QRCBN 62-6861-0508-697
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Theoritical Review: Development of a Textbook Integrated with The ISC-STEAM Model Supported by STEMTrails Nuanced with Javanese Culture to Enhance Students' Critical Thinking Skills Oriented with Constructivist Learning Theory

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Abstract. This research aims to analyse a range of literatures studies related to the development of integrated textbooks of the ISC-STEAM model, which are assisted by STEMTrails and oriented towards the Javanese culture nuances, with a focus on the improvement of cirtical thinking skills through the lens of the constructivist learning theory. This research employs a literature study as its methodoligical approach. In order to reach a conclusion, researchers must search for data from books, journals or relevant research articles attached to the results section. This research uses descriptive qualitative data analysis techniques of literature study by describing the results of the sources that have been obtained either through books, journals or related research articles. The syntax of the ISC-STEAM learning model in the development of STEMTrails assisted textbooks with Javanese Culture nuances oriented to constructivism learning theory can be concluded that each learning process promotes students to find, investigate, constructivise, and integrate the knowledge gained so as to form better critical thinking skills by accommodating all aspects of students' abilities with various levels to participate in creating new solutions or theories. The addition of the STEAM approach, as well as the STEMTrails application with Javanese Culture nuances that have not previously been done or even integrated in a mathematics lesson, especially in the ISC learning model.

INTRODUCTION

The advancement of science and technology in the field of education necessitates the cultivation of diverse competencies in learners, including the ability to think in high level. The 21st-century learning system requires schools to transition from a teacher-centred learning paradigm to a student-centred learning paradigm, which is expected to develop the process of higher order thinking skills in learning in the era of disruption (Vong, 2017). This is in

accordance with the fundamental tenets of learning as set forth in Law Number 20 of 2003, which stipulates that students must assume a more active role in developing their potential in order to become valuable contributors to society.

One of the important high-level thinking skills is critical thinking. This is in line with the statement that teachers in the learning process must be able to strengthen students' critical thinking skills, for example, by using students' ability to explain a problem solving in their own language (Heong, 2016). Furthermore, the importance of critical thinking skills is also confirmed by Government Regulation No. 17 of 2010, which states that one of the goals of education in Indonesia is to build the development and potential of students who are knowledgeable, competent, critical, creative and innovative. This is also supported by the research of Jumaisyaroh, (2015) which

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states that critical thinking skills are very important as a basic thinking process so that students' potential and logic can be optimally developed in all aspects of learning.

The importance of critical thinking skills contradicts the facts on the ground, which show that students' critical thinking skills are still very low. TIMSS research results show that Indonesia ranks at the bottom, 35th out of 46 countries in TIMSS 2003, 36th out of 49 countries in TIMSS 2007, 38th out of 42 countries in TIMSS 2011, and 44th out of 49 countries in TIMSS 2015 (Hadi, 2019). This is also supported by preliminary research which suggests that a lack of training in students' thinking skills, as well as a lack of emphasis on the implementation of higher-order thinking skills, leads to low levels of critical thinking skills among students. Based on the observation research conducted at SMP Negeri 1 Jambu, one of the mathematics teachers in the class said that students still have difficulty in dealing with various critical thinking problems.

Therefore, based on the above facts, efforts are needed to develop critical thinking skills, one of which is the development of textbooks. This is certainly in line with the opinion that textbooks are one of the components that must be present in the learning process and at the same time facilitate the process of improving students' critical thinking skills (Nurhikmayati, 2019). One of the textbook developments that can be a solution for improving critical thinking skills is the ISC-STEAM model integrated textbook. This ISC-STEAM model integrated textbook is expected to be a means of an interesting teaching and learning process to improve students' critical thinking skills. This is supported by the opinion that ISC-STEAM model integrated learning is effective in improving students' critical thinking skills (Suryonegoro, 2024).

The inquiry learning model in textbook development is based on the experience of students' learning activities on concrete life objects. This is supported by the opinion that the inquiry model focuses the student learning process on the surrounding objects, so the student must already have a readiness of what is to be learned, which leads the student to prepare the material to avoid difficulties in the learning process (Kao, 2016). The shortcomings of this process can be overcome by applying appropriate learning elements, one of which is social complexity, which allows students to develop their affectivity by observing the behaviour of others, so the hope is to facilitate the equalisation of students' thinking abilities, one of which is critical thinking ability in the process of implementing learning with the inquiry model. This is in line with the statement that social complexity facilitates the process of sharing between individuals with collaborative activities, so that communication and cognitive skills, including students' critical thinking skills, can be optimally developed (Fischer, 2017). In addition, this is also supported by the opinion of Bergman & Beehner, (2015), which states that the implementation of a combined inquiry model and social complexity provides an opportunity to shape students' understanding and knowledge of something learned, so that students' critical thinking skills can be well developed.

The development of textbooks based on the ISC model is also aligned with the STEAM learning methodology. The integration of STEAM principles in the development of coursebooks is designed to enhance students' capacity for critical thinking in the context of mathematical problem-solving. This is corroborated by the assertion that the STEAM learning approach is designed to enhance students' critical thinking abilities in problem solving and encourage them to engage in argumentation during the process of mathematical problem-solving (MasgantiSit, 2022). This is also supported by the view that the STEAM learning approach is suitably integrated into the ISC learning model, as it enables children to engage in high-quality thinking, particularly critical thinking (Jamil, 2018).

The development of integrated textbooks for the ISC-STEAM model may prove a more engaging process if it incorporates ethnomathematics nuances related to Javanese culture. The incorporation of ethnomathematics into the creation of coursebooks is an effective method for enhancing students' critical thinking abilities. This is supported by the view that ethnomathematics can assist students in demonstrating mathematical processes and communicating mathematical ideas, thereby enhancing their critical thinking skills (Orey, 2018). Furthermore, the creation of textbooks is linked to the utilisation of mathtrails activities, facilitated by the STEMTrails application, with the objective of enhancing students' critical thinking abilities. This is in accordance with the assertion that mathtrails
activities facilitate students' navigation towards the fundamental issue in the process of solving mathematical problems with authentic reasoning, thereby enhancing their creativity, innovation, and critical thinking (Cahyono, 2018). The development of mathematics textbooks is also oriented towards learning theory in strengthening the foundation of improving students' critical thinking skills. One of the learning theories that has been integrated into the curriculum is constructivism. The implementation of constructivism learning theory in the development of ISC

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STEAM coursebooks will encourage students' ability to conduct group learning to solve a mathematical problem properly adjusted by associating new experiences, phenomena, and facts into their knowledge structure and bringing students to self-construct new knowledge related to other sciences. This is further reaffirmed by the statement that meaningful learning theory focuses on cognitive structures that encourage students to be more critical in changing the existing schema structure so that the knowledge gained does not only become a truth but puts more emphasis on the interpretation of knowledge as a working hypothesis (Schunk, 2012).

The background to this research project is such that it attempts to propose a theoretical study of the creation of STEMTrails-aided mathematical textbooks with a view to enhancing critical thinking capabilities through the ISC STEAM model with Javanese cultural nuances. It is hoped that this article will: (1) increase readers' knowledge and insight into the development of ISC-STEAM integrated mathematics textbooks on students' mathematical critical thinking skills; (2) serve as a reference source for the development of mathematics learning innovations in the classroom to improve students' critical thinking skills integrated with the ISC-STEAM model; and (3) provide a foundation for further research in analysing mathematical critical thinking skills through the ISC-STEAM model oriented to meaningful learning theory on Javanese culture with STEMTrails.

METHOD

The research method deployed in this study is that of a literature review. Researchers seek data from books, journals, or relevant research articles about textbooks, inquiry social complexity-STEAM learning models, STEMTrails, critical thinking skills, ethnomathematics, constructivism learning theory, and theories about developing integrated textbooks with inquiry social complexity-STEAM (ISC-STEAM) models assisted by STEMTrails with Javanese Culture nuances in improving critical thinking skills oriented towards constructivism learning theory, which are then attached to the results section so as to produce a conclusion. The data sources from the results of this literature review were obtained from previous research articles conducted in the past. Subsequently, the articles were subjected to a filtration process in order to identify those that were most pertinent to the subject matter under investigation. Moreover, the content analysis process was conducted in order to ensure the accuracy and reliability of the discussion results and conclusions. This research employs descriptive qualitative data analysis techniques typical of a literature study, whereby the results of the sources obtained, whether through books, journals or related research articles, are described.

RESULTS

Textbook

Textbooks are a set of materials that are systematically designed and planned with the objective of creating an optimal learning environment for students (Depdiknas, 2008). Textbooks facilitate the coherent and systematic learning of competencies in accordance with the desired learning outcomes. This is supported by the assertion that coursebooks facilitate coherent and systematic learning of competencies, with the objective that students will be able to master all competencies and learning objectives (Anggraeni & Dewi, 2021).

The textbook serves a number of functions, objectives and benefits in supporting the successful achievement of learning goals. Furthermore, it has been stated that textbooks serve as a guide for educators and learners throughout the learning process and as an instrument for evaluating the achievement of learning outcomes (Depdiknas, 2008). Moreover, it is explained that textbooks are prepared as a means of meeting the requirements of learning guidelines that are in accordance with the demands of the curriculum. This is achieved by considering student needs, providing students with alternative reference books in addition to the textbooks obtained, and facilitating the work of teachers in carrying out learning.

In addition to the crucial functions and objectives of textbooks, there are numerous advantages associated with their use. Consequently, educators must possess the capacity to create textbooks that align with the established objectives and scope of the material to be studied. This ensures that the learning process is not contingent upon textbooks that are occasionally challenging to comprehend. Moreover, the creation of effective coursebooks offers numerous advantages. Firstly, coursebooks are more comprehensive as they are developed by the teacher using a

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range of sources. Secondly, they contribute to the teacher's expertise and experience in writing coursebooks. Thirdly, well
designed coursebooks facilitate effective communication between teachers and students (Anggraeni & Dewi, 2021). The use of diverse textbooks can enhance the appeal of the learning process. This assertion is further reinforced by the observation that textbooks are fundamentally utilized to facilitate the learning process within the classroom setting (Febrianto & Puspitaningsih, 2020). Moreover, the utilisation of diverse textbooks prompts students to become more active participants in the learning process, thereby ensuring that the outcomes attained are optimally impactful.

ISC-STEAM Learning Model

The ISC-STEAM model is founded upon a synthesis of diverse learning theories, including social complexity theory, which serves as a foundation for the model's learning outcomes. The ISC-STEAM model is ontologically developed on the basis of an analysis of the pattern of learning interrelationships, with the objective of ensuring a match between expectations and reality in terms of learning achievement. The ISC-STEAM model was developed conceptually for the presentation of material oriented towards competency achievements, with the objective of fostering high-level thinking skills, including critical and creative thinking skills. The following section presents the conceptual framework of the ISC-STEAM model, which is based on a comprehensive literature review (Sudarwati, 2020).

Model of Inquiry	Discovery Learning	Interactive Demonstration	Inquiry Lesson	Inquiry Laboratory	Real-Word Application	Hypothetic al Inquiry
Level Of Student Skills	Rudimentary Skills	Basic Skills	Intermediate Skills	Integrated Skills	Culminating Skills	Advanced Skills
SINTAX	Observation Manipulation Generalization Verification Application					
Level of Kognitif	Low	Intellectual Sophistication				High
Teaching Activity	Teacher	Locus of Control				Student
Level of Social Complexity	Deep	Intermediate				Shadow

FIGURE 1. Literature study about level of inquiry, level cognitive, teaching activity, dan level of social complexity

Figure 1 illustrates that the social complexity element is weak at all levels of inquiry. As a result, it is imperative to integrate social complexity elements into the learning process through the utilisation of the inquiry model. This is corroborated by the statement that social elements are of significant importance in the empowerment of learning, thus enabling the optimal development of cognitive abilities and skills across a spectrum of student abilities (Trif, 2015). Consequently, students' capabilities are contingent upon their capacity to resolve issues and disseminate information amongst their peers. The teacher plays a pivotal role in guiding and facilitating opportunities for students to ascertain their comprehension of the subject matter. Such an approach may result in social development that is not aligned with cognitive abilities if not executed optimally, potentially leading to irregularities in the resolution of mathematical problems (Goldin, 2016).

It is imperative to foster the growth of social abilities that are not aligned with cognitive abilities and skills through the incorporation of elements inherent to a learning approach, one of which is STEAM. The STEAM approach offers distinct advantages in the learning process, as it fosters socialisation and discussion with the surrounding environment. This approach is designed to align and enhance cognitive abilities, facilitating the generation of novel ideas. This is in accordance with the assertion that effective communication between students when they exchange information during learning facilitates their cognitive processes, which in turn enables them to generate innovative solutions to mathematical problems (NCREL, 2003).

The syntax of the ISC model is generally an extension of the inquiry model, incorporating elements of

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social complexity and undergoing modification to become the ISC model. The implementation of the ISC model in an educational context is illustrated in the activity plan presented in Figure 2.

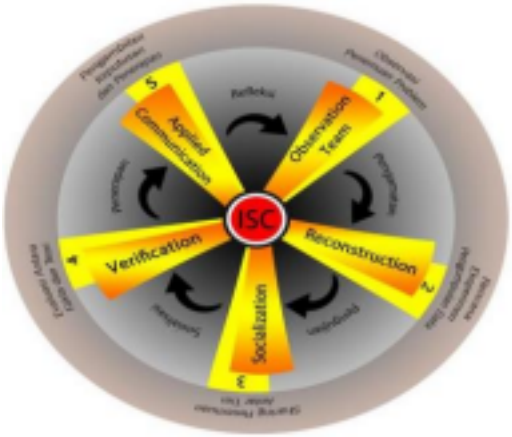

FIGURE 2. Learning Syntax of Inquiry-Social Complexity (ISC)

The design of the ISC model, which integrates the STEAM learning approach, modifies the ISC learning syntax by applying elements of science, technology, art, and mathematics. Based on the findings of the study into the syntax of the ISC model and the modification of the STEAM learning approach, the five syntaxes of ISC-STEAM learning are carried out in order and gradually throughout the learning process, as outlined in Table 1 below.

TABLE 1. Syntax Table of ISC-STEAM Model

Syntax Learning Activity Plan	
Observation Manipulation	with the objective of raising problems that will be researched and studied.
Generalisation	The students in each team are required to generate ideas and collate data from a range of sources, including journals and related literature, as well as conducting searches on digital platforms such as Google. This data is then analysed both qualitatively and quantitatively. The data is collected through the preparation of plans by students in groups using the agreed LMS (engineering integration).
Verification Application	In this activity, students are divided into small groups, where they engage in a discussion about the data they have obtained. One member of each group is designated as the primary discussant, while the remaining members contribute to the discussion by sharing the results of other groups. These results are then presented by the primary discussant to their groupmates, who in turn, engage in a discussion about the insights gained from the sharing process. It is essential that each student actively participates in this group discussion process.
The students engage in a team discussion process to observe phenomena that have been provided by the teacher in the form of videos or demonstrations of events related to aspects of science and art. This process is undertaken	

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The students in the team evaluate the veracity of the facts they have identified by establishing a connection with the theoretical basis that has been obtained from the preceding stage. (*The integration of scientific principles into the process of analysing knowledge and linking it; then the integration of engineering principles into the process of creating a media presentation of the discussion results*).

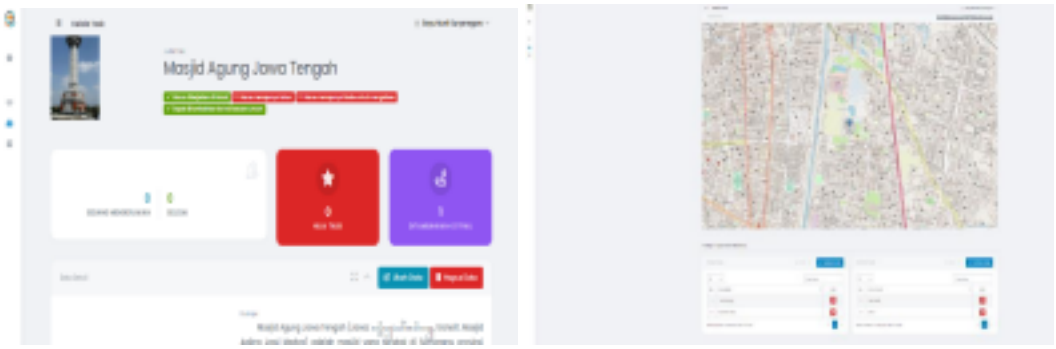
Students engage in group discussions and present their opinions orally and in writing. They do so by sharing the results of their group discussions with their classmates. The teacher then facilitates a discussion in which the students agree on the truth. This process is an effective learning tool that can be applied in everyday life.

Syntax Learning Activity Plan

STEMTrails

The Mathtrail activity-based learning technology was initially introduced with the objective of popularising mathematics. However, its benefits can now be employed to apply real-life mathematics in authentic situations that could potentially occur in the real world. This is in accordance with the statement that Mathtrail is an important tool for several reasons. Firstly, it introduces an element of enjoyment and challenge into the learning process, which can help to engage students more effectively. Secondly, it provides an alternative assessment method to the traditional written exam, offering a more flexible approach to evaluation. Finally, it can stimulate students who have previously struggled with mathematics by presenting the subject in a different light (Chen, 2013).

The STEMTrails application represents one of the mathtrail activity-based learning technologies implemented. The STEMTrails application represents a technology-based activity that offers a transformative approach to mathematics education, particularly in enhancing students' higher-order thinking abilities, including critical and creative thinking. This is in accordance with the assertion that learning mathematics through mathtrail learning technology enables students to solve mathematical problems in the real world, thereby enhancing creativity, innovation, and critical thinking (Barbosa, 2016). The activities facilitated by the STEMTrails application are highly conducive to supporting mathematics learning activities, as they enable students to engage with problems directly and observe the processes involved in their solution in a precise and detailed manner (Cahyono, 2023). The STEMTrails application provides users with the opportunity to apply their mathematical abilities to real-world scenarios. This is consistent with the statement that the process of implementing STEMTrails in learning commences with students receiving a mathematical problem, subsequently developing it through communication, connection, reasoning, and arriving at a solution (Cahyono et al., 2015). Figure 3 illustrates the functionality of the STEMTrails application.



(a) (b)

FIGURE 3. (a) The first page of the trail in the STEMTrails application; (b) the task assignment view of the problem in the STEMTrails application

Critical Thinking Skill

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The critical thinking skill is the capacity of an individual to engage in creative thinking, thereby facilitating a critical approach to problem-solving in mathematical contexts (Danaryanti, 2017). Additionally, critical thinking skill can be conceptualised as a multifaceted concept, encompassing cognitive abilities and self-assurance. This can also be shaped by the various pedagogical approaches employed by educators in conveying conceptual material to learners (Noor, 2019). The capacity to engage in critical thinking is conducive to the development of a range of competencies, including creativity, criticality, and the ability to make informed decisions in problem-solving contexts. (Aizikovitsh, 2015). The ability to think critically can be defined mathematically as an individual's capacity to comprehend a problem by analysing it and generating novel ideas that can be developed into a logical argument (Jumaisyaroh, 2015). It follows, then, that mathematical critical thinking ability can be defined as an ability that
involves both individual cognitive abilities and self-confidence, or affective abilities. This ability enables an individual to understand a mathematical problem intellectually, and it is influenced by the various ways in which a lesson may be conveyed, with a view to developing new ideas or ideas for each problem into a logical thought.

A number of studies have identified a range of indicators that can be used to assess the level of critical thinking skills demonstrated by students. In accordance with the stages of critical thinking as outlined by Perkins (2006: 301), there are a number of indicators that can be used to assess critical thinking skills. These include: (1) clarification; (2) assessment; (3) inference; (4) strategies. Zetriuslita's research (2016) also identifies indicators of critical thinking skills in mathematics as a high-level mathematical ability, which are measured using the following indicators: (1) The capacity to identify and justify concepts, that is, the ability to provide reasons for concept mastery; (2) The capacity to generalise, that is, the ability to complete supporting data or information; (3) The capacity to analyse algorithms, that is, the ability to evaluate or check an algorithm. Additionally, Facione (2008) identified several indicators of critical thinking skills, including interpretation, analysis, evaluation, inference, explanation, and self-regulation. Accordingly, the indicators of mathematical critical thinking ability can be expressed in terms of the aforementioned indicators of clarification, assessment, strategy, and inference/evaluation.

Ethnomathematics

D'Ambrosio states that the prefix 'ethno' denotes a broad concept that encompasses the socio-cultural context, including language, jargon, behavioural codes, myths and symbols. The root word 'mathema' is defined as 'to explain, to know, to understand, and to perform activities such as coding, measuring, classifying, inferring, and modelling'. The term "tics" ultimately derives from "techne," signifying a concept that is analogous to the term "technique." Ethnomathematics may also be understood as a global description of the intertwining of cultural practices and mathematical principles (Wahyuni, 2013). Furthermore, in the context of ethnomathematics, it is defined as the practice of mathematics among identified cultural groups, including tribal national communities, labour groups, children belonging to specific age groups, and professional classes. From a research perspective, ethnomathematics is also defined as the cultural anthropology of mathematics and mathematics education (Kuntarto, 2017).

It can thus be concluded that ethnomathematics is a highly expansive concept, encompassing the socio cultural context so that its application or culture incorporates elements of mathematics practised among identified cultural groups, including tribal, national communities, labour groups, children of certain age groups and professional classes. The use of ethnomathematics facilitates more memorable learning by simultaneously introducing local traditions and cultures that are still recognised and practised by certain community groups (Putri, 2017). Mathematics is developed in different cultures and subcultures in accordance with their own unique characteristics. It is perceived as a product of human intellect, manifested in the context of daily community activities. In conclusion, it can be stated that mathematics is a cultural product, the result of human abstraction and a tool for problem-solving.

Constructivism Learning Theory

Constructivism is a learning theory that provides opportunities for students to construct their own understanding and knowledge of a mathematical problem (Amineh, 2023). Constructivism provides the foundation

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for a learning model that guides students in developing their own ideas and acquiring knowledge independently (Barger, 2018).

The constructivist learning theory emphasises that knowledge is not regarded as an absolute truth, but rather as a working hypothesis that can be interpreted and revised (Schunk, 2012). In accordance with constructivist learning theory, students are encouraged to construct their own knowledge, describing how they can comprehend the material and apply their understanding practically (Janjai, 2012). This theory is therefore deemed suitable for use as the foundation for learning, including the inquiry social complexity-STEAM (ISC) model, which is enhanced by ethnomathematical learning technology applications and facilitates the development of higher-level thinking skills, including critical thinking.

The learning activities that are characteristic of constructivist learning theory are distinguished by active engagement, inquiry, problem-solving, and collaboration. This is in accordance with the learning process, designed to accommodate learning, which enables students to gain a broader insight into knowledge. Furthermore, the learning process in accordance with constructivist learning theory places emphasis on the elaboration of knowledge, thereby facilitating the formation of new knowledge perspectives. The implementation of diverse learning models, coupled with the advancement of learning innovations aligned with constructivist learning theory, can be regarded as a process
of behavioural change. This encompasses investigative activities facilitated by ethnomathematical learning technology applications, which accommodate the actual level of development observed in students' ability to solve problems. The potential level of development, however, is evidenced by the child's capacity to complete tasks through a collaborative process with their peers.

It is therefore possible that students' higher-level thinking skills may also be optimally well developed when various encouragements are provided for the decomposition of problems, planning of solution steps and other actions in accordance with the application of constructivist learning theory.

Development of a Textbook Integrated with ISC-STEAM Model Assisted by STEMTrails Nuanced with Javanese Culture to Improve Critical Thinking Ability Oriented with Constructivism Learning Theory

The ISC-STEAM learning model, which is supported by STEMTrails and incorporates Javanese cultural nuances, is aligned with constructivist learning theory and is integrated into coursebooks with the objective of enhancing students' mathematical critical thinking abilities. This is achieved by employing a range of indicators, including clarification, assessment, strategy and inference.

The clarification aspect in the development of coursebooks is related to the ability of students to identify a problem or the meaning of the truth of a fact or knowledge in relation to concept questions, descriptions, or forms of questions that express beliefs and decisions based on experience and evidence, as well as information and opinions. The assessment aspect is related to the identification and selection of elements in the Javanese Culture STEMTrails assisted activity that are necessary to form a reasoned conclusion or hypothesis at the verification stage. This is achieved by considering relevant information and reducing the consequences of data, questions, principles, evidence, judgements, beliefs, opinions, concepts, descriptions, questions or other forms of representation. Subsequently, the outcomes of this assessment are integrated into the comprehension of skills, articulation of meanings, statements derived from experiences, data pertaining to situations and events, as well as decisions, conversion to procedures or criteria for a problem and its resolution. This is based on the processes of generalisation and manipulation, and the analysis of the facts obtained to express opinions in the application process in everyday life.

The strategy aspect in the development of textbook materials is applied through the process of incorporating knowledge obtained based on evidence, concepts, methodology, specific criteria, and the capacity to present reasons in the form of compelling arguments. The next aspect is inference. This aspect is related to the awareness of a student to monitor their cognitive processes, the elements used in the thinking process and the results developed at the application stage. In particular, it concerns the improvement of critical thinking skills, enabling the application, analysis, evaluation and drawing of conclusions in the form of questions, confirmation, validation and correction. It can be seen, therefore, how this aspect of strategy and inference is closely related to the process of developing critical thinking skills, given that the former is concerned with the application of knowledge

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gained. Consequently, students must also possess the capacity to evaluate and express opinions regarding the credibility of questions or other presentations. This entails assessing or describing an individual's perceptions, experiences, situations, decisions, beliefs, and evaluating the strength and inferential relationships in the context of application activities involving other forms of knowledge, questions, descriptions, or representations.

It is therefore proposed that the use of the STEMTrails application in conjunction with the integration of Javanese cultural nuances into the development of coursebooks will lead to a notable enhancement in students' ability to analyse mathematical problems. Furthermore, it will facilitate the creation of more comprehensive student understanding, thereby enabling the integration of both elements in textbooks to effectively and efficiently improve students' critical thinking abilities. The development of textbooks can be employed for students in even the 8th grade, with the content of the textbooks including material on statistics. The integration of ISC-STEAM learning activities into the development of STEMTrails-assisted textbooks with Javanese cultural nuances, as outlined in Table 2.

TABLE 2. ISC-STEAM Syntax in the Development of STEMTrails-assisted Textbooks Nuanced with Javanese Culture

Syntax	**Learning Activity Plan in Textbook Development**
Observation Manipulation	The students engage in a collaborative discourse to observe the phenomena presented by the teacher at the beginning of the chapter. These phenomena may take the form of videos or demonstrations of events related to aspects of science and art, which are designed to raise questions that will be investigated and studied in depth, particularly in relation to the nuances of Javanese culture around the students.
Generalisation Verification Application	The students, in accordance with their respective teams, are required to create ideas and collect data from a variety of sources, including journals and related textbook materials, as well as through search activities on media such as Google and content on STEMTrails, among others (technology integration). This data is to be collected both qualitatively and quantitatively. The data is collected through the preparation of plans by students in groups using the agreed LMS (engineering integration). In this activity, students are divided into small groups, where they engage in a discussion about the data they have obtained and recorded. This discussion is conducted in order to identify the results of each group. Subsequently, one member of each group remains, while the others engage in a process of data sharing with other groups. This involves presenting the results of other groups and subsequently explaining them to their groupmates. Furthermore, at this stage, each student is expected to play an active role in the group discussion process. The students in each team test and analyse the facts they have found, connecting them with the theoretical basis obtained from the preceding stage. This is achieved by examining the teaching materials provided, which include textbooks and other learning resources. The students then present their findings in a creative and structured presentation media. (*The integration of scientific principles into the process of analysing knowledge and establishing connections; followed by the integration of engineering principles into the process of creating media presentations of discussion results*). Students engage in group discussions and express their opinions orally or in writing through the presentation of findings from their group discussions. The teacher then facilitates a discussion to reach a common understanding of the facts, which is an effective learning strategy that can be applied in everyday life.

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The constructivist learning theory is also aligned with the process of developing integrated textbooks of the ISC-STEAM model, which are assisted by STEMTrails and incorporate Javanese cultural nuances, with the objective of enhancing critical thinking skills. The ISC-STEAM model encourages students to engage in collaborative learning and communication, facilitating the exchange of ideas to effectively address mathematical problems properly from the observation of the problem to the application stage in finding the right solution to the problem. This process is modified by associating new experiences, phenomena, and facts with existing knowledge, thereby introducing students to new concepts and attempting to develop new solutions or theories related to other sciences through the integration of the STEAM approach, the use of the STEMTrails application, and the nuances of Javanese culture. The objective is to enhance students' cognitive and affective potential in a balanced and aligned manner.

Based on the explanation of the syntax of the ISC-STEAM model in the development of STEMTrails application-assisted textbooks with Javanese Culture nuances oriented to constructivism learning theory, it can be concluded that each syntax prioritises students to find, investigate, constructivise, and integrate the knowledge gained so as to form better critical thinking skills by accommodating all aspects of students' abilities with various levels to participate in every aspect and step of learning. This is supported by the opinion that each of the syntax of ISC-STEAM
learning by integrating STEMTrails applications with Javanese Culture nuances oriented to constructivism learning theory has an important role in empowering students' critical thinking skills, this is seen from the learning process that applies an effective and programmed teaching process (Klement & Dostal, 2016). Moreover, other scholars have posited that the integration of the STEAM learning approach is a crucial strategy for enhancing students' critical thinking abilities (Permata et al., 2023). Another opinion that lends support to this argument is that the application of STEMTrails in learning can improve students' critical thinking skills (Victory et al., 2023). The integration of Javanese cultural nuances into the learning process has also shown to be an effective and supportive method for enhancing students' critical thinking abilities (Novitasari et al., 2022). The constructivist learning theory is also highly supportive in the process of developing textbooks, as it encourages students to develop their abilities and knowledge through active involvement, investigation, problem solving, and collaboration (Suryonegoro, 2024). In light of the aforementioned studies, it can be concluded that the development of textbooks integrated with the ISC-STEAM model assisted by STEMTrails with Javanese Culture nuances, oriented to constructivism learning theory, has the potential to shape and empower the process of improving students' critical thinking skills.

CONCLUSION

The 21st-century learning system necessitates a shift in focus from teacher-centred learning to student centred learning in order to facilitate the optimal development of critical thinking skills. Nevertheless, the evidence base in the field of student critical thinking skills remains limited. One potential solution is the development of an integrated coursebook for the ISC-STEAM model, with the assistance of STEMTrails and Javanese cultural nuances, aligned with constructivist learning theory. Each component of the coursebook is designed to facilitate the implementation of learning activities in accordance with the ISC-STEAM model. Furthermore, the creation of integrated textbooks for the ISC-STEAM model, assisted by STEMTrails with Javanese Culture nuances oriented towards constructivism learning theory, is a highly beneficial approach to developing critical thinking skills. It can be concluded that the discussion of textbooks, the inquiry social complexity-STEAM learning model, STEMTrails, critical thinking skills, ethnomathematics, constructivism learning theory, and the theory of developing integrated textbooks for the inquiry social complexity-STEAM model (ISC-STEAM) assisted by STEMTrails with Javanese Culture nuances represents an effective approach to enhancing students' critical thinking abilities. Furthermore, in light of the crucial role that critical thinking plays in the learning process, additional research can be conducted on the creation of other innovations based on the ISC-STEAM model, with the support of STEMTrails and its Javanese cultural nuances, while maintaining a focus on fostering active and effective learning.

ACKNOWLEDGMENTS

We would like to express our gratitude to Prof. Dr. Dr. Wardono, M.Si., for his invaluable contributions in

the form of corrections, reviews, and comments, which were instrumental in the preparation of this article. Furthermore, we are grateful to Monica Luishanda Wuryastuti for her assistance and commitment throughout the article development process.

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