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The effectiveness of the Connect, Investigation, Analysis and Conclusion (CIAC) learning model in Promoting students' Understanding on the Roles of Empirical Evidence in Science

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Abstract. An important goal of science education is for students to understand the nature of science. Science education has raised the question of what science is, how scientific knowledge is developed and how people participate in this process under the conceptual umbrella of 'nature of science' (NOS). This study aims to look at the effectiveness of the Connect, Investigation, Analyze and Conclution (CIAC) learning model on the Nature of Science (NOS) abilities of elementary school students on empirical characteristics. The research method used was a pre-experimental design with a One Group Pretest-Posttest Design with 38 elementary school students in Bandung Regency as the subject of research. Data collection methods used are questionnaires. Meanwhile, to analyze the data using the normality test, homogeneity test, t test and gain test. The results showed that the average NOS pretest score of students on empirical properties was 2,56 and the average posttest NOS score of students on empirical properties was 2,86 this resulted in a gain value of 0,21. Based on the above results, the CIAC learning model can improve students' NOS abilities in the empirical aspect in elementary schools, especially girls if seen from the increase. In addition, students' interest in science is an important point in the acquisition of students' NOS abilities. This study sheds light on the potential of the CIAC learning model in improving the NOS ability of primary school students, especially in the empirical aspect.

Keywords: Elementary, Empiric, Nature of Science

1. Introduction

One of the efforts made to improve science education can be done by increasing understanding of NOS (Abd-El-Khalick, 2012). Nature of Science (NOS) is a part of science that must be taught by teachers but is often neglected or gets little attention. NOS can provide students with important background on how science and scientists work and how scientific knowledge is created, validated, and influenced (McComas & Nouri, 2016). The nature of scientific knowledge is often phrased as "nature of science" and one's perceptions of how scientific knowledge is developed are specifically related to scientific inquiry (Lederman et al., 2013; Lederman & Lederman, 2019). A high NOS understanding is considered something very important and valuable because it is believed to be able to assist someone in making informed decisions and being responsible for taking action so that in the future, they can solve complex problems in the future (Kahana & Tal, 2014).

As an epistemological knowledge of science, NOS has characteristics or aspects. According to McComas & Nouri (2016) those aspects are 1) Scientific knowledge is not entirely objective; 2) Scientists use creativity; 3) Scientific knowledge is tentative but durable; 4) Scientific knowledge is socially and culturally embedded; 5) Laws and theories are distinct kinds of knowledge; 6) Scientific knowledge is empirically based; 7) There is no universal stepwise scientific method; 8) There is a distinction between observations and inferences; 9) Science cannot answer all questions (and is therefore limited in its scope); 10) Cooperation and collaboration are parts of the development of scientific knowledge; 11) There is a distinction between science and technology; 12) Experiments have a role in science.

The results of the pre-study showed that from the results of initial observations of the NOS ability of elementary school students, it was found that the lowest NOS scores were on the Knowledge indicator, especially on Empirical characteristics. Simply put, empirical means that scientific knowledge is based on data or evidence obtained from observation with the five senses or experiments (Jumanto et al., 2018). Scientific knowledge is based on logical and conceptual connections between evidence and explanations. This means that science is based on and originates from observations of the world around us from which interpretations are made. Scientists depend on empirical evidence to generate scientific knowledge (Kelly, 2014). Any scientific explanation must be consistent with empirical evidence, and new evidence brings revisions to scientific knowledge.

Learning about science means learning about facts. Science is "proven". Failure to recognize that reference to observations of the natural world is a major criterion that sets science apart from other disciplines of inquiry. However, scientists always interpret their observations to draw inferences and construct explanations, which are infused with assumptions and based on theoretical (Abd-El-Khalick & Akerson, 2004). Scientific knowledge that is built cannot be separated from life experiences. Experience regarding science can be obtained when field trips to zoos or conducting experiments in laboratories. Based on Kelly (2014) explains there are at least four ways one can build an understanding of science namely 1) Reading about science; 2) Direct instruction; 3) Process science teaching; 4) Project based learning. From the explanation above, the effort that we can do to develop NOS is to provide good science experiences when in class. One of the learning models that can be used is the Connect, Investigation, Analyze and Communication (CIAC) learning model. The absence of the nature of science in science learning is an urgent problem. Especially considering that it is a policy to include it in the curriculum, what aspects are studied in the nature of science, the comparison of the nature of science between one scientific discipline and another, and the model of science education. Some of these cases are challenges before bringing the essence of science into the classroom. Through this research, an explanation of the nature of science to teachers and students is revealed. Because that is a meaningful topic before examining more deeply in the lesson.

Empirical evidence is central to science and plays an important role in their process of inquiry (Hansson et al., 2021). According to Barwise (1995) science is an interaction between data and theory. The theory that develops is taught according to what has been written in schoolbooks while the data needed for the development of student knowledge is obtained from the empirical results of students. The importance of empirical evidence is very influential in building one's knowledge. In the learning process, students are often presented with clear or limited information. This can provide an understanding of the picture being studied. However, with the empirical results of something learned, it will bring up complete information that will produce a more accurate representation which is also easier to obtain (Kirschner et al., 2006).

1.1. Problem Statement

Based on the explanation above, students' NoS ability in the empirical aspect is very important in the process of building knowledge through direct observation of phenomena and trying to explain these phenomena based on the theory that has been learned. This makes researchers want to know the effectiveness of the Connect, Investigation, Analysis and Conclusion (CIAC) learning model on the empirical aspects of Nature of Science that affect science learning in elementary school students.

1.2. Related Research

Wallace & Louden (1992) explained that in the cognitive development of elementary school children the role of empirical evidence is needed. Empirical teaching can help children develop important empirical observation, measurement, and inference skills in STEM (Science, Technology, Engineering, and Mathematics). This emphasis on the importance of empirical learning at an early age helps children better understand abstract concepts and provides a solid foundation for the development of more complex STEM skills in the future. This article can be an important reference for teachers and policy makers in the development of an effective STEM curriculum at the elementary school level. Another study conducted by Blumenfeld et al., (1994)also suggested that teachers use students' empirical experiences as a basis for building scientific knowledge and teaching students how to think scientifically. They also stressed the importance of teachers facilitating scientific practice and experimentation in the classroom, as well as providing feedback to students on their performance. Debating empirical evidence and students' prior knowledge is also an important experience in building a knowledge. therefore the use of empirical evidence must form the basis of effective science education practice (Ratcliffe et al., 2005). A good learning process can be illustrated from the activities carried out by students. Science teaching that focuses on developing student understanding can help students build explanatory developments and overall strengthen their scientific understanding (Novak & Treagust, 2022). One of the efforts that can be made when teaching science is to emphasize the existence of empirical evidence in every student's discussion of topics.

The novelty or state of the art of this research is that it explores the use of the Connect, Investigation, Analyze, and Communication (CIAC) learning model to improve students' understanding of the empirical aspects of the Nature of Science (NOS). The study highlights the importance of NOS in science education and identifies the lack of attention given to it in the classroom. The study also emphasizes the importance of empirical evidence in building one's knowledge and suggests that the CIAC learning model can provide opportunities for students to investigate existing phenomena, prove them, and build an understanding of the empirical evidence because scientific facts are not always found in a document but are also found in empirical evidence(Kahana & Tal, 2014). Overall, this research contributes to the ongoing effort to improve science education by providing a model that can enhance students' understanding of NOS, particularly its empirical aspects.

1.3. Research Objectives

The Connect, Investigation, Analyze, and Communication (CIAC) learning model is a learning approach aimed at enhancing students' understanding of the nature of science (NOS), especially the empirical aspects of scientific knowledge. The model involves four stages: Connect, Investigation, Analyze, and Communication. In the Connect stage, the teacher activates initial thoughts and relates them to the material, stimulating feelings of doubt in students. In the Investigation stage, students produce additional knowledge based on existing ideas to prove doubts raised, and conduct investigations to find evidence. In the Analyze stage, the teacher guides students to analyze the results of the experiment, and in the Communication stage, students communicate their findings to others.

The CIAC model is designed to give students the opportunity to investigate existing phenomena, then prove them so that an understanding of empirical evidence is built. By using this model, students can deepen their knowledge of scientific inquiry and how scientific knowledge is constructed, validated, and influenced. The model emphasizes the importance of empirical evidence in building one's knowledge and aims to develop students' critical thinking and inquiry skills. The CIAC model can be used to teach science and NOS at all levels of education, from elementary to university level.

2. Theoretical Framework

2.1. Connect, Investigation, Analyze and Communication (CIAC) learning model

The Connect, Investigation, Analyze and Communication (CIAC) learning model is a learning model developed to increase students' understanding of NOS, especially the empirical aspects. The CIAC learning model can give students the opportunity to investigate existing phenomena, then prove it so that an understanding of the empirical evidence is built. The explanation of the stages of the CIAC model can be seen based on Table 1

Table 1. CIAC Model Stages

Stages	Teacher Activity	Student Activity
Connect	Activate initial thoughts and relate them to the material so that feelings of doubt arise in students.	Connecting questions, problems or ideas with the material based on his experience so as to grow a sense of doubt about the phenomenon presented.
Investigations	Stimulate students to get more information	Producing additional knowledge based on existing Ideas to prove doubts raised.
	Provide learning resources so that students can deepen their knowledge	Conducting investigations to find evidence
Analyze	Guiding students to analyze the results of the experiment	Students analyze the results of the investigation based on concrete evidence obtained from the experiment.
Conclusion	Help students summarize	Students conclude that science is knowledge based on evidence.
		Students are able to distinguish which science is proven and which is without evidence.

The first stage of learning is Connect, at this stage students will be encouraged to connect their initial understanding with the material to be taught. Students do not come to school with an "empty mind". Students' environment and experiences throughout life make them actually learn everything before starting learning at school (Hansson et al., 2021). In addition, according to Ladachart, (2019) shows that often students' prior knowledge is inconsistent with scientific knowledge, they may have some potential to be developed. Thus, science teachers should not only consider students' limited knowledge but also their potential. The second learning stage is investigations. At this stage students will be invited to build additional knowledge related to the material being taught. This process takes a constructivism approach where at this stage students fill their thoughts with various knowledge generated from activities such as reading, watching videos, conducting interviews, conducting experiments and observations. The results of experiments conducted by students can help them better develop their understanding (Kahana & Tal, 2014). According to constructivism, learning is not just filling students' heads with knowledge, but an active process where students construct meaning based on their individual and social experiences (Yager, 1991). In the next stage, the third stage of learning is Analyze. At this stage students try to analyze the results of the investigative study carried out in the previous stage. This process can help students understand complex information better, build strong arguments, and develop their critical thinking. The last stage of learning is the conclusion stage. In this stage, students will do the process of drawing conclusions or making decisions based on the information available. Students will be guided to be able to conclude that knowledge is based on evidence.

3. Method

3.1. Research Design

This research employed a pre-experimental method through one group pretest post-test design (Gall et al., 2010). The pre-experimental method is selected since the intervention was only conducted to one group, without the presence of a control group as a comparison (Creswell, 2012). The initial stage of the research was the provision of pretest and treatment, while post-test was given in the later stage. The following table illustrates the one-group pretest-posttest design in this research.

Table 2. Research Design

Group	O1	X	O2

3.2. Participant

This research was conducted in one of the public elementary schools in Bandung Regency, West Java in the 2022/2023 school year. In this study, the sample was obtained by nonprobability sampling with purposive sampling technique (Gall et al., 2010). The sample of this study amounted to 38 grade 5 elementary school students consisting of 18 male students and 20 female students. The age of students is around 11-12 years old in the class. On average, students live close to school and near environments related to nature such as rivers, rice fields and hills.

3.3. Data Collection

The instrument used to collect data related to students' understanding of the NOS in the empirical aspect on the pre-test and post-test used a Likert scale questionnaire (4, 3, 2, 1). The instrument used is a questionnaire consisting of 10 statements regarding the empirical aspects of students' understanding of NOS. The following lattice of empirical aspects of NOS understanding instruments can be seen in table 3.

Table 3. Instrument students' understanding of the NOS in the empirical aspect

	Statement	Score
1.	Knowledge in science is more convincing of its truth because it is supported by strong evidence	+
2.	All science knowledge is supported by real evidence	-
3.	Scientists conduct investigations to obtain evidence to support what he says	+
4.	Knowledge that is not accompanied by real evidence cannot be called knowledge	-
5.	Some knowledge may not have found evidence because it is not yet possible to investigate it	+
6.	Although not accompanied by concrete evidence, science knowledge can still be recognized as true as long as it is produced in a way that can be accounted for	+
7.	The truth of science is determined by the presence or absence of supporting evidence	-
8.	Every experiment result is a knowledge	+
9.	Knowledge that is conveyed only through conversation can be called knowledge	-
10.	Everything that cannot be proven is not knowledge	-

3.4. Data Analysis

The data that has been obtained is analyzed descriptively based on the acquisition of the percentage score of students' answers regarding the understanding of the tentative aspects of the NOS. A quantitative descriptive method, with SPSS version 25 and Microsoft Excel 2019 tools, was used to analyze the data collected from the questionnaire. In revealing the effectiveness of NOS explicit learning design implementation, the pretest and post-test results were processed by SPSS.

3.5. Validity and Reliability

Instrument validation was conducted through construct validity based on judgment from experts, peers, and teachers as practitioners. Expert judgment was carried out by one professor who studied Nature of Science with extensive experience in science and NoS to provide input in the preparation of statements on the instrument. The instrument was then evaluated by colleagues or peers who have a comparable understanding of elementary science learning and NoS or the constructs being measured. Peers provided input based on their experiences and perspectives. The final results of the instrument were then piloted by asking for help from teachers to provide feedback on the instrument to be used.

4. Findings

The acquisition of students' NOS scores in the empirical aspect was carried out in two stages. The first stage was before the implementation of the CIAC Model and the second stage was after the implementation of the CIAC Model. The measurement results can be seen in Figure 1.

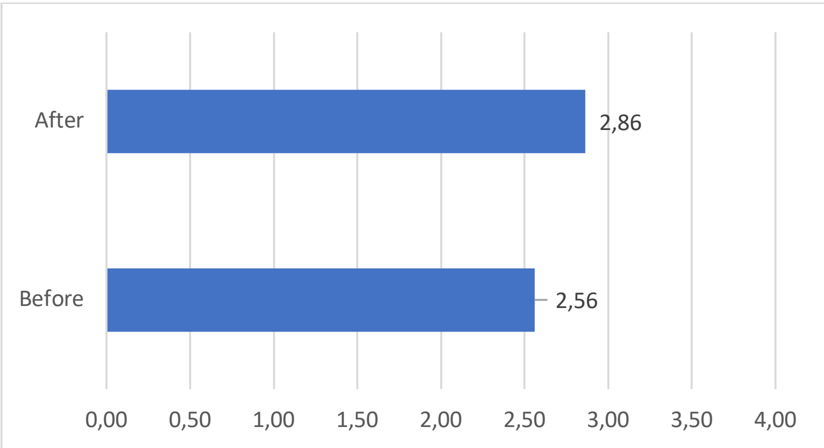

Figure 1. The average score of students' NOS in the empirical aspect

Based on Figure 1, the average score of students before the implementation of learning obtained a score of 2.56 and in the second stage after the implementation of learning obtained a score of 2.86. Based on this acquisition, there is an increase in score after the implementation of learning. The increase was then measured using the n-gain measurement and obtained a score of 0.21.

The average results are taken from the acquisition of student answers to 10 questions related to the empirical aspects of NOS ability. The results of student acquisition when viewed based on questions can be seen in Table 4.

Table 4. Average score of NOS empirical aspects based on question items

No	Before	Affter	Gain	Category
1	2,71	3,42	0,55	Medium
2	1,45	1,68	0,09	Low

3	2,76	3,11	0,28	Medium
4	2,53	2,58	0,04	Low
5	2,79	3,29	0,41	Medium
6	3,29	3,32	0,04	Low
7	2,47	2,58	0,07	Low
8	2,93	2,95	0,02	Low
9	2,00	2,87	0,43	Medium
10	2,66	2,87	0,16	Low

Based on the table above, the highest increase is in the first question with a gain score of 0.55 while the lowest increase is in the fourth question with a gain score of 0.04. Despite the difference in gain scores, the overall score of each question increased from before to after learning.

4.1. Empirical aspects based on gender

The effectiveness of implementing the CIAC model was also examined based on gender. source of data taken based on 19 male students and 19 female students. Based on the empirical NOS score, the score can be seen in Figure 2.

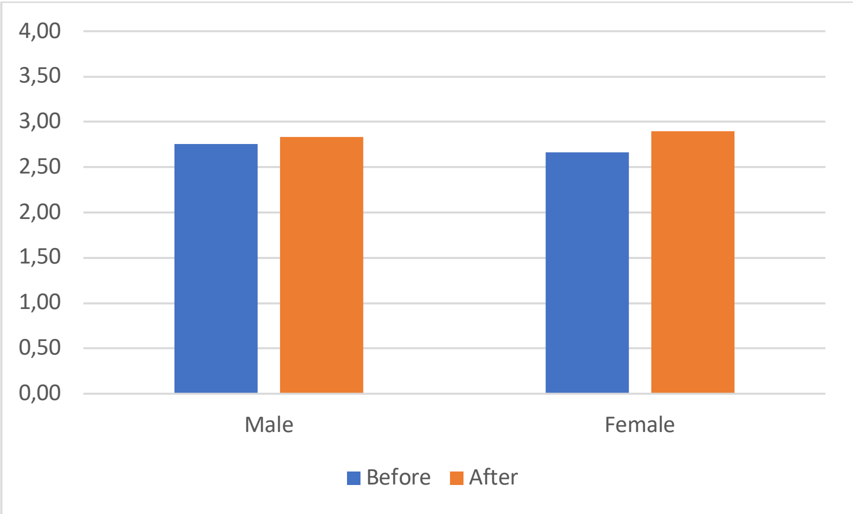

Figure 2. The average NOS score of empirical aspects based on gender

Based on the table above, there is an increase in each gender. The gain score for men based on the results of the empirical aspect of the NOS score is 0.06 while women get a gain score of 0.17. Although women get a higher score, both are still in the low category. These results show that female have the same abilities and even more students in the field of science, even though students' perceptions of science are identical to a male (Makarova et al., 2019). The reality in the field of gender bias in science, including increasing women's representation in the scientific field, is still low. This is also due to the perception of science being synonymous with men.

4.2. Empirical aspects based on interest

The effectiveness of CIAC model implementation was also investigated based on their interest in science. The data source shows that from the total sample studied, there are 22 students who claim to be interested in things related to science and 16 people are not interested in science. The results of the empirical aspect of NOS score in terms of their interest can be seen in Figure 3.

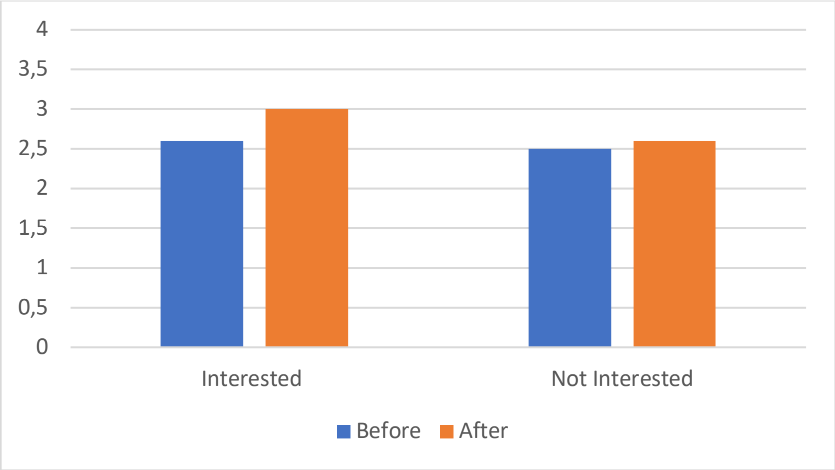

Figure 3. The average NOS score of empirical aspects based on interested in science

Based on the table above, the greatest improvement is for those who have an interest in science, compared to those who are not interested. Students who were interested in science obtained an average score of 2.6 before learning and increased to 3.0 after the implementation of the learning model, while students who were not interested in science obtained an average score of 2.5 before implementation and increased to 2.6 after implementing the learning model.

5. Discussion

Empirical evidence is data obtained through observation, research or experimentation that is real and measurable. The development of students' knowledge can be influenced by empirical evidence because empirical evidence can provide a strong and justifiable basis for strengthening or strengthening a theory or hypothesis. Thus, empirical evidence can help students to understand a concept better and strengthen existing knowledge. Empirical evidence can also help students to gain confidence in understanding a concept and solving problems logically. Learning that makes empirical evidence as the basis of learning has a strong effect in classroom learning (Gay et al., 2012). Furthermore, empirical evidence can also encourage students to develop their own ideas and hypotheses, as they become more familiar with the scientific method and the process of data collection and analysis. This can lead to a deeper engagement with the subject matter and a more active participation in the learning process. In addition, exposure to empirical evidence can help students to become more critical thinkers, as they learn to evaluate the validity and reliability of data and draw their own conclusions based on the evidence presented.

It is important to note that empirical evidence should be presented in a way that is accessible and understandable to students, and that supports their learning goals. Teachers can facilitate this process by using a variety of teaching methods and resources, such as multimedia presentations, interactive experiments, and real-world case studies, to help students connect theoretical concepts to practical applications. In addition, teachers can encourage students to engage in discussions and debates about the interpretation and significance of empirical evidence, which can further deepen their understanding and critical thinking skills. Overall, the use of empirical evidence in science education is crucial for promoting students' engagement, understanding, and critical thinking skills (Vale et al., 2022). By providing a strong and justifiable basis for theory development and hypothesis testing, empirical evidence can help students to develop a more accurate and nuanced understanding of scientific concepts, and prepare them for success in their future scientific endeavors.

During the learning process, empirical and contruvism complement each other. An empirical approach can provide a solid foundation for building knowledge by providing reliable empirical evidence, while a constructivist approach can help students understand how this knowledge can be applied in real life and develop their critical thinking skills. In the view of constructivism, teacher-student equality in the learning process allows the elaboration process of the principles and concepts learned to build new meaningful knowledge. Therefore, it is important for teachers to increase the role of students in order to build constructive habits of mind in each student (Nurdyansyah & Fahyuni, 2016). The documentation shows that students are very interested in the practicum process. On this occasion, students tried a series of experiments related to the material and it helped in building their new knowledge.

During the learning process, support from empirical evidence is helpful in developing students' knowledge. During the learning process, the more human senses involved in learning, the better the learning process is likely to be. The discovery of facts in experiments or activities that support students in finding supporting empirical evidence is very influential in the success of learning (Firdaus & Rahayu, 2019; Stevi & Haryanto, 2020). During the learning process, students usually learn only from books provided by the teacher. The process of finding evidence related to the material taught in the book will make students more confident in the knowledge provided. Their experience to prove what is taught in the book, makes students more confident when explaining it back because of the experience and real evidence done by the students themselves.

Factors such as access to science learning opportunities, as well as gender perceptions related to science, can influence the interest in science in both men and women. For example, if women do not have the same access as men to science learning opportunities or if they feel they are not accepted or supported in science, then their interest in science may be lower. it is important to ensure that all students, regardless of gender, have equal access to science learning opportunities and feel welcome and supported in learning science. This can help reduce differences in interest in science between boys and girls and increase student interest in science as a whole. Gender-related science research has been conducted for a long time and is often the subject of discussion. Research results presented by Chi et al., (2017) revealed that there are different interests between male and female students and continue to develop in line with their age. During the process of development and growth, it was found that women became less of a scientist than men even though research did not find significant differences in ability between men and women seen from various aspects such as science experience, attitudes, and perceptions of science courses and careers. High interest in science can lead to better NOS understanding scores because students who have a high interest in science tend to show better results in learning science (Toma & Greca, 2018).

The gender of students can also have an impact on their performance in science education. Historically, there has been a gender gap in science education, with male students outperforming female students in many areas of science. Males have higher scores of accuracy, flexibility, and dependability than females (Hwang, 2022). However, reserch suggests that this gap is narrowing, and there are a number of factors that can help support female students in science education. One factor that can influence gender differences in science education is societal expectations and stereotypes. Girls may be less likely to pursue science education due to cultural and societal expectations that they will pursue careers in other fields. Additionally, stereotypes about women's ability to succeed in science can lead to lower expectations from teachers and peers, which can negatively impact their motivation and performance. Another factor is the availability of role models and mentors in science. Female students may be more likely to pursue science education if they see other women succeeding in science careers and if they have access to female mentors and role models. Effective teaching strategies can also help support female students in science education. For example, teachers can use inclusive language and classroom practices that recognize and value diverse perspectives and experiences. They can also provide opportunities for students to work in collaborative groups and engage in hands-on activities that promote active learning and problem-solving.

An interest in science can positively influence students' science learning outcomes. Students who have a great interest in science tend to be more involved in science education and are better able to master the concepts being studied (Lee et al., 2019; Maiorca & Mohr-Schroeder, 2020). They are also more likely to participate in science activities outside of school hours, such as science activities in a science laboratory or club, which can reinforce their understanding of science and improve their learning outcomes. An interest in science can also help students develop their critical thinking skills and increase motivation to study science (Toma & Greca, 2018). Students who are interested in science may be better able to explore new ideas and solve problems logically, which are very important skills in science. However, it should also be remembered that interest in science is not the only aspect that influences student science learning outcomes. Other aspects that can affect students' science learning outcomes include the quality of science education provided, efficient educational procedures, and the support provided by teachers and parents. Therefore, it is important to ensure that students have access to quality science education and are supported by a safe environment for learning science so that they can achieve optimal learning outcomes. In addition, developing an interest in science can also have long-term benefits for students beyond their formal education. Students who have a strong interest in science are more likely to pursue science-related careers and make important contributions to scientific research and innovation. They may also be more likely to engage in lifelong learning in science and continue to explore new scientific ideas and discoveries throughout their lives.

Encouraging students to develop an interest in science can be done through a variety of approaches, such as using hands-on activities, promoting inquiry-based learning, and providing opportunities for students to engage with real-world scientific problems (Katehi et al., 2009). Teachers can also make science learning more relevant to students' lives by connecting scientific concepts to their everyday experiences and interests. Parents and caregivers can also play an important role in fostering their children's interest in science by providing opportunities for them to explore and learn about science outside of school. This can include taking children to museums, science centers, and other science-related events, as well as encouraging them to ask questions and explore scientific concepts in their daily lives. Overall, developing an interest in science is important for students' learning outcomes and can have long-term benefits for their future. By providing quality science education and creating a supportive environment for learning, students can develop the critical thinking skills and motivation needed to succeed in science and make important contributions to scientific research and innovation.

6. Conclusion

Based on the results of the study, the process related to empirical evidence is very helpful for students in improving their NOS skills. When viewed from the point of view of gender, there was no significant increase in understanding of NOS between male and female. In addition, students' initial interest in science also affects the students' scores where students who are interested in science get higher scores than those who have no interest in science.

Limitation

The research presented has several limitations that should be taken into consideration when interpreting its results.

First, the sample size is relatively small, consisting of only 38 students, which may not be representative of the larger population. This small sample size also limits the generalizability of the study's findings. A larger sample size could provide more reliable and accurate results. Second, the study only focuses on one school and one subject, namely, physics. Therefore, the results may not be applicable to other schools or other science subjects. Third, the study design only compares the NOS scores of students before and after the implementation of the CIAC model. Therefore, the results do not account for other factors that may have influenced the students' scores, such as individual differences, teacher performance, or differences in classroom environments. Fourth, the study only examines the empirical aspect of NOS and does not assess other aspects of NOS, such as the tentative or subjective aspect. Therefore, the findings may not fully capture students' understanding of NOS. Finally, the study does not assess the long-term effects of the CIAC model on students' NOS understanding, which may provide insights into the effectiveness and sustainability of the model.

Recommendation

Based on the article, it can be recommended that the implementation of the Constructivism-Inductive Approach-Concept Attainment (CIAC) model in teaching and learning can improve students' understanding of the Nature of Science (NOS). The results showed an increase in students' NOS scores after the implementation of the CIAC model, indicating that the model is effective in enhancing students' learning.

Moreover, the study found that the effectiveness of the CIAC model implementation can be influenced by the students' gender and interest in science. Female students showed a higher gain score than male students in the empirical aspect of NOS score, despite still being in the low category. Meanwhile, students who were interested in science obtained a greater improvement in NOS score compared to those who were not interested.

Therefore, it is recommended that teachers consider using the CIAC model in teaching and learning to enhance students' understanding of the NOS. Teachers can also consider the students' gender and interest in science when designing the implementation of the model to cater to their learning needs.

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Conflict of Interest

The Author(s) declare(s) that there is no conflict of interest.

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