Investigating The Effectiveness Of An E-Service-Learning Based Learning Model On High School Students' Critical Thinking Ability

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ABSTRACT

This study seeks to investigate the effectiveness of an e-service-learning-based learning model in increasing high school students' critical thinking abilities. A one-group pre-test-post-test design was employed, with 29 high school students as participants of the study, selected through non-random sampling. The learning model consists of a combination of online and offline learning. A pretest was administered before students went through the e-learning material, followed by a posttest after all the learning model syntax was completed. The result indicates that the learning model has an N-Gain score of 58.62, which fits into the category of "quite effective." It can be concluded that the learning model is quite effective in increasing high school students' critical thinking ability with further development. One recommendation for further study is to develop a teacher training model to teach critical thinking ability and to measure its effectiveness.

Keywords: Learning Model, Critical Thinking, E-Service-Learning, E-Learning, Service-Learning

Introduction

What is the purpose of education? Is what is being taught today still relevant in the future? Those questions are especially important as the world is entering the era of society 5.0, where there will be a decrease in emphasis on technology and assume that the potential for progress is based on collaboration among humans and machines (Adel, 2022). The education of humans as part of Society 5.0 then is the education that equips them to navigate the advanced technology and the internet to solve the problems in current society (Huang et al., 2022).

The statement above is relevant to the four goals of education according to Trilling & Fadel (2009), namely empowering students to contribute to work and society, using and developing talents, fulfilling civic responsibilities, and continuing traditions and values. Furthermore, amid the advancement of technology and the internet, critical thinking skills are often considered the basis of 21st-century learning because they help students meet their learning objectives and make the most of these developments while enabling them to contribute positively to society.

Nevertheless, numerous studies have indicated that Indonesian students' critical thinking skills are very low (Tanudjaya & Doorman, 2020; Abdurrahman et al., 2019; Murtikusuma et al., 2018). With internet users in Indonesia reaching 221.56 million in June 2024, nearly 60% of them encounter hoaxes when using the internet for communication and information access (Asosiasi Penyelenggara Jasa Internet Indonesia (APJII), 2024; Cahyadi, 2020). In addition, Indonesia's national digital literacy index reveals that the sub-index measuring information and data literacy, critical thinking, and the ability to process information has the lowest score (Cahyadi, 2020). This data indicates that individuals in Indonesia are not equipped to use the internet and technological advancement to create values and solutions for societal problems. Furthermore, the diversity of the Indonesian population requires a more contextual education to preserve local wisdom and create relevance in learning (Akhmar et al., 2023). These findings present new challenges for educators, who must make the most of technological advancements and the internet while

continuously developing innovative contextual learning models to give the next generation the critical thinking ability they need to thrive in a changing world.

There are also other considerations in teaching critical thinking, such as students who lack enthusiasm for learning, teachers who are reluctant to teach critical thinking, and the stigma associated with critical thinking as a form of protest are just a few of the difficulties and barriers that come with teaching critical thinking to students (Alfajri, 2020). Teachers must also be prepared to deal with the constant stream of information from the digital age.

Data indicates that students in the 15–18 age range, or those who would be in high school, require extra attention because, according to a survey conducted by the Association of Indonesian Internet Service Providers (APJII) in 2021-2022, Indonesian teenagers use the internet more than any other age group, with internet penetration among the 13–18 age group reaching 99.16% (Asosiasi Penyelenggara Jasa Internet Indonesia (APJII), 2022). Furthermore, DKI Jakarta province has the greatest internet penetration rate in Indonesia among all other regions, with 77.61% in 2020 and 85.55% in 2021 (Badan Pusat Statistik, 2022). To improve high school students' critical thinking ability in Jakarta, a learning model that integrates online components, links students to real-world challenges, and can be used across subject areas is needed.

LITERATURE REVIEW

Related Research

It is essential to comprehend how to use critical thinking in various contexts and curriculum. The origins of critical thinking can be seen in the ideas of Socrates, and they have developed over time. The results of the research clearly show that students' learning needs to be contextualized for the application of critical thinking skills (Ellerton, 2022), complemented by a critical thinking disposition (Rauscher & Badenhorst, 2021), and must be explicitly taught (Rombout et al., 2022; Chen & Wu, 2021; Piedade et al., 2020; Santos Meneses, 2020). In their article, Paulsen & Kolstø concluded that presenting students with interesting, real-world situations that call for critical thinking is one approach to help them develop their critical thinking skills (Paulsen & Kolstø, 2022). Educators can facilitate learning by elucidating the application of skills, attitudes, and knowledge, particularly in assessing potential solutions and supporting data, obtaining adequate data prior to making judgments, and comprehending and interpreting the issue in question and its context.

Several research articles about creating or assessing student-relevant critical thinking learning models were discovered throughout the literature review. After integrating Minangkabau culture with Problem-Based Learning (PBL), Arsih et al. developed the RANDAI (Reciting, Analyzing the problem, Narrating the solution, Doing the solution, Assessing the solution, and Implementing the solution) model and investigated its efficacy in improving the critical thinking skills of pre-service biology teachers in Padang, Indonesia (Arsih et al., 2021). The study revealed that pre-service biology instructors' critical thinking skills were enhanced by the RANDAI learning model. But because the study was restricted to a few variables and the higher education course of biology, it suggests that additional research in other areas and at the high school level is necessary.

The higher order thinking skills of junior high school students in Purworejo, Indonesia, who were the target of the PINTER Mathematics learning, were found to be superior to those of students taught using traditional teaching methods by Kurniawan et al. after they evaluated the PINTER (Presentation to real life, Investigation, Team Activities, Elaboration, Reinforcement) learning model (Kurniawan et al., 2021). However, this learning paradigm was designed specifically for junior high school arithmetic instruction. In their study, Suardana et al. compared the effectiveness of Discovery Learning with the 7E cycle-based cultural learning model (Elicitation, Engagement, Exploration, Explanation, Elaboration, Evaluation, and Extension) in terms of helping high school students in Singaraja, Indonesia develops their critical thinking abilities when studying chemistry (Suardana et al., 2018). The findings revealed that students who learned using the 7E cycle-based cultural learning model had better critical thinking abilities than

students who learned using Discovery Learning. Nevertheless, there were certain implementation-related shortcomings with the 7E approach, including issues with student involvement, preparation, and identifying a local culture that would work well for integration.

The Science Technology Learning Cycle (STLC) is another paradigm whose efficacy in enhancing critical thinking abilities has been studied (Patonah et al., 2021). Although the STLC model is largely focused on science subjects, it may be used to different educational levels and is intended for pre-service teachers. In the context of science education, this strategy seeks to improve critical thinking abilities. The Search, Solve, Create, and Share (SSCS) approach was created and examined for the study of physics among vocational high school students in Lampung, Indonesia. Students' critical thinking abilities may be enhanced by this model, but because of its complexity, implementation may take longer than expected (Pahrudin et al., 2021). The final study is on the Emancipatory Learning Model, created for junior high school pupils in Manggarai, Indonesia. Research has demonstrated that engaging in discussions about social issues and initiatives to address them can foster active student participation and improve critical thinking abilities. But according to Tapung et al., the research's purview is restricted to the classroom and school setting (Tapung et al., 2018).

The literature review portrays an overview of recent studies on critical thinking learning models in Indonesia. Future study needs to fill in a few holes, even if many models that incorporate local culture have been established to make learning relevant and enhance critical thinking abilities. Most existing critical thinking learning models that are currently restricted to the classroom and school setting and are carried out outside of Jakarta do not yet concentrate on high school pupils and still focus exclusively on one subject area. A learning model is needed to fill in the gap to increase high school students' critical thinking ability in Jakarta that connects students with authentic problems and can be applied across subject matter.

Critical Thinking Learning Model

The critical thinking learning model is developed based on Electronic-Service-Learning (eSL) model. The eSL model is an evolution of the Service-Learning (SL) learning model and it uses the same syntax as the SL model. The National and Community Service Act of 1990 defines Service-Learning (SL) as "an educational experience that connects educational institutes to community where students can actively participate in community service and apply their academic theories and concept into real life application that meet community specific needs" (Marcus et al., 2019). John Dewey inspired the birth of SL since it is a type of experiential learning that encourages learning by doing and through reflective experiences (Dewey, 1938).

The eSL is an alternative to traditional SL, which involves online components in either the teaching or service components or both (Waldner et al., 2012). It consists of four types: (1) Hybrid Type I, where the service is fully on-site with fully online teaching; Hybrid Type II, where the service is fully online with teaching entirely on-site; (3) Hybrid Type III, where services and teaching are conducted partly online and partly on-site; (4) Extreme e-service-learning, where service and teaching are conducted 100% online. Based on research, e-Service Learning influences students' learning outcomes, especially their generic skills and enhances their experiential learning process (Marcus et al., 2020).

The aim of the learning model development is to provide a different approach to close the gap between high school students' current critical thinking abilities and the knowledge and skills needed to become competent users of technology and the internet to create novel actions and solutions that benefit others. By connecting students with real-world situations outside of the classroom, this eSL-based critical thinking learning model will help enhance critical thinking abilities and apply students in making decisions to produce actions and solutions for real-life problems in their social environments. The model combines the eSL Hybrid Type III with the Mixed Approach in critical thinking learning. The learning model is named PIJAR AKSI, an acronym for thinking and learning that generates action and solutions.

Since e-service-learning is a learning model that links subject matter to real-world issues in students' social settings and includes an online component, PIJAR AKSI is a learning model that could serve as a foundation for developing the critical thinking learning model. Therefore, the key question asked in this article is how effective is the critical thinking learning model?

This research aims to contribute to the need for a contextual critical thinking learning model by providing insight into the effectiveness of an e-service-learning-based critical thinking learning model. The novelty of this research lies in the effectiveness of a contextual critical thinking learning model based on e-service-learning, a model that has not been explored in the context of high school education in Jakarta, Indonesia. This model has the potential to enhance the critical thinking ability of high school students and prepare them for the challenges of the Society 5.0 era.

METHOD

The participants consist of 29 high school students in Jakarta. The participants were conveniently selected (non-random sampling). The study adopted a one-group pre-test-post-test design, a research method that involves administering a pre-test before treatment and a post-test afterward (Cresswell & Creswell, 2018). The following table 1 illustrates the experimental research design.

Table 1. One-group pre-test and post-test research design

Pre-test	Treatment	Post-test
O1	X	O2

The results of the experiment were analyzed statistically to test the difference between pretest and posttest results using the Paired Sample t-test formula. If the 2-tailed significance level is below 0.05, thus indicating a significant difference between pre and post-test means that there is a significant effect on the treatment given in the learning process to the post-test result. If a significant difference is obtained between the pretest and posttest results, the analysis is continued by conducting an N-Gain analysis to test effectiveness using the N-Gain score formula and the SPSS application to analyze the data (Hake & Reece, 1999).

Table 2. N-Gain Score Effectiveness Interpretation Category

Quantitative Score	Classification
< 40	Ineffective
40 - 55	Less Effective
56 - 75	Quite Effective
> 76	Effective

The one-group pre-test post-test design began through the collection of pre-test scores before students experience the learning model. The posttest was administered after the students complete all the syntax in the learning model. Procedurally, the learning model to improve critical thinking ability has eight steps or syntax that consist of (1) Introduction, (2) Dialogue and Debate, (3) Research, (4) Action Planning, (5) Action and Reflection, (6) Demonstration, (7) Evaluation, and (8) Recommendations. In addition to syntax, this procedural model is also equipped with a social system, principles of reaction, and support systems (see figure 1).

The implementation of the learning model syntax followed the theory of hybrid e-service-learning type III, where services and teaching are carried out partly online and partly on-site, as well as the Mixed Approach critical thinking learning type, which is a combination of the General Approach and Infusion or Immersion Approach. In The Mixed Approach, learners are involved in separate lessons on critical thinking but also engage in learning related to a specific subject matter. The PIJAR AKSI learning model combined a general approach with infusion.

The application of learning models is supported by physical learning resources, as a product of learning model

development. The final draft of the physical model for the PIJAR AKSI learning model is developed based on the formative evaluation. It consists of a teacher manual book and video, a student manual book and video, and an e-learning platform.

E-learning is chosen as the main media and resource for this learning model because E-learning use computer technology and networks to create a rich synchronous and asynchronous learning environment to create solutions for learning, instruction, and collaborative interaction (Wang, 2018; Garrison, 2017).
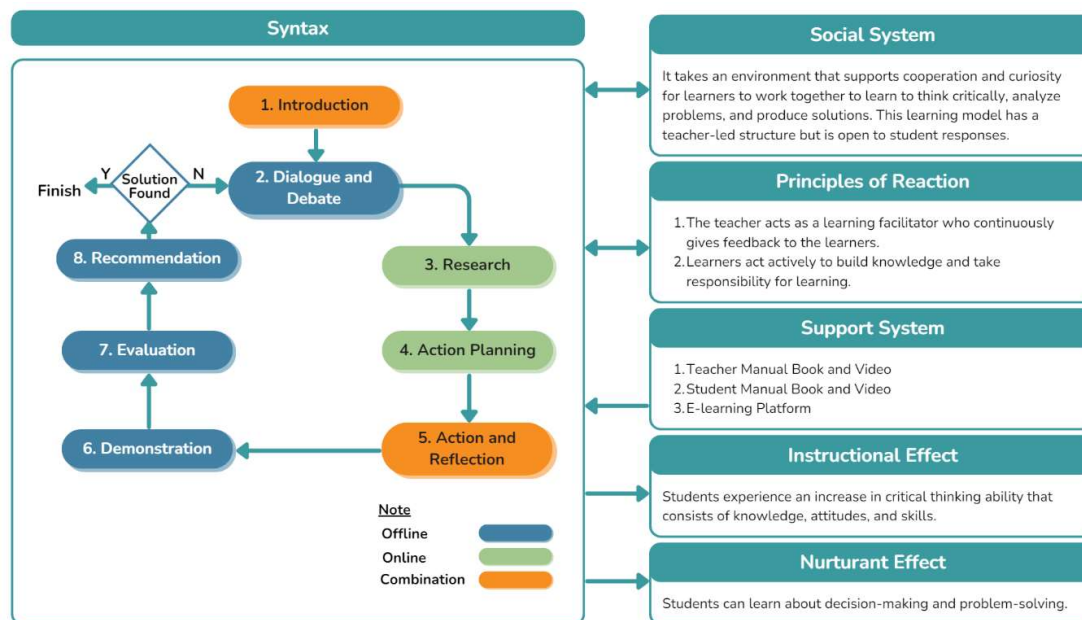

Fig. 1. Procedural Model

RESULT AND DISCUSSION

The e-service-learning based learning model combines both online and offline learning to equip students with knowledge and skills needed to become competent users of technology and the internet as they enter the society 5.0 era. The learning models conditioned learners to be involved in separate lessons on critical thinking but also engage in learning related to a specific subject matter. In this case, the learning model is embedded in a civic class for eleventh graders. However, it can be applied across subject matters whether it is social science or natural science education. The learning model connects students with real issues discussed in the lesson to provide concrete experiences, thus encouraging them to create novel actions and solutions that benefit others.

Edgar Dale (1946) emphasized the importance of concrete experiences in learning. He mentioned that there are two important elements in building a concept, they are: (1) the need for a certain number of concrete experiences and (2) the need for the ability to combine and recombine those concrete experiences in various ways. This theory has been the foundation of PIJAR AKSI learning model.

The learning model was implemented in 2 synchronous offline lessons and 1 asynchronous online lesson (see figure 2 for examples of the learning model's implementation). After the students fill in the pre-test, they enter the first syntax "**introduction**," where they learn the critical thinking material provided in the e-learning platform independently before the first offline meeting. In this meeting, the teacher introduces and previews the learning modal and reviews the materials they learn in the e-learning platform.

The teacher then enters the second syntax "**dialogue and debate**," where the teacher encourages students to do a Socratic dialogue and debate on issues related to subject matter. The purpose of this syntax is to exercise the knowledge that students have learned in the e-learning platform and to prepare them for the next syntax.

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The students undergo the next two syntaxes "**research**" and "**planning**" asynchronously and work on the exercises in groups. They started researching for the best proposed solution the issues discussed previously in the offline meeting.

The "**action and reflection**" syntax is conducted partly online and partly offline during the second offline meeting. In this syntax, students plan their proposed solution and reflect on how they applied their critical thinking knowledge and examine their attitudes throughout the process. They also have a chance to discuss them in person during the offline meeting.

The final three syntaxes "demonstration," "evaluation," and "recommendation" are exercised offline. In the "**demonstration**" syntax, the students present their proposed solution and practice their critical thinking skills. The "**evaluation**" syntax gives the students opportunities to evaluate the process and progress that they are making. The students give "**recommendation**" notes in the last syntax that will be directed towards decision makers. By doing this, students could learn from the solutions proposed by each other, then write them down into more comprehensive recommendations for decision-makers and as a reference for other students who will learn using the PIJAR AKSI learning model. After completing all the syntax, students fill the post test.

The effectiveness of the learning model is measured through a pre and post-test. The pre and post-test results for critical thinking knowledge are counted using the SPSS paired sample t-test and N-Gain Score. The 2-tailed significance level is 0.000, which is below 0.05, thus indicating a significant difference between pre and post-test (see Figure 3). The significance level means there is a significant effect on the treatment given in the learning process to the post-test result.

The result of the N-Gain Score shows an average of 58.62 (see Figure 4), which falls into the category of "quite effective" (see Table 2) (Hake & Reece, 1999). The fact that the N-Gain Score is on the lower level of the "quite effective" category needs further explanation. There are several factors affecting the score: (1) critical thinking is a new material even for teachers; (2) the teacher as main facilitator did not have adequate time to prepare for the lesson, thus requiring an easier manual in the form of video; (3) the use of e-learning and doing the independent study is not something that the students are accustomed to, thus requires a lot of prodding and assistance from the teacher. Further improvement in the teacher's manual and preparation for implementing the model is needed to increase the level of effectiveness.

Fig. 2. The Implementation of the Learning Model

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	POSTTEST - PRETEST	2.00000	1.98206	.36806	1.24606	2.75394	5.434	28	.000

Fig. 3. The result of the Paired Samples Test

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NGain_Score	29	-.33	1.50	.5862	.51391
NGain_Persen	29	-33.33	150.00	58.6207	51.39149
Valid N (listwise)	29				

Fig. 4. The result of N-Gain-Score

CONCLUSION

A learning model that engages students with real-world issues and is applicable across subject matter is needed to enhance high school students' critical thinking ability in Jakarta. Hence, PIJAR AKSI, an e-service learning-based critical thinking learning model, is developed. This research aims to provide insight into the effectiveness of the learning model.

The result of this study shows that the 2-tailed significance level indicates a significant difference between the pre- and post-test. The significance level means there is a significant effect on the treatment given in the learning process on the post-test result. Furthermore, the N-Gain Score was 58.62, which falls into the "quite effective" category.

This study contributes to the body of knowledge in the field of educational research on how a critical learning model can be developed to answer a need for a model that connects students with real-world issues that goes beyond classroom settings to help enhance their critical thinking ability and apply them in making decisions to generate actions and solutions for real-life problems in their social environments. Despite the significant results of this study, there are still limitations. This study is limited to research and development of a critical thinking learning model for high school students, and the research participants were in Jakarta. Further study can explore the effectiveness of other critical thinking learning model development for different levels of education in more cities and involve more schools and students in the process. A more robust teacher training model to help teachers implement the critical thinking learning model can also be a potential future study.

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