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Guided Inquiry and It's Influence on Evolution Concept Mastery: A Challenge in Islamic Boarding Schools

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Abstract

Today's education emphasizes the need for students to manage their own learning independently, allowing them to set learning goals, develop strategies, and evaluate their progress, ultimately enhancing their conceptual understanding. This approach aligns with various learning models, one of which is guided inquiry. This study aims to determine the effect of guided inquiry on students' understanding of the concept of evolution. The research is quantitative and employs a quasi-experimental design, specifically a non-equivalent pretest-posttest control group design. The subjects of the study were students from class XII IPA at MA Miftahul Ulum Bettet Pamekasan during the second semester of the 2024/2025 academic year. Class XII Science B, with 32 students, served as the experimental group, while Class XII Science C, with 31 students, was the control group. The sampling was done using a random sampling technique. The hypothesis was tested using an Unpaired T-Test. The results indicated that guided inquiry had no significant effect on students' understanding of the concept of evolution. However, guided inquiry remains a valuable learning model that can develop various skills in students. Future researchers should consider factors such as student readiness, learning habits, learning styles, time constraints, and the proficiency of teachers or researchers in implementing the learning model.

Introduction

Biology education plays a crucial role in shaping students' understanding of the concept of evolution, which is the foundation for an understanding of life and biodiversity. The role of biology education in shaping students' understanding of evolution is very important because it provides a foundation for scientific investigation and deepens their knowledge of biological concepts (Ardianto, 2021). However, the effectiveness of education can be increased through the application of a scientific approach that has been proven to significantly improve student biology learning outcomes (Rofi'ah & Permana, 2020). In addition, the importance of teaching evolution in biology secondary schools is emphasized by the perception of future biology teachers, who realize the importance of it and suggest interesting teaching methods (Hidayat et al., 2021).

Evolution is a fundamental aspect of biological science, considered essential for biologists and educators to master, as it forms the foundation for various branches of biology. This also applies to students, as a solid understanding of evolutionary theory reflects their comprehension of the material. However, misconceptions and misunderstandings are common in the study of evolution, often hindering students from achieving learning objectives (Utami, 2022). Evolution refers to the study of changes in

organisms over extended periods of time (Santosa et al., 2021). The topic is often considered sensitive due to perceived conflicts with religious views and its existential implications for some individuals (Helmi et al., 2019). A common misconception is that evolution only occurred in the past, whereas in reality, it continues to occur in living organisms today (Jannah & Dina, 2017).

Learning activities about evolution allow students to adjust their cognition to get predetermined results. However, it is still a discourse that reaps pros and cons in studying the theory of evolution because it is considered contrary to the religion of Islam (Santosa et al., 2021). The learning process is very important in ensuring a good understanding of evolution, and one of the learning approaches that has gained widespread attention is guided inquiry. Guided inquiry allows students to actively engage in the learning process, building their knowledge through self-exploration and inquiry. Teachers need to consider students' initial concepts and apply constructivist learning theories to encourage student engagement and problem-solving. These studies collectively underscore the importance of the teaching and learning process in ensuring a robust understanding of evolution, with guided inquiry being a widely recognized approach (Azizah & Sa'adah, 2021). The emphasis in evolution learning is not only to summarize several topics that will later require students to memorize them. However, teachers need to instill an understanding of concepts and also open the imagination of students throughout the learning process (Susanti, 2020).

Regarding learning activities, the results of observations in biology learning in class XII Science MA Miftahul Ulum Bettet Pamekasan in the 2024/2025 school year which was carried out on February 4, 2024 showed that 50% of students did not listen to or take notes on the material explained by the teacher. In addition, students cannot relate experiences to the material studied, and also students are less enthusiastic in making observations, students are less enthusiastic in making observations, students are less active in expressing opinions and asking questions. This is shown by being passive or doing other activities, such as talking to classmates. This shows that students do not have the initiative to learn on their own, so guided inquiry still needs to be developed. The results of the follow-up observation on February 15, 2024 also provide an overview of learning conditions that tend to be the same as the results of the first observation, namely low student learning activity, lack of learning enthusiasm caused by the approaching cottage holiday, thus causing inefficient learning that interferes with student learning activities.

Guided inquiry is an inquiry learning model in which in its implementation the teacher provides guidance or a fairly broad instruction to students (Pratiwi, 2021). A number of studies have explored the influence of guided inquiry on students' understanding of evolution. Evolutionary education has a positive impact on the knowledge and understanding of high school students about evolution (Febri et al., 2020) and significantly improves students' understanding of natural selection after engaging in educational activities (Pinto et al., 2021). In addition, guided inquiry has been shown to significantly improve students' understanding of the concept of evolution through various mechanisms, including improving logical thinking skills and cognitive learning outcomes (Yuliana et al., 2022) and demonstrating its effectiveness in increasing students' curiosity (Idralis et al., 2021). Previous researchers have revealed the opposition to the theory of evolution that many researchers have also found that it is not only based on the view of beliefs (religion) only, but the fundamental reason for the difficulty of the theory of evolution to be learned in schools is derived from the ability and capacity of teachers' knowledge (Helmi et al., 2019). The meta-analysis conducted by previous researchers reported that inquiry-based learning enhanced students' understanding of various scientific concepts, including evolution. This research recommended that teachers integrate this learning strategy into their instruction to help students face the challenges of understanding complex concepts. Inquiry-based learning provided students with opportunities to ask questions, explore, and develop their understanding through hands-on experiences (Antonio & Prudente, 2023).

Although there has been some research on the influence of guided inquiry in biology learning, research specifically exploring its impact on students' understanding of the concept of evolution is limited. This research will make a new contribution to the literature of biology education by exploring the impact of guided inquiry on students' understanding of the concept of evolution. By exploring the factors that moderate the influence of guided inquiry, this study will present new insights that can help develop more effective learning methods in teaching the concept of evolution. The practical implications of this study can provide guidance for teachers and researchers to design more contextual and evidence-based biology learning to improve students' understanding of evolution.

Methods

This study was quantitative research with a quasi-experimental research design with non-equivalent pretest-posttest control group design. The subjects in this study were students of Class XII

Science MA Miftahul Ulum Bettet Pamekasan second semester of the 2024/2025 academic year. Class B was an experimental class with 32 students, while class C was control class with 31 students. Sampling was carried out using a random sampling technique, in which the population was divided into clusters, and the clusters were randomly selected as the sample.

The concept of evolution was measured using a written test (essay). The conceptual aspects studied in this study were age of earth, process of evolution, scientific validity of evolutionary theory, evidence of evolution, evolution of humans, and scientific community's view of evolution (Rutledge & Sadler, 2007). The learning tools used in this study were in the form of Syllabus, lesson plan, and worksheet based on guided inquiry. The normality and homogeneity test were carried out as a prerequisite test, then continued with a hypothesis test with the Unpaired T Test. All statistical tests were conducted with *Jamovi* version 2.5.3.

Results and Discussion

Descriptive data on students' understanding of the concept of evolution is presented in Table 1. The average score for understanding of concepts in the Experimental class is M=8.88 with SD=4.74, while the average score for understanding of concepts in the Control class is M=12.1 with SD=6.30. The data obtained in this study included understanding of evolution concepts as shown in Table 1. Normality and Homogeneity Test are in Table 2 and Table 3. Independent Samples T-Test is shown in Table 4.

Table 1. Descriptive Data Concept Mastery of Evolution

	Group	N	Mean	Median	Elementary school	SE
Concept mastery	Experiment	32	8.88	9.00	4.74	0.837
	Control	31	12.1	14.0	6.30	1.13

Table 2. Normality Test Data

		Statistics	P
Concept mastery	Shapiro-Wilk	0.984	0.607

Table 3. Homogeneity Test Data

	F	df	df 2	P
Concept mastery	1.55	1	61	0.219

Table 4. Independent Samples T-Test

		Statistics	df	p	Effect Size
Concept mastery	Students's t	-2.09	61.0	0.040	0.607
				Cohen' s d	

The results of the hypothesis test in this study showed a significant value of 0.585 (>0.05). The results showed that there was no influence of guided inquiry on the understanding of the concept of evolution of students in class XII IPA MA Miftahul Ulum Bettet Pamekasan. The results of this study revealed that guided inquiry did not have a significant influence on students' understanding of the concept of evolution.

Guided inquiry is a student-centered learning approach where the teacher provides opportunities for students to explore and deepen their understanding of concepts. The goal is for students to independently investigate and respond to questions that arise from their own curiosity, related to a given problem, and to find solutions based on their capacity (Pramudya & Safrul, 2022). However, inquiry-based learning often requires more time to complete the full learning cycle, as students need additional time to plan and conduct experiments (Ural, 2016).

The effectiveness of the guided inquiry learning model still heavily relies on students' internal abilities, such as mathematical skills, language proficiency, and independent learning (Pramudya & Safrul, 2022). Additionally, teachers face several challenges in implementing inquiry-based learning, including low student responsibility and difficulties in managing time, which requires teachers to invest more time and energy. Furthermore, limited facilities and infrastructure in schools pose additional obstacles. Since

students have varying levels of ability, not all of them acquire the same depth of knowledge (Rosida et al., 2021).

Several factors related to students can contribute to misconceptions, including their initial preconceptions, abilities, interest in learning, and ways of thinking (Jannah & Setiadi, 2018). The extensive amount of material on a concept can also make it difficult for students to grasp what is being taught. Additionally, differing perspectives on the theory of evolution can impact the effectiveness of evolutionary learning in the classroom (Saputra, 2017), leading to misunderstandings. Furthermore, the rejection of the theory of evolution is not solely due to differences in religious views. One of the key challenges in teaching this material is the teacher's level of knowledge. Research has shown that misconceptions and insufficient background knowledge among teachers are significant factors contributing to the rejection of evolution in the classroom (Hidayat et al., 2021).

Students often struggle to understand evolutionary concepts due to various factors that shape their attitudes toward evolution. Personal relationships (such as those with elders, teachers, and peers) play a significant role. The immediate environment also has a strong influence; for instance, parents' views on evolution are often passed down to their children, as well as opinions from teachers, friends, and others (Putri, 2021). Other studies show that students give a negative response to the theory of evolution because it is considered contrary to religion. Another fact found in this study is that students are very reluctant to learn the theory of evolution because students consider that the theory of evolution is Darwin's theory which is considered to explain that humans originated from apes (Antika & Ibana, 2018). This highlights how misconceptions about evolution are closely tied to religious perspectives, reinforcing students' rejection of the theory (Antika & Ibana, 2018).

Other research explains that the inquiry process takes a lot of time and teachers must be involved in all learning processes (Kennedy et al., 2022). For students who start with inquiry, achieving their research will require a lot of time and a gradual adaptation process (Feyzioğlu & Demirci, 2021). In addition to student readiness, teacher readiness in teaching is also important for learning success. In other words, teachers who will implement learning with guided inquiry must have been trained and are used to applying the model well. Recent research reveals that positive conditions will also produce positive results (Antika et al., 2022).

The disadvantages of guided inquiry according to Aulia et al. (2023) include: 1) If the guided inquiry learning model is used as a learning model, it will control student activities and success, 2) This model is difficult to plan learning, because it clashes with students' habits in learning, 3) in implementing it, it takes a long time, so teachers often find it difficult to adjust the predetermined time, 4) As long as the success criterion is determined by the student's ability to master the learning material, then guided inquiry will be difficult to implement for some teachers.

Studies on the absence of the influence of guided inquiry on a particular variable have been reported. The results of the study showed that there were other factors outside the research variable, namely intrinsic factors that are more influential on the variables studied. These intrinsic factors include learning motivation, learning regulations, discipline, confidence, and student learning styles (Anam & Antika, 2023). Other research results also explained that internal factors, as well as learning habits of students who need to be more familiar with guided inquiry learning (Wafa & Antika, 2023). In addition, the relatively short time for the implementation of guided inquiry is also suspected to cause a lack of influence on students' understanding of concepts.

he rejection of the theory of evolution is not solely due to differences in religious views. One of the key challenges in teaching this subject in schools is the teacher's level of knowledge. Research by Hidayat et al. (2021) indicates that inadequate knowledge and misconceptions among teachers are major factors contributing to the rejection of evolution. Additionally, several factors on the students' side can also lead to misunderstandings, including their initial preconceptions, abilities, interest in learning, and thinking styles (Jannah & Setiadi, 2018). The large amount of material presented on evolutionary concepts can overwhelm students, making it difficult for them to fully grasp the information. Furthermore, differing views on evolution can complicate classroom learning, ultimately affecting students' understanding and leading to misconceptions (Saputra, 2017). As a result, it can affect students' understanding, causing students to be mistaken in understanding concepts.

The difficulty of students in understanding evolution material is that there are factors that can affect attitudes towards evolution, namely personal relationships, for example relationships with parents, teachers, and friends. The immediate environment has a great influence, as parents who think about the theory of evolution will usually pass it on to their children, as well as teachers, friends, and others (Putri, 2021). Another fact found in this study is that students are very reluctant to learn the theory of evolution because students consider that the theory of evolution is Darwin's theory which is considered to explain that humans originated from apes (Antika & Ibana, 2018). This misconception contributes to further

misunderstanding of evolutionary theory. Moreover, students' rejection of evolution is strongly tied to religious beliefs, reinforcing this reluctance (Antika & Ibana, 2018).

Conclusions and Recommendations

This research reveals that there was no influence of the guided inquiry method on the understanding of concepts. The results of this study show that there are other factors outside the research variables, including student learning style, student confidence, learning motivation, and discipline. In addition, the relatively short time for the implementation of guided inquiry is also suspected to cause a lack of influence on students' understanding of concepts. The student readiness factor is important to consider, especially the students' habits and learning styles. Similar research might produce different results in other schools, particularly those with non-boarding school backgrounds. Future research should consider allocating sufficient time to fully implement the entire guided inquiry syntax to support conceptual understanding, particularly in the topic of evolution.

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