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Development of Powtoon-Assisted Learning Media to Improve Students' Critical Thinking Skills in Science Subjects

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Article Info

ABSTRACT

Purpose of the study: This study aims to develop Powtoon-assisted learning media to improve critical thinking skills among eighth-grade science subjects at Junior High School 1 BPR Ranau Tengah.

Methodology: This qualitative study uses Powtoon software to design instructional media. Data were collected using interview guides, observation sheets, and documentation. Miles and Huberman's interactive model was applied to the data analysis. Primary data were collected through field interviews and classroom observations; Secondary data is obtained from books, journals, and online sources.

Main Findings: Powtoon-assisted learning media significantly increased student engagement, understanding, and motivation in science learning. Students exhibit better critical thinking skills, especially in analyzing, evaluating, and articulating ideas logically. Teachers reported increased student participation and enthusiasm. Despite technical challenges such as internet access and device limitations, the overall response to Powtoon media was positive and indicated a significant improvement in learning effectiveness.

Novelty/Originality of this Study: This study introduces Powtoon as an innovative tool specifically applied to enhance critical thinking in science at the junior high school level. Unlike previous research that focused on general understanding or motivation, this study highlights Powtoon's role in developing high-level thinking. It contributes to the practice of digital education by bridging animation-based media with the development of cognitive skills.

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1. INTRODUCTION

Technological developments have become one of the main drivers of change in various aspects of human life, ranging from economic, social, to cultural [1]. Innovations in the fields of information and communication technology, transportation, and healthcare have created unprecedented convenience and efficiency [2]. For example, the advent of the internet and smart devices allows humans to communicate across continents in seconds, access information instantly, and perform various online activities [3]. On the other hand, automation and artificial intelligence are starting to replace routine work, thus requiring society to continue to adapt to the times [4].

In the world of education, technological developments have brought about very significant transformations, both in terms of learning methods, accessibility, and the quality of education itself [5]. The use of devices such as computers, smartphones, and tablets allows students and teachers to access diverse and innovative learning resources, ranging from digital books, learning videos, to interactive e-learning platforms

[6]. Technology also allows for distance learning, virtual collaboration, and personalization of materials according to the needs of each student. Innovations such as artificial intelligence, virtual reality, and adaptive grading systems further enrich the learning experience, making it more interactive, relevant, and inclusive [7].

In addition, the development of digital technology in the world of education has brought significant changes to the pattern of interaction between teachers and students [8]. In conventional learning methods, students who generally have high-tech literacy skills tend to get bored quickly. Therefore, it is important for educators to adopt a more innovative approach in choosing learning media to engage students [7]. This shows the urgent need to move from passive learning methods to more active and technology-based learning models, which are able to accommodate students' current cognitive needs and learning interests.

Learning media functions as a means to support the teaching and learning process in educational institutions, with the main goal of improving the quality of education. This media can be in the form of simple presentation media that is able to convey information through five forms, namely lines, images, sounds, movements, and symbols [9]. Examples of such media include moving images such as movies and television broadcasts. However, not all types of movies or television programs are able to convey all types of data [10]. Even so, learning media generally received a positive response from students. However, the effectiveness of learning media is highly dependent on the suitability of the form of media with the characteristics of the material and the needs of students, so media development needs to consider both aspects simultaneously.

One of the most widely used mediums is Powtoon, a web-based application that allows the creation of animated presentations with interactive features and dance visuals. Powtoon is here as a solution to overcome boredom in conventional learning, while answering the needs of media that can increase students' motivation and interest in learning in today's digital era [11]. Teachers can use Powtoon to create presentations, learning videos, and explanations of difficult concepts with more easy-to-understand visualizations. Features such as handwritten animations, cartoon characters, transition effects, and simple timing make Powtoon very effective in grabbing students' attention and creating a more lively learning atmosphere [12]. However, there have not been many studies that have specifically evaluated the effectiveness of Powtoon in improving students' critical thinking skills, especially at the junior secondary education level.

Research from Garsinia (2020), shows that the use of Powtoon in the development of learning videos provides many benefits, especially in delivering material in an interesting and interactive way [13]. In this project, a learning video was made with the theme Building a Curved Side Space with a contextual learning approach (CTL) and showed very valid and practical results [14]. Another study from Melati (2025) shows that the use of Powtoon media in general is beneficial in improving student learning outcomes, especially in social studies subjects [15]. Powtoon presents an engaging and interactive visual display that increases students' interest, attention, and motivation to learn [16]. The results showed a significant improvement in learning outcomes after learning using Powtoon, compared to conventional methods [17]. This proves that Powtoon is effectively applied as a learning medium to create a more enjoyable and meaningful learning process [18].

Powtoon-based learning media that can be a solution to improve students' critical thinking skills effectively [19]. Deep thinking and learning is a learning approach that aims to achieve a more focused and comprehensive understanding, so that the learning process becomes more systematic and directed [20]. Because learning activities are structured in stages and levels, this approach is also known as structured learning [21]. The computational process in this approach also influences the way students think, encouraging them to be more independent in analyzing and making decisions, similar to how driverless cars or autonomous vehicles work [22]. Therefore, Powtoon's integration in critical learning strategies needs to be systematically designed to not only present engaging content, but also encourage high-level cognitive activity.

Junior High School 1 BPR Ranau Tengah which is located on Jalan Akmal, Simpang Sender, South OKU, South Sumatra, is an A accredited public school that has been established since November 22, 1985. With adequate facilities, internet access, the school's professional teaching staff is committed to producing a quality and noble generation, as well as being the right choice for parents in supporting their children's future [23]. So far, the teaching and learning process at Junior High School 1 BPR Ranau Tengah is still highly dependent on conventional learning media, such as printed books, whiteboards, and direct explanations from teachers. While this method is still effective, as technology evolves, students need more interactive and engaging media to make learning more fun and easy to understand [24].

In addition, at Junior High School 1 BPR Ranau Tengah, the problems faced by students in critical thinking are quite significant. Students often have difficulty in developing critical thinking skills because conventional learning methods that are still widely used tend to be one-way and tend not to trigger active student involvement. Monotonous and less varied learning causes students to be less motivated and less trained in honing their analytical skills and evaluating their subject matter [25]. The limitations of conventional learning media that only rely on textbooks and teachers' lectures are also an obstacle in creating an interactive and interesting learning atmosphere [26].

Conventional learning media have limitations in delivering material visually and interactively, so it is less able to attract the attention of students who are now used to digital technology [27]. The media also lacks

support the development of 21st-century skills such as critical thinking, creativity, and collaboration. In addition, conventional media is not flexible in adapting to individual student needs, so not all students can learn optimally [28]. Therefore, learning media that are able to answer these challenges directly and relevantly, such as Powtoon, which has the potential to present learning in a visual, interesting, and critical thinking skill-based manner.

Therefore, integrating Powtoon as a learning medium for the learning approach to learning is expected to make the learning process more effective and able to significantly improve students' critical thinking skills. This is very relevant to be applied at Junior High School 1 BPR Ranau Tengah as an effort to improve the quality of education in schools. With this combination, it is hoped that learning will be more effective, students will be more active, and learning outcomes will increase.

Based on the above background, the purpose of this study is to develop Powtoon-based learning media to improve the critical thinking skills of grade VIII students at Junior High School 1 BPR Ranau Tengah, as well as to assess the effectiveness and response of students to media. The research questions asked in this study are: (1) How is the process of developing Powtoon-based learning media to improve students' critical thinking skills? (2) How effective is Powtoon's learning media in improving students' critical thinking skills? (3) How do students respond to the use of Powtoon media in the learning process?"

Thus, the purpose of this study is to analyze the development of Powtoon learning media to improve the critical thinking skills of Junior High School 1 BPR Ranau Tengah. With adequate training and support, Powtoon can be one of the creative learning mediums that deserves to be integrated in the teaching and learning process to create a more enjoyable and meaningful learning experience for every student.

2.   RESEARCH METHOD

This study uses a qualitative approach with the type of library research to in-depth examine the development of integrated Powtoon-based learning media in an effort to improve students' critical thinking skills [29]. The design of this research is not only exploratory, but also descriptive, because it aims to explain and describe the process, concept, and implementation of learning media in depth [30]. This approach was chosen because it is able to reach in-depth theoretical studies while providing practical context for the use of learning media in 21st century learning.

The scope of this research focuses on the development of Powtoon-fostered learning media as a learning approach at Junior High School 1 BPR Ranau Tengah. The main object in this study is the learning media developed and students' critical thinking skills as a result of the application of the learning model. The focus of the research was not aimed at measuring the quantity of score improvement, but examined the learning process and indicators of critical thinking skills that grew through the use of Powtoon media. The research sample is purposive, with the research subjects in the form of subject teachers and grade VIII students in schools. The sampling technique is carried out by *purposive sampling*, which is by selecting individuals who are considered the most relevant and have direct involvement in the learning process using Powtoon media.

The main materials and tools used in this study include Powtoon software as a learning development medium. Data collection is carried out with two main sources, namely primary and secondary data. Primary data was obtained from in-depth interviews with subject teachers and observations of the learning process using Powtoon media While secondary data was collected from scientific books, educational journals, previous research articles, and official online sources that have relevance to the research [31].

The data collection instruments used include: (1) interview guidelines, (2) observation sheets, and (3) documentation. To support the validity of the data, a grid of observational instruments was prepared that included critical thinking indicators such as the ability to analyze, evaluate, conclude, and propose arguments. The operational definition in this study includes two main variables. First, Powtoon-assisted learning media is defined as a visual teaching tool developed in an interactive digital animation format to support the teaching and learning process [32]. Second, students' critical thinking skills which are interpreted as the ability to analyze, evaluate, and deduce information logically and rationally during the learning process Development of video learning media based on powtoon applications on the concept of light properties for elementary school students[33]. Critical thinking indicators refer to high-level thinking models that involve reflection activities, logical argumentation, and evidence-based problem-solving.

The data analysis technique used in this study refers to the Miles and Huberman model, which includes three main stages, namely: data reduction, data presentation, and conclusion drawing [19]. The data reduction process is carried out by selecting and simplifying relevant data from the results of interviews, observations, and literature sources. Furthermore, data is presented in the form of narratives and tables to facilitate interpretation, and finally conclusions are drawn to answer the research focus related to media development and its impact on improving students' critical thinking. The analysis process is carried out repeatedly, so that the researcher can capture the patterns, meanings, and relationships between the media used and the students' thinking ability.

3.   RESULTS AND DISCUSSION

In this study, before conducting an interview at Junior High School 1 BPR Ranau Tengah, the researcher prepared several things first, such as preparing an implementation concept, preparing an interview schedule with the class teacher concerned, and preparing a list of questions to be asked to the resource person. After all the preparations were completed, the researcher conducted an interview by asking several questions, including the following Table 1.

Table 1. Interview Questions

Question
Powtoon media is one of the options in the development of learning media in this school?
What are some of the challenges or obstacles you face in developing and using Powtoon as a learning medium?
How do students respond to the use of Powtoons in learning, especially in relation to their critical thinking skills?
What are your suggestions or expectations for the development of learning media in the future to better support the improvement of students' critical thinking skills?

Prior to the development of learning media using Powtoon, the teaching and learning process at Junior High School BPR Ranau Tengah still used conventional learning media such as textbooks, whiteboards, and oral explanations from teachers. Although these media are quite helpful, students tend to be passive and less interested in learning the material in depth. This causes students' critical thinking skills to not develop optimally because they only receive information in one direction without much opportunity to analyze, evaluate, or develop their own ideas.

After the implementation of Powtoon-based learning media was developed, there was a significant increase in students' critical thinking skills. Powtoon media that presents material in an engaging way through animation, sound, and interactive visuals makes students more interested and active in the learning process. Students become easier to understand the material, more motivated to discuss, and able to provide opinions and solutions to the problems discussed in the lesson. Thus, the use of this media has proven to be more effective than conventional methods in improving students' critical thinking skills.

Results of Teacher Interviews at Junior High School BPR Ranau Tengah

Based on the results of interviews with teachers who have reviewed the development of Powtoon learning media at Junior High School BPR Ranau Tengah, the first question is why is Powtoon media one of the choices in the development of learning media in this school?

"Powtoon is one of the choices because it looks interesting and interactive, so students don't get bored quickly. This medium is suitable for explaining material in a more visual and fun way."

"It is easy to use and can display material in the form of animations. Students are now more interested in learning through videos rather than just reading books."

"By combining Powtoon by providing videos that invite students to think, discuss, and reflect on the material. After watching, students were given an analysis task."

"Inserting a critical question in a Powtoon video. After that, students are asked to answer and discuss in groups so that they can dig deeper into the material."

The third question is, what are the challenges or obstacles you face in developing and using Powtoon as a learning medium?

"The obstacle I face is that the internet connection at school is not always stable. Also, it takes time to create a video that really fits the material."

"Some old teachers like me are not used to using digital applications, so they need further training. On the other hand, not all students have a device to watch videos at home."

The third question is how do students respond to the use of Powtoons in learning, especially in relation to their critical thinking skills?

"From the student response, it is very positive. They are more enthusiastic and actively ask questions. I also saw that they were more courageous to express their opinions after watching the learning videos."

"Students are more interested in the material because it is delivered in a way that is not boring. They become easier to understand and start thinking from a different point of view."

The fourth question is, what are your suggestions or expectations for the development of learning media in the future to better support the improvement of students' critical thinking skills?

"I hope that schools can support digital media training so that all teachers can use it. Media like Powtoon really helps improve students' thinking skills."

"In the future, hopefully there will be more access to technology for teachers and students, as well as regular training so that we can continue to follow the development of learning media."

Based on the results of interviews with teachers at Junior High School BPR Ranau Tengah, it can be concluded that the use of Powtoon media in the development of learning in schools was chosen because of its ability to present material in an attractive, interactive, and visual way, so that it can increase students' interest and enthusiasm for learning. The two are integrated through the insertion of critical questions in videos, group discussions, as well as reflection tasks that encourage students to think more deeply and analytically. Despite facing challenges such as limited internet connections, lack of technology training for teachers, and access to learning tools for students, both judged that the students' response to the use of Powtoon was very positive. Students become more active, enthusiastic, and able to understand the material better compared to conventional methods. This can be seen from the increased courage of students in asking questions, discussing, and their ability to analyze and convey opinions logically. Therefore, they hope that in the future there will be support from schools in the form of training and increased access to technology, so that digital learning media such as Powtoon can continue to be developed to support the improvement of students' critical thinking skills to the maximum.

Based on the results of observations and interviews conducted, the researcher will develop Powtoon learning media Here the researcher makes a presentation with critical thinking material as material.

Figure 1. Presentation Videos Created Using Powtoon

The media developed by the researcher is an interesting Powtoon-based learning media. This media does not only display images, but in the form of animated videos that provide clear and fun explanations of the material. The purpose of this media is to help students at Junior High School BPR Ranau Tengah in understanding the material as well as practicing their critical thinking skills. With a more interactive and visual

delivery, it is hoped that students will more easily understand the material and become more active in the learning process.

Several studies have shown that Powtoon is an effective learning tool and can help students understand the material. However, its use also has some obstacles. One of the main challenges is the need for a stable internet connection, as Powtoon relies heavily on online access. In addition, both teachers and students need to have technological devices such as mobile phones, computers, or laptops in order to be able to make optimal use of this application in learning activities [18].

Here's an explanation of how to use Powtoon to create animated videos or presentations:
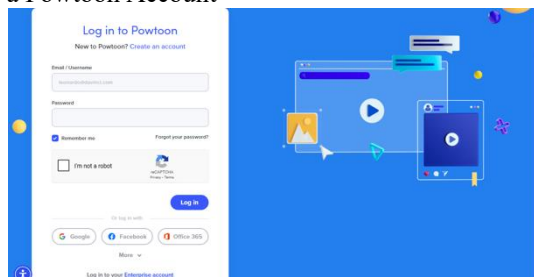1. Sign up and Log in to a Powtoon Account

Figure 2. Login page to Powtoon

First, go to the Powtoon website and sign up if you don't have an account, or log in directly if you already do. You can also sign in using your Google or Facebook account.
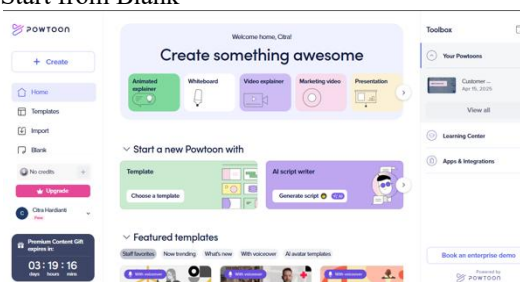
2. Choose a Template or Start from Blank

Figure 3. Powtoon Home

Once you're signed in, select the type of video you want to create, such as a learning, marketing, presentation, or other video. Powtoon provides tons of ready-made templates to choose from as needed, including blank templates to create your own designs from scratch.

3. Design Videos by Adding Elements
    Add animated characters, text, writing effects, properties, images, videos, and music from the features available on the right side of the screen.
    Edit the text by directly clicking on the existing sentence and replacing it as needed.
    Use the timeline at the bottom to set when objects appear and disappear and set animation effects.
4. Video Preview and Edit
    Once you're done editing, click the preview button to see the results of your animated video. If anything doesn't match, re-edit it.
5. Save and Export Videos
    Once you are satisfied with the result, click the export button to save the video. You can download the video in MP4 format (depending on your account type) or share it directly to YouTube, Facebook, or download it as a PDF or PowerPoint.

Powtoon is perfect for creating learning videos, interactive presentations, and marketing videos with engaging animations that are easy to use even for beginners. The free version already provides a lot of features, but for access to more templates and creative features, there's also a premium version. In summary, the main steps of using Powtoon are: register/login → choose a video design → template with animation elements → preview → export and share [34].

The Impact and Implications of Media Use on Students' Critical Thinking Skills

The use of Powtoon media in learning at Junior High School 1 BPR Ranau Tengah has a significant positive impact on students' critical thinking skills. This media was chosen because of its ability to present material in an interesting, interactive, and visual manner, so that it can increase students' interest and enthusiasm for learning. The insertion of critical questions in videos, group discussions, and integrated reflection assignments encourages students to think more deeply and analytically, especially in the aspects of analyzing, evaluating, and summarizing information. These findings suggest that the integration of animation-based media such as Powtoon can be a catalyst in fostering high-level thinking competencies that have been difficult to achieve through conventional methods.

From the results of interviews with teachers, it can be seen that the use of Powtoon makes students more active and enthusiastic in the learning process. Students show increased courage in asking questions and discussing, and their ability to analyze and logically convey opinions is also improved. This shows that Powtoon media not only presents material in an engaging way, but is also effective in developing students' critical thinking skills. Activities such as discussing, building arguments, and evaluating information that emerges during learning are indicators that students have engaged in meaningful learning.

However, there are several challenges faced in the implementation of this media, such as limited internet connections, lack of technology training for teachers, and uneven access to learning tools among students. This challenge is an obstacle that needs to be overcome so that the use of digital media such as Powtoon can be optimized in learning. This emphasizes the need for infrastructure support strategies and ICT competency improvement programs for educators.

The positive impact of using Powtoon is also supported by the results of other research that show that this media is able to improve students' critical thinking skills in the aspects of interpretation, analysis, and inference. Powtoon media combined with a problem-based learning (PBL) model makes lessons more interactive and motivates students to be active in the learning process, so that the understanding of the material becomes better than conventional methods [35]. This alignment shows that the use of animation-based digital media has cross-disciplinary potential in improving the quality of learning.

Other research conducted by [36] also affirms Powtoon's effectiveness in increasing students' achievement and interest in learning. Julianingrum and his colleagues found that the use of Powtoon in financial accounting learning was able to significantly improve student learning achievement. Meanwhile, Mahendra reported that Powtoon learning media was able to increase students' interest in learning, which was characterized by the increase in students' activeness in paying attention to the teacher's explanations and their courage to ask questions during the learning process. This reinforces the conclusion that Powtoon media not only has a cognitive, but also affective impact.

The use of Powtoon also facilitates a process of group discussions that are respectful of each other's opinions and cooperation between students. Students are encouraged to develop and present their work in a confident way, which at the same time trains critical thinking and communication skills. Evaluation and reflection carried out after learning activities further strengthen students' ability to analyze and evaluate information [18]. Learning that encourages collaboration like this is critical in shaping 21st century competencies.

The implication of the use of Powtoon media is the need for support from schools in the form of technology training for teachers and increased access to technology for students. With this support, digital learning media can continue to be developed and utilized optimally to improve students' critical thinking skills on an ongoing basis. If widely adopted, this approach has the potential to become a national strategy in the digital transformation of learning.

Thus, the use of Powtoon media in learning makes a significant contribution to improving students' critical thinking skills through the presentation of interesting, interactive, and supportive material that supports an active and reflective learning process. This shows that digital media such as Powtoon can be an effective alternative in the development of learning oriented towards improving the quality of students' critical thinking. The generalization of these results is that technology-based media innovations can be used at various levels of education to support competency-based learning.

The Success of Powtoon Learning Media at Junior High School BPR Ranau Tengah

The success of Powtoon-assisted learning in improving the critical thinking skills of Junior High School 1 BPR Ranau Tengah students is an innovation that is very relevant to current technological developments and educational needs. In the context of learning, it is not just about memorizing or understanding the material on the surface, but emphasizing deep understanding, critical reflection, and the ability to relate the concepts learned to the real situation around the student [37]. By using Powtoon as a learning medium, teachers can present the material visually and interactively through attractive animations, so that students not only passively receive information, but also are encouraged to actively think and analyze the content of the material [38]. Powtoon allows the delivery of complex material to be simpler and easier to understand through a dynamic combination

of images, sounds, and text, so that students can be more focused and motivated to dig deeper into each concept taught [39]. This shows that learning media is not only a tool, but also acts as a catalyst to change students' learning patterns from passive to active, critical, and reflective. This shows that learning media is not only a tool, but also acts as a catalyst to change students' learning patterns from passive to active, critical, and reflective.

The results of the research conducted at Junior High School BPR Ranau Tengah show that the implementation of Powtoon-assisted learning with a positive approach has a significant positive impact on improving students' critical thinking skills. Quantitative data from the pre-test and post-test showed a considerable increase in scores, which indicates that students are able to understand the material more deeply and are able to apply this knowledge in various contexts. These improvements are not only temporary, but also sustainable, which shows that this learning method is effective in building a strong foundation of critical thinking in students [40]. In addition, students also report that studying with Powtoon is more enjoyable and makes it easier for them to remember the material, thus increasing their motivation to study significantly. Thus, this empirical data strengthens the argument that innovative learning based on digital visual media has a long-term impact in strengthening critical thinking skills.

Furthermore, the use of Powtoon in encouraging the creation of a collaborative and communicative learning atmosphere. Students are invited to discuss, exchange ideas, and work together in completing assigned tasks or projects, so that their social and communication skills also develop along with critical thinking skills. This process of interaction is crucial because critical thinking involves not only the individual's abilities, but also the ability to listen, evaluate, and respond constructively to the opinions of others. Collaborative learning environments also create a sense of ownership over the learning process, which contributes to increased intrinsic motivation. Thus, learning that integrates Powtoon not only improves the cognitive aspects of students, but also affective and social aspects that support the development of 21st-century characters and skills.

The success of this learning is also supported by the validity and reliability of the assessment instruments used to measure students' critical thinking skills. The instruments used have gone through a process of trial and statistical analysis so that the measurement results can be trusted and accurately reflect the students' abilities. This is an important foundation for teachers in data-driven decision-making to design more targeted follow-up learning. With valid and reliable data, teachers can objectively evaluate learning and make necessary improvements to improve the quality of learning in the future. This shows that the implementation of Powtoon-assisted learning with an approach is not only a technological innovation, but also an evidence-based and effective learning strategy.

The integration of Powtoon learning media at Junior High School 1 BPR Ranau Tengah has succeeded in creating a more meaningful, interesting, and effective learning process in improving students' critical thinking skills. Interactive media and in-depth learning models make students more active in the learning process, able to develop critical analysis, evaluation, and information synthesis skills [41]. This also answers the challenge of the world of education in encouraging high-level thinking literacy in the digital era. This success is proof that innovation in learning methods and media is very important to answer educational challenges in the digital era, where the ability to think critically is one of the main competencies that must be possessed by the younger generation [42]. Thus, the implementation of Powtoon-assisted learning can be used as a recommended learning model to improve the quality of education at large. In general, these results can be generalized to other secondary education contexts with the support of adequate technological infrastructure and teacher training.

Research [43] at MTsN 1 Jombang, grade VII students also provided strong evidence of Powtoon's positive influence on mathematics interests and learning outcomes. In this study, the use of Powtoon as a learning medium was proven to significantly increase students' learning motivation.

In addition to the immediate benefits of critical thinking skills, Powtoon-assisted learning also has a positive impact on students' motivation and interest in learning [44]. Students who feel interested and actively involved in the learning process tend to have higher enthusiasm for learning and better learning outcomes [45]. Powtoon as a creative and interactive media is able to reduce boredom and boredom that often arise in conventional learning, so that students are more enthusiastic about participating in each learning session. This high motivation is very important in supporting long-term learning success and forming a positive attitude towards the learning process [46].

Thus, the success of Powtoon-assisted learning at Junior High School 1 BPR Ranau Tengah not only significantly improves students' critical thinking skills, but also strengthens students' motivation and involvement in the learning process. This innovation is a real example of how digital technology can be optimally utilized to create effective, fun, and meaningful learning. In the future, the development and implementation of similar learning models in other schools is expected to expand this positive impact, so that the quality of education in Indonesia will improve and be able to produce a generation that is critical, creative, and ready to face global challenges.

Advantages and Disadvantages of Powtoon

Powtoon as a learning medium has the main advantages in terms of interactivity and high visual appeal. This medium combines dynamic animation, audio, and visuals so that it can grab students' attention and reduce boredom during the learning process [47]. In addition, Powtoon allows teachers to package learning materials creatively and innovatively. This medium is practical because it is web-based and provides a variety of templates that make it easy to create content without having to master graphic design in depth. Thus, teachers can focus more on preparing material that challenges students' analytical and evaluation abilities, which are important aspects of critical thinking [48].

Another advantage lies in its flexibility; Teachers can quickly adapt the content according to different student characteristics and learning contexts. This media also opens up different learning opportunities, as the content can be adapted to visual, auditory, and kinesthetic learning styles.

However, Powtoon also has some drawbacks that need to be considered in the context of learning. One of the main obstacles is the dependence on the availability of technology and a stable internet network. Since Powtoon is an online-based application, the process of creating and storing animated videos requires an adequate internet connection [18]. Additionally, using Powtoon requires special technical skills from teachers and students. The operation of this application is not completely intuitive for all users, so training and technological competence improvement is required so that this medium can be used optimally [49]. In practice, teachers who are not familiar with technology tend to need longer adaptation times, so the implementation of this medium can be hampered if it is not accompanied by adequate technical support.

The duration of the videos produced by Powtoon is also one of its limitations. Learning videos that are too short can make the material not delivered in depth, while too long a duration has the potential to make students lose focus [50]. In demanding in-depth understanding and critical analysis, this limited duration must be overcome with proper material planning so that each video is able to present dense and meaningful content without sacrificing the quality of learning. There needs to be a concise but controversial content packaging strategy, such as the use of short storytelling, animated concept maps, or a gradual narrative flow.

Another advantage of Powtoon is its ability to provide feedback and allow collaboration between students. This medium can be used to create assignments or projects that involve the creation of animated videos, so that students are not only passive recipients but also active in the learning process. This approach is very appropriate by emphasizing deep learning through interaction and reflection, so that it can significantly improve critical thinking skills [48]. Collaboration in Powtoon's content creation also trains social skills such as communication, compromise, and teamwork—all of which are part of the essential soft skills of the 21st century. The implications of this analysis suggest that the success of Powtoon's use is greatly influenced by the readiness of teachers and supporting infrastructure in schools. Therefore, education policy-making must accommodate digital media training for teachers and equitable procurement of ICT facilities.

This study introduces the use of Powtoon-assisted learning media as a specific approach to improve students' critical thinking skills in science education at the junior high school level. While many previous studies have focused on improving student motivation or general learning outcomes, this study highlights the cognitive depth that can be achieved through animated interactive media. Its novelty lies in integrating visual storytelling with critical question strategies to foster analytical and evaluative thinking in a classroom context.

The results of this study have important pedagogical implications. First, they support the integration of digital animation platforms like Powtoon in classroom teaching to foster critical thinking, especially in science subjects. Second, the findings show that teacher training in the use of digital media must be prioritized to maximize learning effectiveness. Third, this research contributes to a growing body of evidence supporting the alignment of media-based learning with 21st century skills, promoting a student-centered and reflective learning environment.

This research is limited by several factors. This involves a relatively small sample size within a single school, which can affect the generalization of the findings. The use of Powtoon also requires stable internet access and digital devices, which poses challenges in terms of infrastructure and digital literacy among some participants. Future research should explore broader implementation across a variety of educational settings and examine the long-term impact on student performance.

4.   CONCLUSION

The development of Powtoon-assisted learning media at Junior High School 1 BPR Ranau Tengah has proven to be effective in improving students' critical thinking skills through the presentation of interactive, interesting, and easy-to-understand materials. This approach encourages students to understand the material in depth, hone their skills in analysis, evaluation, and synthesis of information, and connect lesson concepts with real-life contexts. The use of Powtoon also increases student motivation, engagement, and collaboration in the learning process, thus creating a more communicative and enjoyable learning atmosphere. The results of the study showed a significant increase in student learning outcomes, both quantitatively and qualitatively, which

was strengthened by the use of valid and reliable assessment instruments. Thus, digital media-based learning innovations such as Powtoon deserve to be used as an alternative model that is recommended to be widely applied, in answering the challenges of 21st century education in shaping a generation that is critical, creative, and adaptive to technological developments.

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