

## PAPER

# Seamless Online Learning: Future Learning in a Disruptive Era to Improve Critical Thinking Skills

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## ABSTRACT

This study aims to investigate the impact of seamless learning based on the “among” Ki Hajar Dewantara approach on improving critical thinking skills. This quantitative study focused on the experimental group using a control group pretest-posttest design. The participants of this study were divided into 42 individuals in the experimental group and 45 individuals in the control group. The experimental group received treatment using seamless learning based on the “among” approach, while the control group received treatment through online learning. Participants underwent a pre-test to evaluate their critical thinking skills. Subsequently, participants engaged in seamless learning based on the “among” system. A post-test was administered to evaluate the intervention’s impact. The data analysis method employed in this study was the independent samples t-test. The findings of this study demonstrate a statistically significant increase in critical thinking skills, as evidenced by the results of the pre- and post-tests. Seamless learning, based on the “among” approach system, presents a learning model that combines the values of Ki Hajar Dewantara’s learning independence with the concept of seamless learning. It offers independent learning spaces with formal and informal patterns, allowing students to explore knowledge extensively without spatial or temporal constraints. By utilizing the seamless learning approach of the “among” system, there is great potential for a novel and innovative online learning model to enhance critical thinking skills and provide a vast learning environment conducive to seamless learning.

## KEYWORDS

seamless learning, “among” system Ki Hajar Dewantara, e-learning, critical thinking

## 1 INTRODUCTION

The 21st century places high demands on human resources, requiring creative thinking, problem-solving abilities, effective communication, collaboration skills, and, most importantly, critical thinking [1]. Furthermore, the advancement of technology in various educational sectors is crucial. Following the educational shift during the COVID-19 pandemic, nearly all educational institutions in Indonesia

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have adopted online or virtual learning through electronic devices. This transition has familiarized people with electronic devices and online learning, aligning with the technological demands of the 21st century. This progress incorporates cutting-edge technology and artificial intelligence that individuals utilize to streamline their tasks. Particularly in educational settings, technology plays a vital role in facilitating learning activities in both schools and universities.

The use of technology plays a crucial role in enhancing and revolutionizing education, with the current environment being a key driver in the integration of new technologies into the education system for its advancement and transformation [2]. Utilizing cutting-edge technology in schools and universities necessitates educators adapting effectively to these advancements. They need to engage in continuous learning to proficiently navigate various updates in online learning and master multiple digital platforms essential for learning activities. Students should be appropriately guided and introduced to actively participate in dynamic learning activities at school using these digital components. This presents a challenge for educators accustomed to traditional face-to-face teaching. While incorporating technology into schools presents challenges for school administrators and teachers, there are now more engaging educational technologies available that offer teachers innovative ways to deliver content to students [3].

Especially at the tertiary level, it is crucial to manage various aspects in this situation. Lecturers who are accustomed to conducting direct learning in class with students now have to adapt to online learning. Even the development of character and several important aspects in students must be facilitated online. When learning takes place in a physical classroom, lecturers can easily engage with students, encourage critical thinking, and guide these thought processes using a clear emotional approach. Critical thinking is a vital trait that students must acquire, as it is a necessary skill in the 21st century [4]. Critical thinking skills are highly sought after in the job market, making it essential to cultivate them at the tertiary education level [5]. It is important to regulate excessive critical thinking to ensure it remains focused. While this issue often arises in face-to-face classes, it can still be managed effectively.

Currently, learning is conducted online outside the classroom with the same objectives as traditional classroom learning. The main difference is the absence of face-to-face interaction between lecturers and students, who engage with each other through their respective device screens. This form of remote learning has been prevalent since the COVID-19 pandemic. However, there are still unresolved issues associated with online learning implementation. As previously mentioned, fostering an emotional connection between lecturers and students is crucial for creating a more humanistic learning environment. This approach enhances the depth of learning and improves classroom management. At the tertiary level, a key objective is to enhance students' critical thinking skills. The aim is to cultivate sharp and robust critical thinking abilities that are aligned with the learning outcomes. Developing students' critical thinking skills is a fundamental educational goal across societies worldwide.

Of course, this control requires a good emotional relationship between lecturers and students. If this is not present in learning activities, then critical thinking control is difficult to do. There are several conditions that occur when learning is done online, including: (1) the learning atmosphere online becomes passive compared to in direct classes; communication and interaction activities lack emotional closeness; (2) online learning is more rigid than direct learning, as expressiveness is limited online; and (3) online learning restricts class control, making it less free and controlled, allowing students more freedom to study wherever they want, with lecturers unable to provide direct intervention, guidance, and direction. Social and emotional interactions can influence cognitive function, satisfaction in collaboration, and student learning

outcomes [6]. Teachers may perceive online engagement differently from classroom engagement, so understanding their views, especially in an online environment, is crucial [7].

However, the primary objective of developing students' critical thinking skills remains intact. Even with online learning, students have more freedom to think. Advances in science and technology promote the development of critical thinking skills in students [8]. Students have greater autonomy to locate the necessary information sources to enhance their critical thinking abilities. Online learning presents significant opportunities for students to think critically across various real-world aspects and issues. Nevertheless, the main challenge lies in the absence of supervision and guidance. Consequently, the critical thinking developed may lack proper direction, failing to fully align with the primary goal of critical thinking. This study seeks to implement seamless learning based on the "among" system to enhance students' critical thinking in higher education.

Learning that is carried out seamlessly is the main driver for students to be able to learn online wherever they are without any learning barriers. Choosing seamless learning provides students with the opportunity to improve their critical thinking potential by utilizing their time and opportunities to learn as much as possible. Seamless learning is carried out by utilizing various materials that are needed and can be accessed by students [9]. This enables students to maximize their potential to collect various information to build critical thinking. Previous research that has been conducted [10] proves that seamless learning has a positive impact on academic performance and learning approaches to learning as well as student involvement in learning activities.

In addition, the use of the "among" system, which embodies the educational values of Ki Hajar Dewantara, in this seamless learning environment provides positive reinforcement for optimal control and guidance. Learning based on the "among" system offers support through supervision, coaching, guidance, and emotional support. This advantage is crucial in online learning settings. Despite the lack of face-to-face interaction, the "among" system fosters a strong emotional connection in online learning. By engaging in online learning activities with a seamless approach grounded in the "among" system, it is expected that students' critical thinking skills can be developed effectively and with greater focus.

## 2 METHOD

This study employs an experimental research design with a quasi-experimental design type. The quasi-experiment utilized a control group pretest posttest design. Two groups were involved in the study, with one group receiving treatment. Table 1 illustrates the study design utilized. Group SA represents the experimental group using seamless based on "among," while group CL represents the control group using conventional learning. O denotes the administration of tests to each group.  $O_1$  stands for the pre-test of the experimental group, and  $O_2$  represents the post-test of the experimental group.  $O_3$  indicates the pre-test in the control group, and  $O_4$  signifies the post-test in the control group. X signifies the treatment administered to the experimental group. The control group did not receive any treatment.

**Table 1.** Research design

Groups	Pre-Test	Intervention	Post-Test
SA	$O_1$	X	$O_2$
CL	$O_3$		$O_4$

The study procedure was conducted in several stages following the research design flow, which included three main activities.

1. The first activity is a pre-test for each group, including both the experimental and control groups. This initial assessment aims to evaluate the critical thinking skills of both groups. The pre-test involves using a test with identical questions and difficulty levels for each group. The primary goal of this initial evaluation is to ensure that the critical thinking skills of students are equivalent, consistent, or not significantly different.
2. Next, the second activity involves learning activities in both groups, specifically in the e-learning development course for one semester. Learning activities between the two groups are conducted differently. The experimental group engages in learning through seamless learning based on the “among” system. In contrast, the control group follows conventional learning, utilizing online learning as usual.
3. The third activity involves administering a post-test after the lecture concludes in one semester. The post-test is conducted at the end of the lecture for both the experimental and control groups. The post-test questions presented to both groups are of similar difficulty levels and closely resemble the pretest questions. The aim of the post-test is to assess the development of critical thinking skills in students following the lecture. The post-test data reveals the outcomes of the study.

This study was conducted at the State University of Surabaya in Surabaya City, East Java Province, Indonesia. The implementation took place in the second semester of the 2022–2023 academic year. The participants of this study were undergraduate students in the Educational Technology study program who were taking e-learning courses. The participants included two classes: the first class had 42 students and the second class had 45 students, making a total of 87 students.

## 2.1 Instrument and data analysis

This study utilizes observation instruments, interviews, and test instruments. Researchers employ observation instruments for preliminary research, which allows them to identify initial field conditions and directly pinpoint problems. Interview sheets are utilized to delve deeper into information regarding field conditions through insights from lecturers and several students. Test instruments are employed to conduct quasi-experiments measuring students’ critical thinking skills. The test instrument comprises multiple-choice questions designed to foster critical thinking, with several indicators serving as measurement references.

Table 2 presents critical thinking skills indicators used as a reference for assessment. The indicators in this study are based on the perspectives of Ennis and Facione. Five key indicators were selected as they are believed to demonstrate rational and reflective thinking abilities. Interpretation, basic support, and inference [11] assess students’ rational thinking skills, clarity and overview [12] and evaluate reflective thinking skills. Achievement descriptions for each indicator are tailored to the seamless learning system’s syntax in each phase. The data analysis method employed in this study is the independent sample t-test to compare differences between the two groups and assess the impact or improvement in critical thinking skills pre- and post-learning.

**Table 2.** Indicators of critical thinking skills

Indicators	Descriptions
Interpretation	Students are taught to practice their ability to identify and understand problems accurately.
Basic support	Students are taught to practice their critical thinking skills by conducting discussions and providing supporting arguments based on situations and facts.
Inference	Students are encouraged to construct problem-solving steps and provide conclusions correctly and logically.
Clarity	Students are expected to take responsibility for the reports they have created.
Overview	Students thoroughly review their decisions.

### 3 RESULTS

The results of the data analysis test using the independent samples t-test on the pre-test results and critical thinking score are presented in Table 3. Meanwhile, the independent samples t-test on the post-test results and the scores are shown in Table 4. The comparison of the scores of the two groups on the pre- and post-tests are presented in Figure 1.

**Table 3.** Independent samples t-test on pretest scores of critical thinking ability in the control group and experimental group

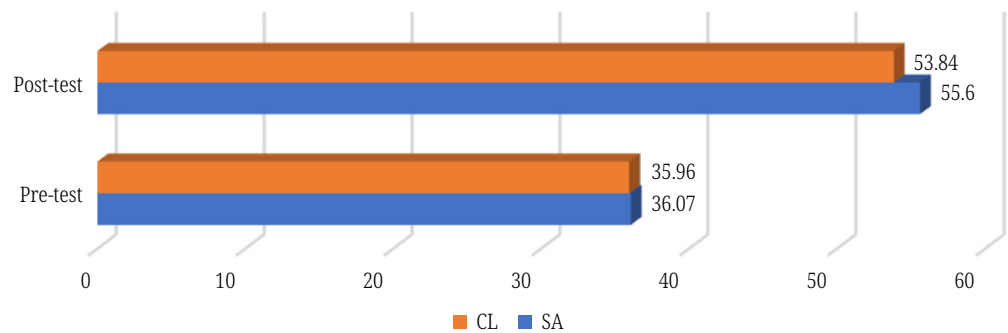
Groups	N	Mean	SD	T-Value	P-Value
SA	42	36.07	3.598	.143	.886
CL	45	35.96	3.919		

Based on the pre-test results in Table 3, it is evident that the experimental group achieved an average critical thinking skills score of 36.07 (SD = 3.498), while the control group scored an average of 35.96 (SD = 3.919). The critical thinking skills between the two groups showed minimal variance. The independent samples t-test results revealed a non-significant difference ( $t = .143$ ;  $p = .886$ ), indicating no disparity in the critical thinking skills of students between the experimental and control groups.

**Table 4.** Independent samples t-test and critical thinking ability post-test scores in the control group and experimental group

Groups	N	Mean	SD	T-Value	P-Value
SA	42	55.60	2.794	2.881	.005
CL	45	53.84	2.868		

Based on the post-test results in Table 4, it is evident that the experimental group achieved an average critical thinking ability score of  $M = 55.60$  (SD = 2.794), while the control group obtained an average critical thinking ability score of  $M = 53.84$  (SD = 2.868). The critical thinking abilities of students in both groups significantly differ. The independent samples t-test results revealed a statistically significant difference ( $t = 2.881$ ;  $p = .005$ ), indicating a variance in the critical thinking abilities between the experimental and control groups.



**Fig. 1.** Mean scores of critical thinking skills on the pre- and post-tests for the experimental and control groups

## 4 DISCUSSION

The seamless learning model, based on the “among” system, aims to empower learners as the central focus (student-centered) in both synchronous and asynchronous learning activities. The goal is to create a seamless experience where learners perceive no barriers between the different modes of learning. Seamless learning enables learners to study at their convenience, in diverse settings, and transition effortlessly between scenarios. It encompasses various active, productive, and creative scenarios, allowing learners to collaborate anytime and anywhere across different learning environments.

The core of the Seamless learning model based on the “among” system lies in the engagement of participants and the autonomy of learners in attaining learning objectives. “Parents” grant their students the freedom to move while also overseeing to ensure they do not misuse this freedom and put themselves at risk [13]. Both processes serve as instances of learning behavior to (1) explore knowledge and resources in diverse ways and from various sources, (2) cultivate critical thinking and problem-solving skills, (3) make learners realize that learning takes place seamlessly and continuously, and (4) help learners recognize their own weaknesses and strengths. In the context of learners/instructors, the seamless learning model based on the “among” system underscores the role of learners/instructors to (1) act as role models by setting good examples in behavior and providing clear instructions for assignments (best practices), (2) motivate learners by monitoring assignment completion progress both synchronously and asynchronously, and (3) support learning by creating learning environments both offline and online (synchronous and asynchronous) aligned with learning objectives.

The seamless learning model based on the “among” system was developed on the fundamental theory of seamless learning and the “among” system of Ki Hajar Dewantara. The seamless learning theory is applied in both formal and informal dimensions, which form the basis of the learning environment. Learning taking place in a classroom or directly is categorized under the formal dimension, while learning occurring outside the classroom or indirectly is classified as the informal dimension. The values within the “among” system of Ki Hajar Dewantara [14] are reflected in concepts such as (1) Giving examples (voorbeeld), (2) Habituation (pakulinan, gewoontevorming), (3) Teaching (learning, wulang-wuruk), (4) Commands, coercion, and punishment (regeering en tucht), (5) Nails (zelfbeheersching, zelfdiscipline), (6) Physical and spiritual experience (ngerti, ngeras and ngelakoni). This model is constructed based on the theories of constructivist, connectivist seamless learning, and the “among” system, incorporating the values of Ki Hajar Dewantara.



The seamless learning model within the “among” system shares the core concept of enabling a certain level of freedom and autonomy to facilitate learning for students [15]. This model aims to empower learners to collaborate and integrate knowledge acquired from both formal and informal learning settings (synchronous and asynchronous). In alignment with the “among” system, the lecturer’s role as a mentor evolves to one that can offer guidance, instill motivation, and set examples [16], [17]. In this framework, lecturers are not solely assigning tasks; rather, they kick off activities by showcasing exemplary outcomes that align with online learning principles, thereby guiding students in their e-learning development. This approach addresses a challenge identified in a preliminary study where students felt disoriented due to the absence of clear examples or models of e-learning that meet the required criteria and educational standards during ICT-based courses.

The seamless learning “among” system learning model aims to enhance students’ critical thinking skills. This is supported by the outcomes of critical thinking ability tests in classes utilizing the seamless model based on the “among” system, which have shown higher results compared to classes taught conventionally in formal settings. Students in the seamless model group achieved an average critical thinking ability score of ( $M = 55.60$ ), surpassing the control group’s average score of ( $M = 53.84$ ). The results of the significance test indicated a notable difference between the two groups with a p-value of 0.05, highlighting the superior performance of students in classes using the seamless learning model based on the “among” system. These findings demonstrate the effectiveness of the seamless learning model in enhancing students’ critical thinking skills.

The implementation of seamless learning based on “among” is certainly challenging. Some obstacles that arise during the implementation of learning include lecturers mastering the “among” method, organizing seamless classes with the “among” system, and students adapting to this method. While seamless learning presents initial challenges, they are not insurmountable. The successful implementation of seamless learning based on “among” is evident, particularly towards the end of the learning process. Initially, an introduction to the learning approach and adaptation was conducted for both lecturers and students. As learning progressed, both parties grew accustomed to seamless learning with the “among” system, requiring only flexibility from lecturers in its implementation. By the end of the learning period, lecturers had developed their strategies for delivering this method effectively. Students showed increased enthusiasm and engagement in learning activities.

The development of students’ critical thinking skills at the start of their learning journey may not be immediately apparent as they navigate through new lecture materials and learning methods. As students progress to subsequent sessions, they become more accustomed to the process and can engage in learning activities more smoothly. Seamless learning allows students to explore without constraints, with all necessary information and resources readily available. The role of the mentor system is to oversee and guide the learning process. Throughout each stage of the learning process, students actively participate under the mentor’s guidance. During the interpretation phase, where students are required to identify and comprehend problems accurately, mentors offer advice and direction to help students focus and approach tasks diligently. Such guidance is crucial in fostering strong emotional connections and facilitating effective learning.

The final result of this learning has a positive impact. Seamless learning based on the “among” system can effectively enhance and refine students’ critical thinking skills. Through seamless learning, students have access to more optimal learning opportunities. The integration of the “among” system is highly supportive and

beneficial, aiding in the enhancement of students' critical thinking skills to be more acute and focused. This study demonstrates that educators can establish an online learning environment in both formal and informal settings seamlessly while still applying pedagogical skills to ensure that students perceive learning as a continuous process, regardless of whether it takes place online or face-to-face. It highlights that technology-enabled learning can also incorporate a humanistic approach, and with the “among” system in online learning, emotional closeness and effective interaction between lecturers and students can be achieved.

Similar research conducted by Mykytiuk, Moroz, and Dolgusheva indicated that their study demonstrated improved learning outcomes in the experimental group [18]. The group was instructed using a seamless model. Seamless learning fosters increased social interaction and collaborative learning among students [19]. Integrating cutting-edge technology is crucial in the 21st century to reach educational objectives, enabling educators and students to leverage emerging educational technologies [20]. One fundamental teaching principle is that the design of school structures and classrooms should strive to establish and nurture strong, positive relationships between teachers and students. These relationships should provide academic and socio-emotional support to promote the development of appropriate skills, emotional safety, resilience, and empowerment for students [21]. By employing the seamless learning model based on the “among” system as a technology that offers a comprehensive package in online learning, learning outcomes in critical thinking are attained. This is further enhanced by the guidance provided during the learning implementation, which cultivates stronger social relationships.

## 5 CONCLUSION

Based on the results of this study, it is evident that seamless learning based on the “among” system can enhance students' critical thinking skills. Students engaging in learning activities through seamless learning using the “among” system demonstrated better thinking skill development compared to those using online learning with synchronous and asynchronous methods. Online learning can still incorporate valuable social and humanistic aspects. However, the integration of seamless learning through the “among” system can further enhance humanistic and compassionate learning experiences. Seamless learning based on “among” offers a more significant and positive enhancement in critical thinking skills.

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