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Cognitive Learning Strategy

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Abstract: *This study aims to analyze the application of abstract cognitive learning strategies in improving students' high-level thinking skills in biology subjects at the high school level. Abstract cognitive strategies involve the use of concepts, principles, and logical thinking that are not directly related to concrete objects, but rather to complex mental processes such as analysis, synthesis, and evaluation. The method used in this study is a qualitative study with a descriptive approach, which is carried out through observation, interviews, and documentation studies at SMA Negeri 3 Padangsidimpuan. The results of the study indicate that the use of strategies such as advance organizers, analogies, concept maps, and reflective discussions can help students understand abstract material more deeply and develop critical thinking skills. In addition, learning that is directed at mental representation and integration of conceptual knowledge has been shown to increase students' active participation in the learning process.*

Keywords: *Learning Strategy, Abstract Cognitive, Higher Level Thinking*

INTRODUCTION

21st century education requires students to not only master factual knowledge, but also to be able to develop higher order thinking skills (HOTS), such as critical, analytical, creative, and reflective thinking. Within this framework, learning strategies play a very important role in facilitating the development of students' cognitive potential, especially in understanding abstract concepts that are often found in science subjects such as biology, physics, and mathematics. One approach that is very relevant to improving students' higher order thinking skills is the abstract cognitive learning strategy. This strategy emphasizes deep mental processes, such as forming generalizations, understanding relationships between concepts, and building mental representations of things that are invisible. Abstract material, such as the human organ system, the mechanism of photosynthesis, or the theory of evolution, requires a delivery method that allows students to build a comprehensive conceptual understanding, not just memorizing definitions or procedures.(Asrori, 2016, p. 45).

However, the main challenge in learning abstract concepts is the students' limitations in connecting theory with concrete experiences. Therefore, strategies are needed that can bridge students' understanding, such as the use of advance organizers, analogies, metaphors, concept maps, and reflective discussions. These strategies not only help students organize new information into existing cognitive structures (schemata), but also stimulate them to build connections between concepts and transfer learning to other situations. In the context of the independent curriculum and differentiated learning approaches that are now starting to be implemented in many schools in Indonesia, the use of abstract cognitive learning strategies is becoming increasingly relevant.(ayu, nd, p. 78)

Teachers are required to be able to design learning that is adaptive to students' cognitive needs and characteristics. Therefore, a deep understanding of this strategy is needed as a foundation for increasing the effectiveness of learning, especially in materials that require high-level thinking. With this background, this study focuses on the study of abstract cognitive learning strategies, how they are applied in biology learning at the high school level, and their impact on improving students' conceptual understanding and critical thinking skills. This study is expected to contribute to the development of more effective, innovative learning practices that are in accordance with the demands of modern education.(Azis, 2019, p. 87)

METHODS

This study uses a qualitative approach with a descriptive exploratory research type. This approach was chosen because it aims to deeply understand the processes, strategies, and meanings contained in the implementation of abstract cognitive learning, especially in the context of biology learning at the high school level. Qualitative research allows researchers to explore the dynamics of the learning process in a naturalistic way, as well as capture the perspectives of teachers and students directly through interactions in real contexts. Location and Subjects of the Study This study was conducted at SMA Negeri 3 Padangsidimpuan, which was chosen purposively because this school has implemented various learning innovations and has adequate laboratory facilities to support biology learning. The subjects of the study consisted of grade XI biology subject teachers, who were

considered to have experience in implementing cognitive learning strategies

Grade XI students, who took biology lessons during the research period. Data Collection Techniques Data in this study were collected through several main techniques, namely: Observations were conducted directly on classroom learning activities, with a focus on the use of abstract cognitive strategies such as advance organizers, concept maps, reflective discussions, and critical thinking modeling. The instruments used were observation guidelines with indicators of cognitive strategies and student learning behavior. In-depth Interviews Conducted with teachers and several selected students to obtain more detailed information regarding perceptions, understanding, and obstacles and successes in implementing abstract cognitive learning strategies. Interviews were conducted in a semi-structured manner to be flexible and allow for in-depth exploration.

Documentation Study Includes analysis of the Learning Implementation Plan (RPP), learning modules, teacher notes, and student work results relevant to the research topic. Research Instruments The main instrument in this study is the researcher himself (human instrument) assisted by tools such as observation guides, interview guidelines, and documentation sheets. The instrument was developed based on cognitive learning theories, especially from figures such as David Ausubel and Jerome Bruner, who emphasize the importance of cognitive structure and elaboration in abstract learning. Data Analysis Techniques Data were analyzed using thematic analysis techniques. The analysis procedure was carried out in several stages Data reduction: sorting and simplifying data from observations, interviews, and documentation. Data presentation: arranging data in the form of narratives, matrices, or concept maps to facilitate interpretation.

Conclusion drawing: finding patterns, themes, or categories that show how abstract cognitive strategies are applied and how they impact student learning. To ensure data validity, source and method triangulation techniques were used, namely comparing the results of observations, interviews, and documentation so that the data obtained were more accurate and credible. In addition, member checking was also carried out by asking for confirmation from informants regarding the results of the researcher's temporary interpretation. Research Ethics The researcher upholds ethical principles in research by first asking for written permission from the principal and the biology teacher who were the subjects. The identities of the participants were disguised to maintain confidentiality and privacy, and it was conveyed that participation was voluntary without coercion.

RESULTS & DISCUSSION

What are the obstacles faced by teachers and students in implementing cognitive learning strategies?. Teacher Constraints Lack of Understanding of Abstract Cognitive Strategies Many teachers do not fully understand what is meant by abstract cognitive strategies and how to implement them effectively in the classroom. Most teachers are still fixated on conventional approaches that are oriented towards memorization, rather than on the formation of deep conceptual understanding. Limitations of Professional Training Teachers often do not receive training or workshops that specifically equip them with abstract cognitive learning methods, such as the use of scientific analogies, thinking modeling, or concept maps as a means of visualizing understanding. Difficulty in Designing Abstract Materials to be Concrete Compiling teaching materials or lesson plans that are able to concretize abstract concepts (e.g. chemical reactions of cells, the immune system,

etc.) requires in-depth pedagogical and content skills. Not all teachers are able or have the time to simplify complex materials with analogies or visual approaches.(Della, 2022, p. 54)

Limited Learning Time Limited learning time in schools often makes teachers focus more on delivering material to complete the syllabus, rather than providing space for students' cognitive exploration such as in-depth discussions, debates, or concept mapping. Limited Supporting Facilities Abstract cognitive learning requires visual media, technology (eg animation, simulation), and conceptual aids that are sometimes not available in schools due to budget or laboratory facility limitations. Constraints from the Student's Side Limited Initial Cognitive Abilities Not all students have the same readiness or ability to think abstractly. Students with concrete thinking skills tend to have difficulty understanding logical relationships that are not directly apparent, such as the concept of homeostasis or membrane transport mechanisms. Low Interest and Motivation to Learn Abstract concepts are often considered "boring" or "difficult", so students become passive and less motivated to participate in learning. This is exacerbated if the teacher is unable to relate the concept to everyday reality.

Limitations of Previous Learning Experiences Students who are not familiar with reflective learning, concept mapping, or argumentative discussions may have difficulty engaging in learning strategies that encourage higher-order thinking. Difficulty Connecting Concepts Cognitive learning(Halaly, 2022, p. 54)requires students to integrate various information and relate it to a logical framework of thinking. For students who are not yet trained, this is a big challenge, especially in subjects that require systemic understanding such as biology. Contextual Factors (Environment and System) Rigid and Exam-Oriented Curriculum An education system that places too much emphasis on achieving national exam scores or end-of-semester exams often encourages teachers to pursue low cognitive targets (C1–C2), not C4–C6 which are the targets of cognitive strategies

Large Class Sizes Too many students in one class make it difficult for teachers to implement strategies that require individual guidance, small group discussions, or more personalized assessments of understanding. Insufficiently Supportive Assessments The assessment instruments used are often still limited to multiple-choice questions and memorization, not accommodating the assessment of critical thinking skills, problem solving, or deep conceptual understanding. Obstacles in implementing abstract cognitive learning strategies lie not only in the limitations of individual teachers or students, but are also influenced by the education system, learning culture, and availability of resources. Therefore, efforts to improve the effectiveness of this strategy need to be carried out comprehensively, starting from teacher training, curriculum design, provision of learning media, to evaluation based on conceptual understanding.(Haudi, 2021, p. 12)

This study generally aims to describe, analyze, and evaluate the application of abstract cognitive learning strategies in the biology learning process at the Senior High School (SMA) level, especially grade XI. These objectives are detailed into several main aspects as follows: Identifying Abstract Cognitive Learning Strategies Used by Teachers This study aims to explore the types of abstract cognitive strategies applied by biology teachers in classroom learning. The focus is on strategies such as advance organizers, concept maps, analogies and metaphors, and reflective discussions that help students understand abstract concepts in biology materials. Describing the Process of Implementing Strategies in Class The study aims

to describe how teachers implement these strategies in real terms in learning, from planning, implementation, to evaluation. This includes how teachers prepare lesson plans, choose media, organize classroom activities, and guide students in understanding concepts that are not concrete.(Istiningsih & Hasbullah, 2015, p. 44)

Analyzing Students' Responses and Understanding of Abstract Cognitive Strategies. The study aims to determine how students respond to the use of abstract cognitive learning strategies, both in terms of learning interest, level of involvement, conceptual understanding, and development of critical thinking skills. This objective is important to assess the effectiveness of the strategy from the perspective of students. Identifying Barriers and Challenges in Implementing Strategies This study also aims to reveal the obstacles faced by teachers and students in implementing abstract cognitive learning strategies. These obstacles can come from internal factors (such as limited understanding of strategies, student readiness) or external factors (such as limited time, facilities, or curriculum).(DMMPd & M.Pd, 2022, p. 66)

Evaluating the Impact of Strategies on Learning Processes and Outcomes Another objective is to evaluate the extent to which the application of abstract cognitive strategies is able to improve the quality of the learning process and student learning outcomes, especially in the aspects of conceptual understanding, analytical skills, and scientific reasoning of students in understanding biology materials. Providing Practical Recommendations for Teachers and Schools This research is expected to provide recommendations to teachers, principals, and educational policy makers on how to design and implement learning strategies that are in accordance with students' cognitive characteristics and the demands of a competency-based curriculum.(DBMPd S. Ag, nd, p. 90).

Forms and Implementation of Cognitive Learning Strategies in Teaching. Cognitive learning strategies are instructional approaches that focus on how students process information mentally to improve comprehension, memory retention, and the ability to transfer knowledge. These strategies are especially effective for teaching abstract and complex concepts, as they help students develop meaningful and sustainable cognitive structures. One prominent strategy is the Advance Organizer, developed by David Ausubel, which serves as an initial framework presented before students engage with new material. It connects prior knowledge to new content, increasing students' readiness and reducing cognitive load. For instance, in biology, a teacher might present a diagram of the body's coordination system before discussing the nervous system. Another important method is Concept Mapping, a visual tool that displays the hierarchical relationships between concepts. This helps students organize information logically and facilitates deeper understanding. In biology, concept maps are often used to show the classification of living organisms or energy flow within ecosystems. Similarly, Analogies and Metaphors make abstract ideas more accessible by linking them to real-life experiences. For example, enzymes can be explained using the "lock and key" analogy, or DNA as a "recipe book," which fosters imagination and enhances conceptual clarity. Elaboration is also a critical cognitive strategy, where students expand new information by relating it to prior knowledge or real-world applications. When learning about photosynthesis, students might explore its role in the carbon cycle and its impact on global warming, which deepens their comprehension. Visualization and Simulation utilize media, animations, or interactive tools to present invisible or complex phenomena, like simulating blood flow or visualizing cell division, helping students grasp difficult concepts and minimizing

misconceptions.

The Think-Pair-Share technique and Reflective Discussions encourage critical thinking and collaborative learning. Students might, for instance, reflect on the effects of global warming on ecosystems, discuss in pairs, and present their insights to the class. Problem-Based Learning (PBL) is another strategy where students solve real-life issues, such as river pollution, by researching and proposing solutions like bioremediation. This nurtures analytical and higher-order thinking skills. Scaffolding offers step-by-step support, gradually withdrawn as students gain independence. In biology, a teacher may guide students through initial analysis questions and then allow them to tackle similar problems independently. Graphic Organizers, like Venn diagrams or comparison tables, help summarize and clarify complex information such as comparing mitosis and meiosis thus improving retention. Furthermore, Metacognition teaches students to monitor and regulate their own thought processes. By writing learning journals, for example, they can reflect on confusing concepts and plan strategies for improvement, increasing learning ownership and reducing anxiety. These diverse strategies are vital for fostering deep conceptual understanding, especially in subjects like biology. Teachers who effectively apply these methods help students not just memorize content, but understand, apply, and transfer knowledge to real-world contexts. Events or training programs focused on cognitive learning aim to enhance participants' understanding of such strategies, including their theoretical foundations, practical benefits, and curricular relevance. Such events also aim to strengthen teacher competence in designing and implementing cognitive strategies by aligning teaching methods with students' needs, and focusing on meaningful information processing.

Participants are encouraged to share experiences and explore contextual solutions to challenges like time limitations, inadequate facilities, or varying student readiness. Moreover, these programs promote adaptive and innovative approaches tailored to local conditions and emphasize the importance of reflective and continuous learning. Collaboration among educational stakeholders teachers, principals, supervisors, and academics is another key goal, fostering synergy in implementing cognitive learning practices. These events also serve to develop strategic recommendations, such as creating curriculum modules based on cognitive strategies and integrating them into the national education system. The aim is not only to conduct ceremonial events but to establish platforms for knowledge transformation and practical implementation. Such initiatives play a pivotal role in professional teacher development by enhancing pedagogical competence and inspiring creativity in instructional design. Although students are not direct participants, they benefit significantly from improved teaching methods that support meaningful learning, engagement, and collaboration. Furthermore, these events contribute to curriculum reform and educational policy development, emphasizing critical thinking and competency-based learning over rote memorization. By strengthening communication among educators, these events also build professional learning communities where best practices and innovations are exchanged. They serve as platforms for disseminating modern educational theories, encouraging the use of cognitive strategies and technology to enhance learning. Ultimately, they help formulate policy recommendations to improve teacher training and develop competency-focused curricula, thereby advancing education in a direction that prioritizes deep and critical student thinking.

CONCLUSION

Cognitive learning strategies focus on processing information in students' minds to help them build deeper understanding, remember information longer, and apply it to new situations. This strategy is very important in learning that is oriented towards developing critical thinking skills, problem solving, and application of knowledge. Thus, strategies such as advance organizers, concept maps, elaboration, problem-based learning, and visualization and analogy approaches are very effective in helping students understand complex and abstract material. Event Objectives Events that focus on the application of cognitive learning strategies have various very deep objectives, including Increasing participants' understanding, especially teachers, of various cognitive learning strategies that can be used to improve the quality of teaching Facilitating practical skills for teachers in designing and implementing learning strategies that can activate students' cognitive processes Compiling recommendations for the development of curriculum and education policies based on critical thinking skills and deep understanding Encouraging collaboration between various parties in the education sector to share experiences and find solutions to the challenges faced in implementing this strategy in the field.

REFERENCES

Asrori, M. (2016). Definition, Purpose and Scope of Learning Strategy. MADRASAH, 6(2), 26. Https://Doi.Org/10.18860/Jt.V6i2.3301

Ayu. (ND). ISLAMIC RELIGIOUS EDUCATION LEARNING STRATEGY IN THE DIGITAL ERA: QUALITATIVE LITERATURE REVIEW | Jurnal Media Akademik (JMA). Retrieved November 12, 2024, From Https://Jurnal.Mediaakademik.Com/Index.Php/Jma/Article/View/515

Azis, TN (2019). Digital Era Learning Strategies. The Annual Conference On Islamic Education And Social Science, 1(2), Article 2.

(2022). LEARNING STRATEGY. CV Literasi Nusantara Abadi.

Fitri, H. (2016). ANALYSIS OF DIFFICULTIES IN LEARNING PHYSICAL EDUCATION FOR CHILDREN WITH SPECIAL NEEDS AT THE DISABLED FOUNDATION (YPPC) SCHOOL IN BANDA ACEH CITY. Journal of Physical Education, 3(2), 33–40. Https://Doi.Org/10.46244/Penjaskesrek.V3i2.770

Halaly, ANH (2022). Muhadharah Learning Strategy in Improving the Preaching Ability of Students of Al-Mubarok Bukit Kemuning Islamic Boarding School in the 2021/2022 Academic Year [Undergraduate, IAIN Metro]. Https://Repository.Metrouniv.Ac.Id/Id/Eprint/5876/

Haudi. (2021). Learning Strategy. Independent Intellectuals.

Istiningsih, S., & Hasbullah, H. (2015). Blended Learning, Future Learning Strategy Trends. Jurnal Elemen, 1(1), Article 1. Https://Doi.Org/10.29408/Jel.V1i1.79

MA, PDHAN (2014). Islamic Perspective on Learning Strategies. Kencana.

M.Pd, DB, S. Ag. (ND). PLANNING AND LEARNING STRATEGY OF ISLAMIC RELIGIOUS EDUCATION. Jakad Media Publishing.

M.Pd, DM, & M.Pd, EI (2022). LEARNING STRATEGY TEXTBOOK Components, Aspects, Classifications and Models in Learning Strategies. Lakeisha Publisher.

Riyono, B., & Retnoningsih, A. (2015). EFFECTIVENESS OF PICTURE AND PICTURE LEARNING MODEL WITH INQUIRY STRATEGY ON STUDENTS' MOTIVATION AND LEARNING OUTCOMES. Journal Of Biology Education, 4(2), Article 2. Https://Doi.Org/10.15294/Jbe.V4i2.8907

Sahrudin, A. (2014). IMPLEMENTATION OF DISCOVERY LEARNING STRATEGY TO IMPROVE MATHEMATICAL PROBLEM SOLVING ABILITY AND LEARNING MOTIVATION OF HIGH SCHOOL STUDENTS. JUDIKA (UNSIKA EDUCATION JOURNAL), 2(1), Article 1. Https://Doi.Org/10.35706/Judika.V2i1.117

Sanah. (ND). Development of Creative and Innovative Learning Strategies for Islamic Religious Education (PAI) in the Digital Era | Dewantara: Journal of Social Humanities Education. Retrieved November 12, 2024, From Https://Jurnaluniv45sby.Ac.Id/Index.Php/Dewantara/Article/View/2438

Sholichin, MM, Alim, WS, & Nasrullah, AMA (2022). Integration of Islamic Teachings with Science in the Natural Education Study Program of IAIN Madura: Curriculum Structure, Learning Strategies and Community Views. NUANSA: Journal of Islamic Social and Religious Science Research, 19(1), Article 1. Https://Doi.Org/10.19105/Nuansa.V19i1.5431