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The effect of smart app creator application on ımproving students' critical thinking

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ABSTRACT

This study aims to evaluate the extent to which students' critical thinking skills are improved by the utilization of the smart apps creator program. A quasi-experimental research methodology utilizing a nonequivalent control group design is applied. Purposive sampling was used to choose 150 students for the research sample. A multiple-choice exam was used to gather data. The Mann-Whitney U Test and descriptive statistics were used to analyze the data. The n-gain value for the experimental class was 0.7629, whereas that of the control class was 0.3144. These results demonstrated that students' critical thinking abilities had improved in both groups. This suggests that students who use the Smart Apps Creator application learn more effectively than those who do not in terms of their critical thinking abilities. The Mann Whitney U Test hypothesis test value at the Asymptotic Sig. A value (2-sided test) of 0.000 <0.05 indicates this. The utilization of the smart applications Creator program is found to be highly beneficial in enhancing pupils' critical thinking abilities. According to the research, students can benefit from the Smart Application Creator application by having their learning demands met and their critical thinking abilities enhanced. Teachers can use it to become more creative in creating unique learning activities and to serve as a resource for resolving various issues in learning exercises. The contribution of this research to the future is to serve as a reference for implementing the national curriculum in Indonesia as a learning medium that can be integrated with in-depth learning.

INTRODUCTION

The development of information and communication technology has changed how history education is taught. Electronic text, databases, system platforms, and audio and visual media are potential options in the real world (Lin, 2023). In addition, you can also take advantage of instant accessibility via smartphone (Ailincai & Heckert, 2024). History teachers should be encouraged to be more imaginative and creative in their design of history lessons because the use of technology certainly aims to improve the quality of learning and give students access to learning resources they need.
Based on this, this can be a good opportunity to use technology in history learning. Several studies have applied technology in history learning and have had a positive impact on learning activities so that this becomes a real action in implementing learning activities, such as improving learning

outcomes (Ibrahim et al., 2024), learning experiences (Fitrianto & Saif, 2024), critical thinking (Rachman et al., 2022), creative thinking (Nela & Supriatna, 2021), critical and creative thinking (Shavab et al., 2023), motivation (Basri et al., 2021), and learning interest (Putri, 2024). Based on these references, one of the problems that can be solved by using technology is students' critical thinking skills. This means that the use of technology plays a major role in fostering and improving students' critical thinking skills because, with technology, students can study various materials according to their learning needs, which are then based on the understanding learned through these technological products, and are able to interpret, analyse, and provide conclusions.

In the process of further developing students' cognition, critical thinking skills are essential and can be enhanced in a positive manner by actively guiding the implementation of learning (Syaputra & Sariyatun, 2019) (Yulifar & Agustina, 2020). The study's findings demonstrated that if instruction is not planned with a student center, students' critical thinking abilities cannot be developed to their full potential (Styoningsih, 2021) (Ainiyyah & Saraswati, 2023a). Another thing is the provision or use of low-learning resources and learning media that are less appropriate and varied (Chairini et al., 2023) (Susilo et al., 2023).

Consequently, history educators must devise new and innovative instructional approaches to enhance students' critical thinking skills. This also happened in SMAN 3 Tasikmalaya and SMAN 1 Sindangkasih in class X. Considering the findings of history teachers' interviews; most students do not yet have good critical thinking skills. For instance, it is evident from the metrics of critical thinking skills, such as in terms of reason, providing reasons that support the conclusion that the lack of references from students causes a lack of understanding to add reasons or arguments in concluding the material presented. This can be seen during the discussion activities that took place: the reasons or arguments of students in providing discussion materials were not varied, relying only on one source so that the knowledge that emerged in learning activities was based on the source of the discussion material only. Another problem that was seen was the lack of variety and innovation in the use of learning media used by history teachers. This situation makes students not very enthusiastic about learning activities because they carry out activities as usual or that have been done before, so this has the potential to create new problems in learning activities for students. This symptom is also experienced in the results of other studies that show that one of the causes of low critical thinking in students is the use of less varied and innovative learning media by history teachers (Harningsih & Suprijono, 2024).

One way to address students' low critical thinking skills is to use the Smart Apps Creator learning media, which has been previously used in mathematics (Qotrunnada et al., 2025), civics (Putera et al., 2024), biology (Sugianto et al., 2024), and physics (Fahlevi & Aminatun, 2023). Thus, the research reviewed here is considered novel because it was conducted on historical subjects, and the research methods used differ from those employed in relevant research. The research method used in this study was quasi-experimental, while the research methods in relevant research results mostly used research and development methods. In fact, in other references, there are also similar studies regarding the use of Smart Apps Creator in history learning (Ibrahim et al., 2024) (Dori et al., 2023). However, this research is still limited to the development of learning media, and one of them was conducted at the elementary school level. This is different from the research to be studied, and another novelty is that the material to be created in the application is limited to the spice route and the origins of the ancestors of the Indonesian nation, and the research method to be used is quasi-experiments. Finally, to address the issue of pupils' poor critical thinking abilities, the Smart Apps Creator was created.

Smart Apps Creator is software that can make it easier for users to create multimedia applications easily and quickly. The characteristics of this software include not using coding, and the way to use it is also like Microsoft PowerPoint (Arnandi et al., 2022). Another thing is that this media is software that is used to create learning media that can be used on computers or Androids with the addition of images, videos, animations, and music (Syadida, 2022).

This study aims to evaluate the effectiveness of Smart Apps Creator in improving high school students' critical thinking skills in history education. This study aims to enhance students' critical thinking skills, making the learning experience more meaningful and engaging, and to facilitate

students' learning needs. It will also serve as a reference for other teachers to create and develop interesting learning designs by collaborating on technology.

RESEARCH METHOD

The study methodology utilised is a quasi-experimental approach employing a Nonequivalent Control Group Design. To ascertain the independent and dependent variables' causal relationship, this approach was chosen. We also want to discover if students' critical thinking abilities are affected by using Smart Apps Creator material. However, the Nonequivalent Control Group concept concept takes into account that the research participants are not chosen at random or by chance.; in other words, the experimental and control groups can be selected based on the characteristics of the previous group, and in this study, both groups showed low critical thinking skills. Figure 1 shows a flowchart of the research process.

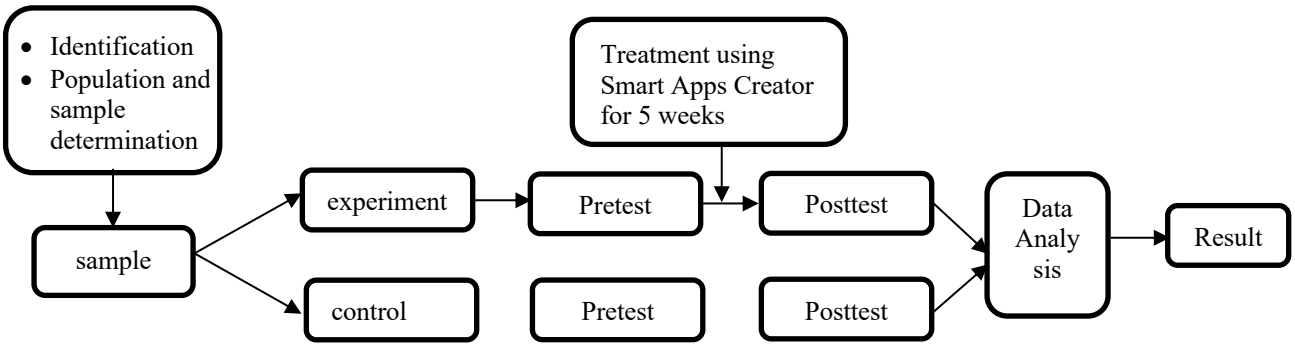

Figure 1. Research Stages

Participants

Class X had a total enrolment of 524 students, comprising 76 students in the experimental group and 74 in the control group. The research was conducted at SMAN 3 Tasikmalaya and SMAN 1 Sindangkasih in the West Java Province. Both classes have nearly identical personalities and poor critical thinking abilities, which is why this class was chosen.

Data Collection

The research was conducted during the history learning activities carried out for 2 months. The data collection technique will be carried out by distributing question instruments to the sample to measure critical thinking. To measure critical thinking, the sample will be given question instruments. The questions used are critical thinking tests with five answer choices (a, b, c, d, and e). Each question is given a score of one if answered correctly and 0 if the student does not answer or answers incorrectly. The critical thinking test that was developed was adjusted to the critical thinking indicators according to the indicators conveyed by Ennis, which consist of reason, focus, situation, inference, clarity, and overview (Ennis, 1996). The instruments that have been made are first validated with content validity. Content validity is a term that refers to the estimation of the validity of the measure of the feasibility or relevance of the test content based on rational analysis or expert assessment by a competent panel. This ensures that the test contains relevant and representative elements of the explanation of the idea. Then, to ensure that the instrument was of good quality after the instrument test was carried out in the form of a content validity test, a construct validity test was carried out on 36 people.

Data Analysis

Descriptive and inferential statistical analysis are used in this study to examine the data. Statistical analysis performs three tasks: classifying data and refining and conveying the results of the analysis. In this study, descriptive statistical analysis is used to find the mean, median, mode, standard deviation, and variance. The interim conclusions of the study are generalized through inferential statistical analysis. This study used inferential analysis to conduct hypothesis, normality, and homogeneity tests using SPSS version 27 software. N-Gain measures how well a lesson or intervention helped students develop their critical thinking skills. The N-gain value requirement, which is shown in Table 1, makes sense as follows:

Table 1. Value criteria for N-Gain (Hake, 1999)

Gain Score	Interpretation
$N\text{-}Gain \geq 0{,}70$	High
$0{,}30 \leq N\text{-}Gain < 0{,}70$	Medium
$N\text{-}Gain < 0{,}30$	Low

According to the table, high values can show that the treatment is successful in raising the test scores of the respondents; medium values can show that the treatment is successful in raising the test scores of the respondents; and low values can show that the treatment is not as successful in raising the test scores of the respondents.
This research instrument consisted of multiple-choice questions and was initially tested on 30 students in class X outside the sample. The instrument trial was conducted to obtain information regarding the validity and reliability of the test instrument used. Calculations for the investigation of validity and reliability were conducted using version 27.0 of the Statistical Package for the Social Sciences (SPSS) software. Content validity pertains to the validity evaluated by examining the appropriateness or relevance of the test content by logical analysis or expert evaluation by a qualified panel. The Aiken V coefficient was employed to assess content validity, with the findings of the interpretation displayed in Table 2.

Table 2. Interpretation of Aiken's V-Value

Aiken's V-value	Interpretation
$0 < V < 0{,}4$	Low validity
$0{,}4 < V < 0{,}8$	Medium validity
$0{,}8 < V < 1$	High validity

Source: (Aiken, 1980)

Based on the processed content validity results from two examiners, each had an average value of 0.9, indicating high validity. Therefore, the next step was to conduct construct validity, which yielded five invalid questions and 25 valid questions. Thus, the research instrument consisted of 25 statements, as shown in Table 3.

Table 3. Construct Validation Calculation Results

Question Items (QI)	R-count	R-table	Interpretation	Conclusion (Valid(V) & Invalid (I))
QI 1	0,730	0,3610	Strong	V
QI 2	0,786	0,3610	Strong	V
QI 3	0,203	0,3610	Low	I
QI 4	0,181	0,3610	Low	I
QI 5	0,694	0,3610	Medium	V
QI 6	0,794	0,3610	Strong	V

QI 7	0,729	0,3610	Strong	V
QI 8	0,860	0,3610	Strong	V
QI 9	0,728	0,3610	Strong	V
QI 10	0,863	0,3610	Strong	V
QI 11	0,840	0,3610	Strong	V
QI 12	0,574	0,3610	Medium	V
QI 13	0,748	0,3610	Strong	V
QI 14	0,493	0,3610	Medium	V
QI 15	0,763	0,3610	Strong	V
QI 16	0,689	0,3610	Medium	V
QI 17	0,842	0,3610	Strong	V
QI 18	0,218	0,3610	Low	I
QI 19	0,569	0,3610	Medium	V
QI 20	0,607	0,3610	Medium	V
QI 21	0,708	0,3610	Strong	V
QI 22	0,713	0,3610	Strong	V
QI 23	0,542	0,3610	Medium	V
QI 24	0,817	0,3610	Strong	V
QI 25	0,613	0,3610	Medium	V
QI 26	0,834	0,3610	Strong	V
QI 27	0,800	0,3610	Strong	V
QI 28	0,732	0,3610	Strong	V
QI 29	0,235	0,3610	Low	I
QI 30	0,143	0,3610	Low	I

The next step is to conduct a reliability test using the IBM SPSS Statistics 27.0 program, specifically the Cronbach's Alpha test. The results of the reliability test are presented in Table 4. The instrument is considered reliable if Cronbach's Alpha is greater than 0.60.

Table 4. Reliability Calculation Results

Cronbach's Alpha	N of Items
0,965	25

Based on Table 4, Cronbach's alpha yields a value of 0.965, which can be interpreted as reliable. Thus, the research instrument used will consist of 25 questions assessing critical thinking skills. The following is a breakdown of the instrument, as shown in Table 5.

Table 5. Critical thinking instrument grid

Critical thinking skills indicators	Sub-indicators	Question Number
Focus	Understand the material presented	1, 2, 3,
Reason	Provide reasons for drawing conclusions	4, 5, 6, 7, 8
Inference	Conclude accurately	9, 10, 11, 12, 13
Situation	Uncover essential factors to consider in making decisions	14, 15, 16, 17
Clarity	Provide further explanations for conclusions drawn	18, 19, 20, 21, 22
Overview	Check what has been decided and concluded	23, 24, 25

RESULT

The research data are described as follows: the experimental group, where students use Smart Apps Creator as a learning medium, and the control group, where students use PowerPoint as a learning medium. Table 6 summarizes the findings of the descriptive statistical analyses of the experimental and control groups' critical thinking scores before and after the tests. Apart from that, there are also mean, median, standard deviation, variants, minimum score, and maximum score.

Table 6. Outcomes of the descriptive statistical analysis of the critical thinking abilities scores before and after the test

Group	N	Mean	Median	Standard Deviation	Variants	Minimum Score	Maximum Score
Experiment (pre-test)	76	50,32	36	8,740	76,379	24	60
Experiment (post-test)	76	87,89	84	5,142	26,442	76	96
Control (pre-test)	74	49,30	52	8,774	76,979	24	60
Control (post-test)	74	65,24	76	7,881	62,104	44	80

According to Table 6, the experimental group's average score on the pre-test of students' critical thinking abilities was 50.32, whereas the control group's score was 49.30. Simultaneously, the mean post-test score for students' critical thinking skills was 87.89 in the experimental group and 65.24 in the control group. Based on these results, the experimental group appears to have a higher average post-test score compared to the control class. The experimental and control groups' pretest and posttest averages are depicted in Figure 2 and are derived from Table 6.

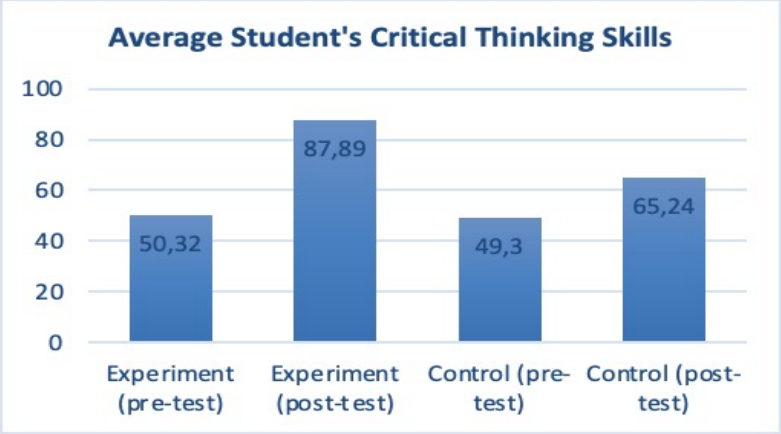

Figure 2. Average student's Critical Thinking Skills

The next stage is to ascertain whether students' critical thinking abilities are impacted by using the Smart Apps Creator application. First, a normalcy test is performed, as shown in Table 7, and the Villiers analysis is employed. The data will be regarded as normally distributed and the normality test decision criteria will be implemented if the significance value (Sig.) exceeds 0.05. The data is not typically distributed if the significance value (Sig.) is less than 0.05, on the other hand.

Table 7. Summary of the findings from the normalcy assessment of critical thinking skills

Group	Df	Normality Test (Lilliefors)	Status
Experiment (pre-test)	76	0,000	Not Normal
Experiment (post-test)	76	0,000	Not Normal
Control (pre-test)	74	0,000	Not Normal
Control (post-test)	74	0,000	Not Normal

Table 7 shows that the data is not normal, so the next step does not need to do a homogeneity test. Instead, a non-parametric hypothesis test will be carried out using the Mann-Whitney U Test analysis. The decision criteria for the Mann Whitney U Test analysis are if the Asymp.Sig. (2-tailed) value is <0.05, and if the value is >0.05, then there is no significant effect.

Table 8. Outcomes of the Mann-Whitney U hypothesis examination

N	Mann Whitney U Test	Asymptotic Sig. (2-Sided test)
150	37,00	0,000

Based on Table 8, the hypothesis test analysis was conducted using the Man-Whitney U Test and the Asymptotic Sig. (2-sided test) value showed that the value of 0.000 was less than 0.05. This shows that the critical thinking skills of students in Class X at SMAN 3 Tasikmalaya & SMAN 1 Sindangkasih are very different between the group using Smart Apps Creator and the group using PowerPoint. In other words, there is an influence of the use of Smart Apps Creator application learning media on students' critical thinking skills. The subsequent phase involves examining the enhancement of students' critical thinking abilities via the n-gain calculation illustrated in Table 9.

Table 9. The experimental and control groups' n-gain value results are summarized below

Group	N	Mean	Standard Deviation	Variants	Minimum Score	Maximum Score
Experiment	76	0,7629	0,07480	0,006	0,58	0,91
Control	74	0,3144	0,11012	0,012	0,09	0,54

Table 9 demonstrates that the experimental group possesses an average N-gain value of 0.7629, in contrast to the control group, which has an average N-gain value of 0.3144. According to N-gain decision-making (Hake, 1999), the Smart Apps Creator program considerably enhances students' critical thinking abilities as a learning medium, whereas PowerPoint has a moderate effect. This indicates that the Smart Apps Creator application possesses a superiority over PowerPoint in fostering students' critical thinking abilities. Table 9 indicates that Figure 3 shows the average N-gain results for the experimental and control classes.

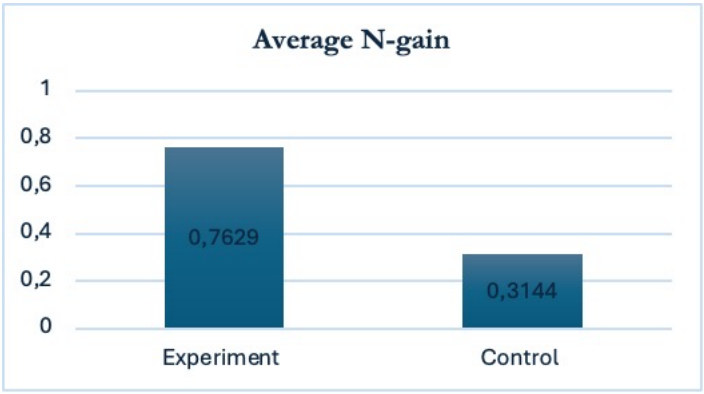

Figure 3. The average N-gain values for the experimental and control groups

The final phase involves determining whether there is a substantial difference in the efficacy of the Smart Apps Creator and the Powerpoint. The initial step is to conduct a normality test on the n-gain data. The homogeneity test is conducted if the data is normal; however, if it is not normal, the Mann-Whitney U Test hypothesis test is utilized. The Independent Sample T-Test hypothesis test, which assumes that identical variances are not relevant, is used when the data is not homogeneous.
Table 10 displays the normalcy test results using Lilliefors analysis. If the significance value (Sig.) is higher than 0.05, the data will be deemed normally distributed, and the normality test's decision criteria will be used. Conversely, if the significance value (Sig.) is less than 0.05, the data is not regularly distributed.

Table 10. The results of the normality test of the test n-gain value are summarized

Group	Df	Normality Test (Lilliefors)	Status
Experiment	76	0,028	Not Normal
Control	74	0,200	Normal

Table 10 shows data that are not normal, so the next step is to carry out the Mann-Whitney U Test hypothesis test, which is presented in Table 11.

Tabel 11. Outcomes of the Mann-Whitney U hypothesis test

N	Mann Whitney U Test	Asymptotic Sig. (2-Sided test)
150	0,000	0,000

Using the Man-Whitney U Test, a hypothesis test analysis was conducted based on Table 11 and the Asymptotic Sig. Value (2-sided test) was set at 0.000 <0.05. The findings indicate that the experimental group utilizing the Smart Apps Creator program has a markedly different effectiveness in enhancing critical thinking skills compared to the group employing PowerPoint teaching materials.

DISCUSSION

There is evidence that history learning activities in secondary schools need to be improved to address the problem of students' critical thinking skills. The following are research findings regarding the analysis of low critical thinking skills in high schools (Wulan, 2020) (Ainiyyah & Saraswati, 2023b). There are several reasons for this phenomenon, for example the lack of variety in the use of history learning media (Agastya & Musadad, 2020) and the lack of variety and innovation in learning (Andriani et al., 2021); (Rohani et al., 2020). The existence of this problem should make teachers increase their motivation and creativity in creating solutions to overcome these problems.
Because of its innovative contributions to the field of history education, the Smart Apps Creator application was chosen as a learning media (Rezeki & Susanti, 2023) and other learning (Nasrullah et al., 2022). With conditions like this, history teachers should develop creativity to use learning media that can answer these problems. The use of the Smart Apps Creator application is able to facilitate learning experiences that are tailored to students' learning needs (Setyaningsih, 2024). This condition makes the learning resources in the Smart Apps Creator application more useful and very helpful for students, so that their learning needs are met. The study's findings indicated that the experimental group had a superior average value of critical thinking skills and a greater enhancement in these skills compared to the control group. The use of the Smart Apps Creator programme as an educational tool improves students' critical thinking skills. The educational materials in the Smart Apps Creator aplications improve the standard of historical instruction (Adelia et al., 2024).
The control group used PowerPoint, which shows that critical thinking skills still need to be improved. Teachers need to find other solutions to improve students' critical thinking skills, and there are many options to overcome this problem, such as using a learning approach (Firmansyah, 2024), learning models (Agastya & Musadad, 2020), utilizing museums (Evitasari et al., 2020), and learning

methods (Putri & Sumiyatun, 2019). With these many solutions, it can be a reference for teachers to develop innovative and meaningful learning activities for students.

The presence of varying critical thinking skills between the experimental and control courses indicates that the instructional intervention significantly enhances students' knowledge and develops their cognitive abilities. The process of information acquisition in student learning activities aligns with constructivist theory, which posits that constructivism focuses on students as active participants in their learning, and in its implementation, students are the center of learning (Dewi & Fauziati, 2021) and knowledge is built through unique experiences for each individual (Mokalu et al., 2022). The basic idea of this theory is the relationship between experience and the surrounding environment in learning activities, and knowledge and art are formed based on this (Driscoll, 2000). Based on this theory, experience is an important element in learning activities because students can shape their knowledge by learning based on what they do.

The experimental class's students not only utilized the Smart Apps Creator application as their primary learning media, but also engaged in a collaborative learning process that involved discussion methods between groups to address the given problems (Arafah et al., 2023). This clearly shows the student-centered learning approach. Another experience besides discussion is that they explore learning materials on the Smart Apps Creator application so that their knowledge is built optimally. Meanwhile, the control class only relies on PowerPoint learning media whose material content is not as varied as in the experimental class, so their knowledge is not built optimally.

The findings of this study suggest that teachers should enhance their creativity in developing creative learning designs by integrating various learning models, approaches, strategies, method, and procedures. The deployment of the Smart Apps Creator as a pedagogical tool can provide a model for other instructors in enhancing students' inadequate critical thinking skills. This research may serve as a foundation for future studies, as the application of Smart Apps Creator to enhance students' deficient critical thinking skills has not been previously examined. The study indicates that students' critical thinking skills improve and their learning demands are satisfied, since the Smart Apps Creator program offers educational resources tailored to their aural and visual learning methods.

These results also demonstrate that the use of Smart Apps Creator learning media contributes to teacher performance, including planning, implementation, and assessment, as these activities are evident during teacher development. Good teacher performance also impacts student potential (Aulia et al., 2023) (Nugroho et al., 2024).

The limitation of this research is that the learning activity material is still in class X in the second semester. This is a challenge for other researchers to continue developing learning materials for one school year or at least one semester. Another limitation is the unstable internet network, especially for materials in the form of videos, because they require a lot of memory to access them. This becomes an obstacle for students to explore the material in order to build their knowledge and critical thinking skills Finally, there are still students who lack access to these learning media due to a lack of devices. Therefore, schools can assist by providing gadgets for underprivileged students (Theodorio et al., 2024) .

CONCLUSION

This study demonstrates the significant enhancement of students' critical thinking skills through the implementation of Smart Apps Creator learning media, in contrast to traditional methods devoid of such tools. The results support the principles of constructivist learning theory, highlighting the effectiveness of student-centred approaches that facilitate knowledge construction. The implications for educators are profound, suggesting that the integration of Smart Apps Creator into instructional practices not only benefits student engagement and cognitive development but also paves the way for its application in diverse educational contexts. Furthermore, this research opens avenues for future investigations aimed at adapting Smart Apps Creator for higher educational tiers and examining its wider implications on learning outcomes.

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