25	Critical
> 43.75 - 62.50	Less Critical
25.00 - 43.75	Not enough
>81.25 - 100	Very Less Critical

Source: (Klimovienė, G. 2006)

RESULTS AND DISCUSSION

In this study, the analysis stage was the initial stage in developing digital teaching materials based on Google education. At this stage, several activities were carried out, namely analysis of students' problems and needs analysis of basic competencies. Problem analysis was conducted to determine the basic problems in developing digital teaching materials based on Google education. In this step, the researchers generally observed the problems in learning physics for class VIII of the Kalam Kudus Christian Junior High School, Surakarta.

The students' needs analysis results revealed that students needed innovations in learning physics that could explain the content of the motion system material. Researchers offered this innovation with Google-based educational digital teaching materials, consisting of images, animations, and learning videos. In this case, the basic competencies analysis determines that the material developed focuses on basic competencies (3.1. Analyzing motion in living things, motion systems in humans, and efforts to maintain the health of the motion system and 3.2. Analyzing straight motion, the effect of force on motion based on Newton's law, and its application to the motion of objects and living things).

The planning stage is a systematic process that begins with compiling flowcharts and storyboards as the basis and description of the form, content, and appearance in developing educational Google-based digital teaching materials. This stage collected supporting content for digital teaching materials for product development based on Google education in physics.

This stage made Google-based educational digital teaching materials developed, containing cover pages, KI, KD, phases 1, 2, 4, and 5, explained with learning animations to train students' critical thinking skills. The development results can be seen in the following link. https://docs.google.com/document/d/1O7cOIwjxLpHgZllkmwHzc2sWBE4esFMAiSU0gxZcLhU/edit?ts=5f802979.

Product validation of digital teaching materials based on Google education was carried out by two competent experts in their fields. The material validation results can be seen in Table 3.

Table 3. Material Validation Results

Validator	Theory	Criteria
1	80	Very feasible
2	82	Very feasible
Average	81	Very feasible

Table 4. Media Validation Results

Validator	Theory	Criteria
1	80	Very feasible
2	89	Very feasible
Average	84.5	Very feasible

Based on Table 3, the average percentage of the educational Google-based digital teaching materials' material validation/feasibility results was 81%, with very feasible criteria. Meanwhile, in Table 4, the average acquisition of media feasibility for digital teaching materials based on Google education was 84.5%, with very feasible criteria so that the materials and media in educational Google-based digital teaching materials could be implemented in the learning process.

Limited trials of small and large groups were conducted to determine the practicality and legibility of the developed product. This test was carried out by teachers and students because both were users of educational Google-based digital teaching materials developed. The practicality test results of Google-based digital teaching materials for teachers and students are listed in Table 5.

Table 5. Limited Trial Results

Respondent	Average (%)	Criteria
Teacher	86.4%	Very practical
Student	83.5%	Very practical
Average	85%	Very practical

Based on the data obtained from the final test (post-test), students' critical thinking skills before and after being taught with educational Google-based digital teaching materials had a significant difference. The comparison of pre-test and post-test of students' critical thinking skills can be seen in Figure 1.

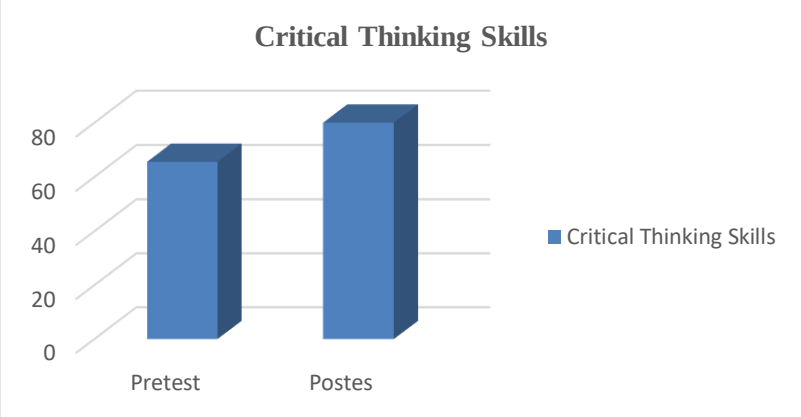

Figure 1. Average Pretest and Posttest Scores

Based on Figure 1 above, it can be explained that learning with educational Google-based digital teaching materials had a positive influence on students, where the post-test score of 80 was higher than the pre-test score of 66. Thus, it can be concluded that educational Google-based digital teaching materials had a very significant influence on improving students' critical thinking skills. After implementation (post-test), students' critical thinking skills had better critical thinking skills than before applying (pre-test) digital teaching materials based on Google education.

The results of this study align with Michael, Odewumi & Adebisi (2019). In this case, Google education integrated into the learning process has major implications for improving students' thinking. Besides, Nash (2015) stated that Google-based learning education is currently still the best prospect for

the future of education in the world. Therefore, the development of digital teaching materials based on Google education can be used as a solution to improve students' critical thinking skills.

After going through the previous stages, the development of digital teaching materials based on Google education received several improvements that should be made. Evaluation of digital teaching materials was based on assessment sheets, inputs, and suggestions from expert validators and test subjects as users. The evaluation phase was carried out in two parts: formative and summative evaluations. A formative evaluation was carried out at each stage of ADDIE development. Meanwhile, the summative evaluation consisted of the final evaluation of the entire ADDIE process.

CONCLUSIONS AND RECOMMENDATIONS

Research on the development of digital teaching materials based on Google education is an alternative answer to the use of innovative learning resources amid today's digital technology era. In their duties as facilitators and mediators, teachers must always try to develop learning, especially through the use of learning tools (teaching materials) that are relevant and in accordance with the demands of the times. Therefore, teachers should always be motivated to become innovative teachers, especially in creating learning resources that suit the needs of students.

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