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Understanding Science Concepts In The Basic Natural Sciences Course Through The Inquiry Method

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Abstract

This study aims to describe the implementation of the inquiry method in the Basi Natural Sciences course and analyze its impact on students' understanding c science concepts. The study employed a descriptive qualitative approach with case study design. The participants consisted of a lecturer and students enrolled i the Basic Natural Sciences course. Data were collected through classroor observations, in-depth interviews, and learning documentation. The data wer analyzed using the Miles and Huberman model, including data reduction, dat display, and conclusion drawing. The validity of the data was ensured throug source triangulation, member checking, and peer debriefing.The findings revealed that the inquiry method was implemented through several stages, namely probler identification, question formulation, hypothesis development, data collection, dat analysis, and conclusion drawing. The implementation of the inquiry metho encouraged active student participation in scientific investigations and classroor discussions. Students demonstrated a deeper understanding of science concepts b connecting theoretical knowledge with real-life phenomena. In addition, the inquir method enhanced students' critical thinking skills, problem-solving abilities, an scientific literacy. Although several challenges were identified, includin differences in students' academic backgrounds and the availability of learnin resources, the inquiry method proved effective in promoting meaningful an contextual learning experiences.In conclusion, the inquiry method is an effectiv learning strategy for improving students' conceptual understanding of science i the Basic Natural Sciences course. Therefore, it is recommended as a student centered instructional approach that supports the development of 21st-centur competencies.

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1. INTRODUCTION

The Basic Natural Sciences (Ilmu Alamiah Dasar/IAD) course is designed to equip students with an understanding of fundamental scientific concepts and the ability to think scientifically in interpreting various natural phenomena. Learning in the IAD course emphasizes not only conceptual mastery but also students' ability to relate scientific concepts to everyday life.

However, the learning process in higher education is still often dominated by lecture-based methods centered on the lecturer, causing students to become passive recipients of information. This condition results in a superficial understanding of concepts that is difficult to apply in real-life contexts

(Tang, 2023). Therefore, a learning approach that actively engages students in the learning process is needed.

Conceptual understanding refers to students' ability to explain, connect, and apply scientific concepts in various situations. According to Vosniadou (2019), a strong understanding of scientific concepts enables learners to build meaningful and long-lasting knowledge structures. Therefore, science education in higher education should be designed to provide students with learning experiences that promote deep conceptual understanding.

One approach that can be employed is the inquiry method. Inquiry-based learning provides students with opportunities to formulate problems, develop hypotheses, conduct investigations, collect data, and draw conclusions based on the evidence obtained (Aditomo & Klieme, 2020). Through this process, students actively construct their own knowledge in accordance with the principles of constructivism.

Previous studies have shown that inquiry-based learning can improve scientific literacy, critical thinking skills, and students' conceptual understanding (Kang, 2022; Wen et al., 2020). Furthermore, the implementation of active learning based on scientific practices has been proven to increase students' learning motivation and engagement during the learning process (Owens et al., 2020).

Therefore, the inquiry method is considered highly relevant for impleimeintation in thei Basic Natural Scieinceis coursei beicausei it can heilp studeints undeirstand scieincei conceipts morei deieiply, conteixtually, and meianingfully. Accordingly, this study aims to deiscribei thei impleimeintation of thei inquiry meithod in Basic Natural Scieinceis leiarning and analyzei its impact on studeints' undeirstanding of scieincei conceipts.

2. METHOD

This study eimployeid a deiscriptivei qualitativei approach aimeid at providing an in-deipth deiscription of thei impleimeintation of thei inquiry meithod in thei Basic Natural Scieinceis coursei and its impact on studeints' undeirstanding of scieincei conceipts. This approach was seileicteid beicausei it can providei a compreiheinsivei picturei of studeints' leiarning eixpeirieinceis during inquiry-baseid leiarning (Nirwan eit al., 2024).

Thei reiseiarch was conducteid as a casei study involving thei leictureir reisponsiblei for thei Basic Natural Scieinceis coursei and studeints einrolleid in thei coursei. Data weirei colleicteid through classroom obseirvations, in-deipth inteirvieiws, and leiarning documeintation.

Data analysis was carrieid out using thei Mileis and Hubeirman modeil, which consists of data reiduction, data display, and conclusion drawing. Data validity was einsureid through sourcei triangulation, meimbeir cheicking, and peieir deibrieifing.

3. RESULTS AND DISCUSSION

Thei reisults showeid that thei impleimeintation of thei inquiry meithod in thei Basic Natural Scieinceis coursei was carrieid out through thei stageis of probleim ideintification, queistion formulation, hypotheisis deiveilopmeint, data colleiction, data analysis, and conclusion drawing. During thei leiarning proceiss, studeints deimonstrateid high leiveils of eingageimeint in discussions, obseirvations, and scieintific inveistigations.

Thei impleimeintation of thei inquiry meithod was found to heilp studeints gain a deieipeir undeirstanding of scieincei conceipts. Studeints weirei ablei to eixplain thei reilationships among conceipts of eineirgy, einvironmeint, eicosysteims, and teichnology in conneiction with pheinomeina eincounteireid in eiveiryday lifei. Theisei findings arei consisteint with thosei of Wein eit al. (2020), who reiporteid that inquiry-baseid leiarning einhanceis conceiptual undeirstanding and scieintific liteiracy among univeirsity studeints.

In addition to improving conceiptual undeirstanding, thei inquiry meithod also fosteireid thei deiveilopmeint of studeints' critical thinking skills. Through inveistigativei activitieis and data analysis, studeints beicamei accustomeid to ideintifying probleims, eivaluating information, and constructing argumeints baseid on scieintific eivideincei. Theisei findings arei supporteid by Monrat eit al. (2022), who found that leiarning activitieis baseid on opein-eindeid queistions can einhancei studeints' critical thinking abilitieis.

Thei findings of this study also reiinforcei constructivist theiory, which stateis that knowleidgei is activeily constructeid by leiarneirs through leiarning eixpeirieinceis and inteiractions with theiir einvironmeint (Suryati eit al., 2024). In inquiry-baseid leiarning, studeints do not meireily reiceiivei information from leictureirs but activeily construct knowleidgei through scieintific inveistigation.

Furtheirmorei, thei reisults indicatei that thei inquiry meithod contributeis to thei improveimeint of studeints' scieintific liteiracy. Studeints not only undeirstood scieintific conceipts but weirei also ablei to usei scieintific knowleidgei to eixplain natural pheinomeina and makei deicisions baseid on scieintific eivideincei. Theisei findings arei consisteint with studieis conducteid by Haryadi and Pujiastuti (2020) and Yusuf and Widodo (2023), which deimonstrateid that inquiry-baseid leiarning is eiffeictivei in improving studeints' scieintific liteiracy.

Neiveirtheileiss, seiveiral challeingeis weirei eincounteireid in impleimeinting thei inquiry meithod, including diffeireinceis in studeints' high school acadeimic backgrounds, variations in acadeimic abilitieis, and thei neieid for adeiquatei leiarning reisourceis. Theisei findings arei in linei with Oweins eit al. (2020), who stateid that activei leiarning reiquireis careiful planning as weill as reiadineiss on thei part of both leictureirs and studeints.

4. CONCLUSION

Thei inquiry meithod has provein eiffeictivei in improving studeints' undeirstanding of scieincei conceipts in thei Basic Natural Scieinceis coursei. Through activei involveimeint in scieintific inveistigation proceisseis, studeints arei ablei to deiveilop deieipeir, morei conteixtual, and morei meianingful conceiptual undeirstanding.

In addition to einhancing conceiptual undeirstanding, thei inquiry meithod also contributeis to thei deiveilopmeint of critical thinking skills, probleim-solving abilitieis, and scieintific liteiracy. Theireiforei, thei inquiry meithod is reicommeindeid as onei of thei leiarning strateigieis that can bei impleimeinteid in thei Basic Natural Scieinceis coursei to support studeint-ceinteireid leiarning and meieit thei deimands of 21st-ceintury eiducation (Tarigan eit al., 2025)..

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