International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 7, 2025
https://theaspd.com/index.php

Development Of A Colaborative Guided Inquiry (Itc) Model To Improve Students' Critical Thinking In Biology Subjects At Man 3 Padang Panjang City

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Abstract
The Learning is a very complex thing influenced by several factors including teachers, students, facilities, media, and the environment. The achievement of learning cannot be separated from the learning model used. The general objective of this study is to develop a collaborative Guided Inquiry (ITC) learning model to improve students' critical thinking in Biology subjects at State Islamic Senior High School 3, Panjang City. Descriptive qualitative and quantitative data analysis were employed in this study. The design of this study is research and development, using a combination of 2 learning models consisting of a Guided Inquiry learning model and a Collaborative Learning Model developed through ADDIE steps that can be clearly separated into stages of Analysis, Design, Development, Implementation, Evaluation. The results of this study indicate that it is very effective to use the Development of a collaborative Guided Inquiry learning model to improve students' critical thinking. The significance value of 0.001 < 0.05, means that the use of the Collaborative Guided Inquiry Model (ITC) is very effective to improve students' critical thinking. Also from the calculated t table > t table: 18,514 > 2.093. Which shows the effectiveness and relevance of the use of ITC Model to improve students' critical thinking. MAN 3 Padang Panjang City.
Keywords: *Model development, collaborative guided inquiry, critical thinking)*

1. INTRODUCTION

Learning in the twenty-first century emphasizes student-centeredness and aims to equip students with critical and collaborative thinking abilities. Thus, it is believed that education would produce human resources with critical and cooperative thinking abilities. More information and skills are integrated into 21st-century learning. Mardhiyah (2021). Certain innovative learning methods are the means by which critical thinking skills can be enhanced, according to Zamroni and Mahfudz (2009:30) in (Utama, 2018). One of the advanced cognitive abilities required for 21st-century skill development is critical thinking. Critical thinking abilities are necessary for everyone to solve challenges in challenging circumstances. To make critical judgments, everyone must assess and examine their current circumstances. Rahardhian (2022). This highlights a number of flaws in the educational process that are linked to learning issues, such as the fact that students' learning is still primarily focused on the teacher (Teacher Center), that they are learning less independently, and that they still lack critical thinking abilities. According to Suyanto (2008), learning must be able to teach pupils, enhance their capacity for critical and logical thought, solve problems, research and process necessary information, and help them reach their full potential. Learning is a very complex thing influenced by several factors including teachers, students, facilities, media, and the environment. For learning to take place effectively, teachers have a very important role. Teachers not only function as sources of knowledge, but must also act as motivators and facilitators in developing students' interest in seeking knowledge independently (Surayya et al., 2014).

Learning is a complex process influenced by several factors, including teachers, students, facilities, media, and the environment. For effective learning, teachers play a crucial role. Teachers not only serve as sources of knowledge but also as motivators and facilitators in developing students' interest in seeking knowledge independently (Surayya et al., 2014).

Numerous issues with the teaching and learning process at madrasahs (Islamic schools) have been found based on the findings of the Biology Subject Teachers' Meeting (MGMP), which has an effect on the outcomes of student learning. A teacher evaluation of the teaching and learning process is required at State Islamic Senior High School 3 (MAN 3) in Padang Panjang City. This is influenced by several factors, including: a) Teachers have not effectively used a variety of methods and models appropriate to the development and learning styles of students. b) Students have not been able to investigate or discover knowledge independently to solve learning problems, thus hindering critical thinking. c) Learning remains teacher-centered, not yet student-centered. d) Students have not been effective in collaborative learning. This problem is proven by the learning outcomes of students at State Islamic Senior High School 3, Padang Panjang City.

For the 2022–2023 academic year, 15% of students received scores higher than the Learning Objective Achievement Criteria (KKTP) on virus material. Fifteen percent of students met KKTP. 70% of students had scores that fell short of the Learning Objective Achievement Criteria. For the same material, 15% of students in the 2023–2024 academic year received scores higher than the KKTP. Twenty percent of students received scores within the KKTP, while sixty-five percent received scores below it. A significant portion of pupils continue to fall short of KKTP, according to the findings of the past two years.

Based on the data presented, further research is necessary to identify appropriate solutions to the challenges faced at Madrasah Aliyah Negeri 3 Padang Panjang City, particularly in the teaching of Biology. One possible effort is to provide teachers with socialization and training on innovative learning methods and models. If no solution is implemented, the issues reflected in the data may negatively affect the quality of education at MAN 3 Padang Panjang City. Therefore, the author is motivated to conduct a study entitled "Development of a Collaborative Guided Inquiry Learning Model (ITC) to Enhance Students' Critical Thinking in Biology at MAN 3 Padang Panjang City."

2. LITERATURE REVIEW

In general, a model is defined as an object or concept that represents something real and is transformed into a more comprehensive form (Trianto, 2013). A learning model is a methodical process for planning educational activities to meet learning goals. It illustrates the learning process from beginning to end, presented in a distinctive way by the teacher in the classroom. Within a learning model are strategies designed to develop student competencies through specific approaches, methods, and techniques. Therefore, teachers are expected to master and apply a variety of learning strategies that incorporate these elements (Learning Strategy Teaching Material Module, 2012).

According to Trianto (2013:22), a learning model is a conceptual framework that describes methodical steps for structuring learning experiences to meet predetermined goals. It serves as a roadmap for educators and instructional designers as they plan teaching and learning activities. Efficient attainment of learning objectives is significantly impacted by the suitability of the selected learning model.

From these perspectives, the researcher concludes that a learning model functions as a specific design that reflects the entire learning process, adapts to classroom conditions, and helps identify and address emerging problems to achieve the intended learning outcomes.

Specifically, the inquiry learning approach comprises educational activities that prioritize critical and analytical thinking to find solutions to issues. Hamalik (2011, in Nurdyansyah & Fahyuni, 2016) describes guided inquiry as a student-centered approach in which groups of learners find solutions to questions through structured procedures and group collaboration, while the teacher facilitates by defining the problems for discussion. The inquiry approach itself can be categorized into three types based on the extent of teacher involvement: (1) guided inquiry, (2) free inquiry, and (3) modified free inquiry (Candrayani, 2016). In this study, the researcher employs the guided inquiry model, as it is considered the most suitable approach for addressing the identified problems.

3. METHOD

This study applies the Research and Development (R&D) approach, which involves creating a new product or refining an existing one to ensure its reliability and accountability (Rusinta et al., 2019). The development of the Collaborative Guided Inquiry (ITC) learning model follows the ADDIE framework,

which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. This framework is employed to address issues related to students' critical thinking in Biology at Madrasah Aliyah Negeri 3 Padang Panjang City. The need for a learning model that fosters independent exploration of knowledge is essential to generate innovative and competitive insights, as well as to enhance students' cognitive, affective, and psychomotor domains particularly their critical thinking skills.

4. RESULT AND DISCUSSION

The guided inquiry model promotes student autonomy in the learning process by involving them directly in experimental activities, with the teacher serving mainly as a guide and facilitator. This model is rooted in constructivist theory, emphasizing that students construct knowledge through guided exploration. Guided inquiry also highlights the importance of Science Process Skills (SPS), positioning students at the center of the learning process and involving them in intellectual activities such as experimentation, which strengthens their critical thinking abilities. According to Prasasti (2017), teachers in guided inquiry must provide direction and guidance so that students with slower thinking or lower academic ability can still participate meaningfully, while preventing high-achieving students from dominating activities. Thus, effective classroom management is essential (Eziyi, 2016).

Classroom management is also closely related to the learning model chosen. One such approach is collaborative learning, which is both a philosophy of interaction and a structured practice designed to foster cooperative efforts toward common goals. Collaboration requires mutual respect, recognition of each member's contributions, and shared responsibility for group outcomes. Unlike competition, which emphasizes individual achievement, collaborative learning promotes consensus and collective progress (Elysia, 2018). In this sense, collaborative learning can be defined as an approach that enables students to work together, support one another, and advance collectively—an essential philosophy in today's globalized world. When differences of opinion arise, decisions are reached through joint agreement (Husain, 2020).

The product developed in this study is the Collaborative Guided Inquiry (ITC) model, which integrates the principles of guided inquiry and collaborative learning. Its development follows the ADDIE framework providing clear and systematic stages for model creation. This combined model serves as a solution to the challenges faced at State Islamic Senior High School (MAN) 3 Padang Panjang City.

Developing the Collaborative Guided Inquiry (ITC) model requires a structured design to ensure its theoretical and practical foundation. The ADDIE framework functions as a design structure rather than a learning model itself, offering general stages for instructional development (Dick & Carey, 1996, in Rusdi, 2019). The process of developing the ITC model through the ADDIE framework is presented in the following table.

Table 1. The development of the Collaborative Guided Inquiry Model (ITC) through the ADDIE

Development Stage	Activities
Analysis	This stage involves pre-planning by considering new products (models, media, or teaching materials) to be developed. It includes identifying products that suit target students and learning objectives, determining relevant content, analyzing the learning environment, and selecting appropriate delivery strategies. The analysis phase defines what students need to learn through needs assessments, problem identification, and task analysis. The outcome is a profile of prospective learners, identification of learning gaps, and detailed task specifications.
Design	At this stage, the concept of the new product is created and documented in detail. Each learning unit is carefully designed, including clear implementation guidelines. Tests are developed based on learning objectives, and appropriate media and instructional strategies are selected. Supporting resources and relevant learning materials are also considered. The results are compiled into a comprehensive blueprint.

Development	This stage focuses on producing the tools and materials required to build the model. Teaching materials and supporting instruments are created in line with the structure of the intended model. Additionally, instruments are designed to measure the performance and effectiveness of the product.
Implementation	The developed product is applied in real learning settings. This stage involves reviewing the goals of the development, observing student interactions, and collecting initial feedback to refine the learning and evaluation process.
Evaluation	In this final stage, the impact of the learning product is critically assessed. It measures the extent to which development goals have been achieved, evaluates student outcomes, and identifies factors that contribute to effective learning performance.

Based on the explanation above, an essential aspect in developing the Collaborative Guided Inquiry (ITC) model is its **components**. The model for Biology learning consists of five main elements: (1) syntax, (2) social system, (3) reaction principle, (4) support system, and (5) instructional impact (Joyce & Wei, 2003 in Suharti, 2019).

The instructional impact of the ITC model lies in enabling students to investigate and build knowledge related to the material, while engaging collaboratively in problem-solving tasks assigned by the teacher, thereby enhancing critical thinking in Biology. The accompanying impacts include: (1) the ability to investigate subject-related knowledge, (2) collaborative problem-solving, and (3) the promotion of student-centered learning that enhances critical thinking.

Critical thinking itself involves a series of stages such as analyzing, synthesizing, problem identification and solving, drawing conclusions, and evaluation, all of which aim to develop deeper understanding. Indicators of critical thinking are reflected in specific behaviors outlined in its definitions. Several studies indicate that activities such as questioning, reasoning, and evaluation demonstrate critical thinking, while a Mann-Whitney analysis showed no significant gender differences in critical thinking skills (Noni, 2018). According to Wasahua (2021), critical thinking is the reflective process of understanding a problem thoroughly, maintaining openness to diverse perspectives, avoiding blind acceptance of information, and engaging in evaluative reasoning. Developing these skills requires a classroom climate that fosters inquiry, dialogue, and deliberation. Critical thinking guides rational decision-making by involving conceptualization, application, analysis, synthesis, and evaluation of information derived from observation, experience, reflection, or communication. Similarly, Samsudin (2017) defines it as a mental process involving deduction, induction, classification, and reasoning.

Critical thinking is categorized under Higher Order Thinking Skills (HOTS), which correspond to the upper levels of Bloom's taxonomy. Specifically, it refers to the ability to analyze arguments, generate insights, construct logical reasoning, recognize underlying assumptions, and present ideas in a structured and convincing manner. Paul and Elder (2007 in M et al., 2012) outline five characteristics of critical thinkers: (1) formulating questions and problems clearly, (2) gathering and effectively using relevant information, (3) drawing well-reasoned conclusions and solutions based on criteria and standards, (4) maintaining an open mindset, and (5) communicating effectively to resolve problems. Indicators of critical thinking are further organized into five categories, as shown in Table 2.

Table 2. Critical Thinking Indicators

No	Aspects	Indicator
1	Providing a simple explanation	a. Focusing on the question b. Analyzing the question c. Asking questions about the explanation
2	Building basic skills	a. Evaluating the credibility of a source b. Observing and considering induction
3	Dedicate	a. Drawing and evaluating conclusions through deduction b. Applying and assessing induction c. Formulating and evaluating judgments

4	Provide further explanation	a. Defining requirements and criteria across three dimensions b. Identifying underlying assumptions
5	Establish strategy and tactics	a. Taking decisive actions b. Engaging in interaction with others

Source: (Samsudin, 2017) .

The relationship between these variables is outlined in a conceptual framework as follows:

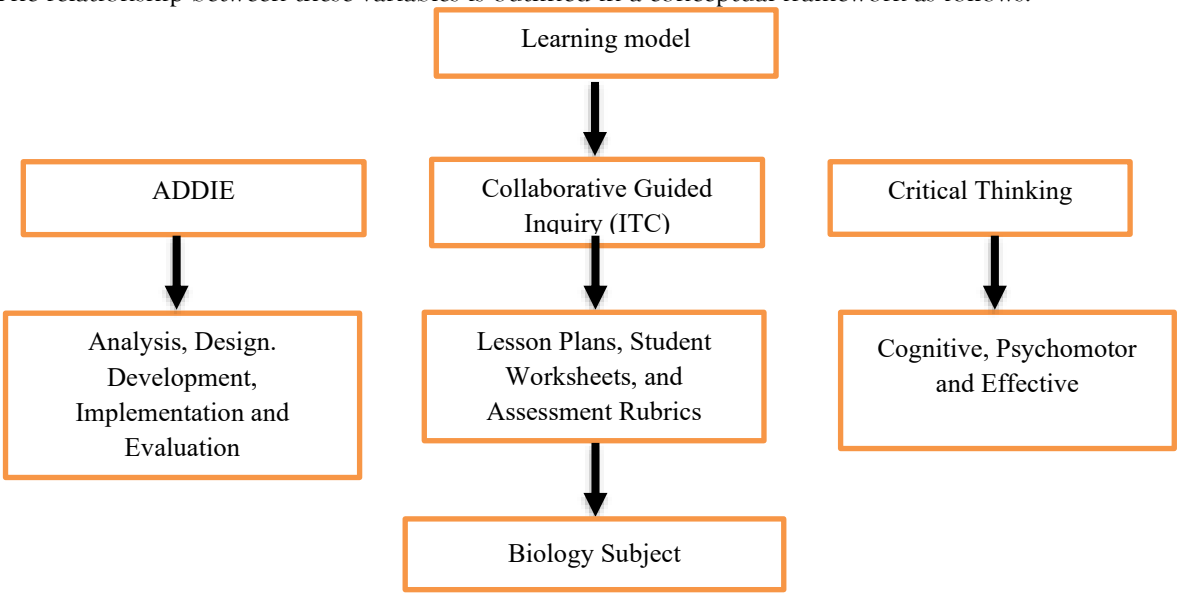

Figure 1. Conceptual framework

Based on the Conceptual Framework above, it can be concluded that the development of the ITC model consists of three components, including the Planning, Implementation and Evaluation stages so that researchers can see whether there is an influence on the Development of ITC Model to Improve Students' Critical Thinking in Biology Subjects at State Islamic Senior High School 3, Padang Panjang City.

The process of developing a Collaborative Guided Inquiry (ITC) learning model requires good planning so that significant results will be obtained. To maximize the process of developing a Collaborative Guided Inquiry (ITC) learning model, a needs analysis is needed for educators and students. At this stage, what teachers must do is carry out an analysis of teaching, student characteristics, and a needs analysis is carried out with the aim that the learning model to be developed can answer the needs required in the Biology learning process (Aji, 2016). This is important to do so that the needs of this learning model are in accordance with the needs of students.

The hypothesis of this study is formulated to examine the effect of developing the Collaborative Guided Inquiry (ITC) model. To test this hypothesis, a t-test was conducted using SPSS. The hypotheses are as follows:

- **H0**: The Collaborative Guided Inquiry (ITC) model is not effective in improving students' critical thinking in Biology at MAN 3 Padang Panjang City.
- **H1**: The Collaborative Guided Inquiry (ITC) model is effective in improving students' critical thinking in Biology at MAN 3 Padang Panjang City.

The decision criteria are: if the significance value is less than the level of significance ($\alpha = 0.05$), then H0 is rejected and H1 is accepted (Kriselli Nopitri Hargaini, 2019).

Table 3. Tests of Normality

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Kelompok	Statistic	Df	Sig.	Statistic	df	Sig.

Hasil	Pretest	.210	20	.021	.884	20	.021
	Postest	.177	20	.099	.893	20	.030

a. Lilliefors Significance Correction

From the statistical results table above, the data is normally distributed, because the significance of 0.21 is greater than 0.05.

Table 4. Paired Samples Statistics

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre test	70.25	20	10.062	2.250
	Pos test	90.50	20	4.261	.953

Table 5. Paired Samples Correlations

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre-test & Pos test	20	.703	.001

If we examine the value above, the significance is 0.001 < 0.05, indicating a relationship between the pretest and posttest variables.

Table 6. Paired Samples Test

Paired Samples Test

		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest - Postest	-22.750	5.495	1.229	-25.322	-20.178	-18.514	19	.000

Based on the data above, h0 is rejected and hA is accepted. Because the significance is 0.00 < 0.05, it can be concluded that there is effectiveness in using ITC to improve critical thinking of students at MAN 3 Padang Panjang City. From the table above, t count > from t table: 18,514 > 2.093. Based on the data above, h0 is rejected and hA is accepted, it can be concluded that there is effectiveness in using ITC to improve critical thinking of students at MAN 3 Padang Panjang City.

5. CONCLUSION

Based on the above explanation, the development of ITC model designed by ADDIE is the foundation for developing a new, systematic, effective, and practical product to enhance students' critical thinking in Biology at State Islamic Senior High School 3, Padang Panjang City.

The researcher hopes that the development of this Collaborative Guided Inquiry (ITC) model will provide students with a stimulus in the form of a presentation of their findings, thereby enhancing critical thinking in learning. Contextual problems must be solved by exploring students' knowledge and experiences. The process of developing this model provides an opportunity for students to discover knowledge through collaborative investigations related to the learning material, enabling them to learn independently or in student-centered learning, with the instructor serving as a facilitator and guide. The development of this model has a significant impact on improving students' critical thinking, resulting in expected learning outcomes.

The instructional impact of ITC model is that students are able to find knowledge or investigate knowledge related to the material to be studied, are able to collaborate in solving problems given by teachers which are useful for improving students' critical thinking in Biology subjects. The accompanying impact of ITC model is: 1) Able to investigate knowledge related to learning materials. 2) Able to learn collaboratively to solve learning solutions. 3) Student-centered learning to improve students' critical thinking.

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