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Implementation of the Philosophical Foundation in Deep Learning of Science Subjects at SD Muhammadiyah 1 Candi Labshool UMSIDA

Rr Indah Prasetya Susilowati[1], Fitri Nur Aeni[2], Frizka Amalia[3], Chika Kharisma Salsabila[4] , Widi Astutik[5], Supriyadi[6*]
[1,2,3,4,5,6]Universitas Muhammadiyah Sidoarjo, Indonesia
indah.prasetya83@gmail.com[1], fitrina433@gmail.com[2], frizkaamalia03@gmail.com[3], chikakhasal.17@gmail.com[4], wastutik689@gmail.com[5], supriyadi@umsida.ac.id[6]
*Corresponding Author

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Abstract
This research was conducted to analyze the implementation process of the philosophical foundation through a deep learning activity model in the Natural Sciences (IPAS) subject on photosynthesis at SD Muhammadiyah 1 Candi Labschool UMSIDA. The development of students' learning is not merely rote memorization but involves practical concepts and critical thinking, as well as instilling character that aligns with the Pancasila student profile. This study employs a qualitative approach with a case study research type, collecting data through interviews with teachers and students, and triangulation tests. The results of the study indicate that the implementation of the philosophical foundation through deep learning is very effective both in ontology, epistemology, and axiology. Student responses showed a range of 92.50% - 97.50 which indicates very good/very effective that learning is related to the material with everyday life. The implementation of deep learning activities in the IOAS lesson on photosynthesis material through a philosophical foundation at SD Muhammadiyah 1 Candi Labschool UMSIDA has proven very effective in improving conceptual understanding and shaping students' scientific attitudes through project-based learning activities.

INTRODUCTION

According to paragraph 4 of the preamble to the 1945 Constitution, education is defined as a deliberate and organized effort to realize a learning process so that students can build the capacity to educate the nation. In Indonesia, education helps students develop their attitudes, character, and abilities, in addition to critical thinking skills. Literally, education is the process by which teachers teach students. Children's moral and ethical growth must be guided and supported by their parents. Family and community are crucial because they provide direction and support for the creation and development of knowledge and understanding through education. This idea of education originates from the family as much as from formal education provided by those in positions of power(Royani, R., Ahda, S., & Silalahi 2024).

The method used by students to receive instructions from teachers to achieve learning objectives. Learning is a cooperative interaction process between students and teachers that utilizes all potential and resources derived from students' internal and external competencies to achieve certain goals (Hrp, Nurlina A. 2022). Other meanings learning is an effort to create the conditions necessary for learning activities to take place. According to the definition given above, learning is an effort to foster a cooperative relationship between students and teachers by helping students achieve their full potential (Almarisi 2023).

Because the curriculum plays a vital role in the learning process, education continues to evolve over time, improving both the quality of education and the curriculum development methods that will be implemented. Law No. 20 of 2003 states that "the curriculum is a collection of learning plans related to content, objectives, materials, and methods used as guidelines in implementing the learning process to achieve national education goals." Between 1947 and 2023, the Indonesian education system underwent ten curriculum modifications.

The Ministry of Education and Culture has released a new strategy called the Independent Learning Curriculum, which aims to transform education through the Pancasila Student Profile. This independent curriculum is seen as a learning strategy that can provide students with the opportunity to demonstrate their innate abilities and learn in a fun way. The Independent Learning Curriculum emphasizes independence, giving students the freedom to learn according to their needs, interests, and abilities. In addition to structured education, learning is more focused on student abilities, fostering critical thinking skills that will prepare them to face future challenges. Independent Learning emphasizes independence, originality, and critical thinking (Dwilestari, D., & Desstya 2022).

The aspects of reading ability, knowledge, skills, and attitudes represented in the Pancasila student profile are integrated into the concept of implementing an

independent learning curriculum. This concept empowers students to think critically and utilize their knowledge optimally according to their needs. An independent curriculum is a teaching method that provides students with opportunities to learn in a more enjoyable way. The concept of the need for learning is related to Allah's command in Q.S. al-Alaq verses 4-5. Meaning: "He who taught (man) with the pen. He taught man what he did not know". The meaning of the two verses above is that Allah shows His Most Generous nature by teaching man with the Qalam (pen) or not with the Qalam (pen). The Qalam is not only interpreted as a tool, but is also interpreted as human effort in seeking or searching for knowledge.

The immersive learning approach is used to implement a self-directed learning curriculum. Immersive learning emphasizes active student participation, the development of critical thinking, and reflective skills for in-depth conceptual understanding, in contrast to previous classical and traditional approaches that focused on memorization and a one-way flow of information solely from the teacher (Diputera, A. M., Zulpan, E. G., & Eza 2024; Trisna Ayu Putri and Agusdianita 2024; Lestari, Dewi, and Junita 2024). To make learning more relevant and understandable, this approach is considered to motivate students to connect course material to real-world situations (Dwilestari, D., & Desstya 2022).

Science education faces complex issues in global socio-cultural elements as science and technology advance in the 21st century. Teachers now need to emphasize the ability to apply knowledge to real-world situations in addition to memorization. This is in line with global goals that highlight the process of scientific literacy as the foundation and basis for every citizen to be able to make critical decisions, engage in discussions about science, technology, and society, and become contributing members in the global era. The demand for more meaningful, introspective, and lasting learning led to the development of the idea of deep learning in science education (Anwar, M., & Sodik 2025).

To develop a lifelong learning mindset, immersive learning can help students understand concepts and develop critical thinking skills. Significant effects have been demonstrated in increased student participation, learning outcomes, and the ability to apply knowledge in new situations. The application of immersive learning, which enables in-depth learning and the development of comprehensive understanding essential for success in facing future challenges, is motivated by the need to equip students to address global challenges (Diputera, A. M., Zulpan, E. G., & Eza 2024).

Information about human life, both as individuals and as social beings as well as living organisms, objects, and inanimate objects in the universe that are interconnected and play a role in the environmental life cycle or ecosystem is included in the field of natural sciences (IPAS). Cause and effect are also related to IPAS learning. Two subjects taught in IPAS classes are social studies and natural

science. Through science, students can learn more about various social and ecological facts and events that occur in their surroundings. Fun learning is one learning method that can be applied as a solution. This type of teaching aims to foster an environment that is fun, easy to understand, interesting, and meaningful (Bella Shadila Sarmadi 2025).

From this background, this case study research will analyze the process of implementing learning philosophically with the Deep learning model in science learning activities at SD Muhammadiyah 1 Candi Labschool UMSIDA elementary school which aims to improve students' learning achievements in a novel manner.

From an ontological perspective, the ontological foundation of Science Lessons means that the lesson includes information about the nature of basic education about photosynthesis. This paper will examine the nature of science lesson teaching, which includes the science learning objectives applied to students. Social sciences and natural sciences, which include academic fields related to social and cosmic issues, are taught in science classes. The foundations, guidelines, and criteria for achieving the learning objectives that teachers expect from the learning process are provided by the object of philosophical study in science lessons (Dwilestari, D., & Desstya 2022).

In-depth learning activities in the IPAS subject consider science as knowledge resulting from human efforts to understand natural and social phenomena or events around them. Science lessons in IPAS are a unified field of study encompassing facts and principles that are interconnected and can be observed in daily life. By understanding the concept of IPAS learning, students are encouraged to cultivate curiosity so they can connect empirical experiences with scientific concepts.

The most common aspect of philosophy is the pillar of ontology, which is a component of metaphysics. One chapter of the philosophical pillars is dedicated to metaphysics. Ontology is a pillar of philosophy that deals with the generic, which is the core and encompasses every reality, including all realities in all their manifestations. The objects studied in ontology are things not bound to specific manifestations (Fajriani, M. H., Hardianti, A., Miladia, U. A., & Dewi 2025).

Epistemology is a branch of science that is evaluative, normative, and critical. The long-term goal of this case study research is to produce an epistemological reconstruction of IPAS lessons in elementary schools. In-depth learning in IPAS is based on the process of acquiring knowledge thru scientific activities, such as observation and reasoning, to develop students into active subjects who construct their own knowledge thru experimentation and reflection.

One of the main natural processes in learning Natural and Social Sciences (IPAS), especially for fifth-grade students, is photosynthesis. Beside providing students with a strong foundation in science, a deep understanding of photosynthesis also introduces them to the environment and the importance of

plants in human life. Students often find it difficult to understand how photosynthesis works (Zahra, F., & Salamah 2025). Thru teaching 5th-grade IPAS lessons, it is hoped that students can gain knowledge, skills, increase their understanding, sensitivity, and how to face life's problems. IPAS lessons are not just to be learned, but also to be used wisely for sustainable living.

Based on educational policy, the Independent Curriculum is a revised curriculum that prioritizes adaptability, personalized teaching, and the creation of Pancasila Student Profiles. This curriculum offers numerous opportunities for teachers and students to enhance learning and discover students' interests, skills, and characteristics. It emphasizes a deep understanding of subject matter thru activities that are more student-centered than teacher-centered. This is intended to provide ample space for students to develop 21st-century skills including critical thinking, creativity, teamwork, and communication (Bella Shadila Sarmadi 2025). The Independent Curriculum strongly emphasizes "teaching at the right level," a teaching method that allows teachers to modify assignments, goals, and the difficulty level of lesson materials to suit each student's unique abilities. Because children learn according to their developmental stages and not just by following minimum standards, this curriculum is considered beneficial in eliminating the variation in student learning outcomes that do not meet expectations. As a result, the Independent Curriculum views students as distinct individuals who need to be treated differently according to their learning preferences (Wahyuni, S. A., Destrinelli, D., & Wulandari 2023).

The Merdeka Curriculum also strongly emphasizes the integration of project-based learning (PBL) as a good approach to shaping students' character and creativity. The Merdeka Curriculum strengthens the role of schools as a holistic learning ecosystem for students. The role of teachers is not only to teach, but also to design learning experiences for students by utilizing various resources, such as digital media, experiments, and environmental integration. This approach allows students to understand life's problems more broadly, and they can connect academic concepts with everyday life.

Thru personalized teaching, project-based learning, and the application of techniques that foster creativity, independence, and higher-order thinking skills, the implementation of the Independent Curriculum learning methodology is expected to motivate students to be active. Teachers use content differentiation, process differentiation, and product differentiation to help students understand and meet different learning objectives. Because they believe the learning process is very important, this approach has been proven to increase student motivation (Wahyudi, A. E., Sunarni, S., & Ulfatin 2023).

Students learn happily thanks to the Independent Curriculum. Another important component of the Independent Curriculum learning technique is the

function and assistance of technology. Digital technology can help make learning more engaging, productive, and diverse. Digital technology assists teachers in providing formative assessments, enhancing student access to learning resources, and fostering collaboration thru digital platforms. In addition to emphasizing various approaches, the Independent Curriculum learning strategies focus on helping students build their character, reflecting the characteristics of Pancasila learners who are active, critical, cooperative, and capable of lifelong learning (Gunadi, Hanifah, and Nugraha 2024). The main goal of the Independent Curriculum is character education. The goal of character education is to shape students into individuals with noble morals and to embody the values of Pancasila. Internalizing values in all learning activities leads to character development. Learning can be done thru experiments or lectures. Culture can naturally embrace the application of Pancasila student ideals. When it comes to practicing character-based behavior, teachers are the primary role models, allowing students to learn from real-life experiences rather than just theory (Amanda and Fernandes 2024; Diana, A., Mirochina, C., & Badrudin 2024).

Teachers use Permendiknas No. 4 of 2007 as a guide in carrying out learning activities that are in accordance with the Process Standards when using models, strategies, and methods to achieve more optimal learning outcomes in the face of educational competition in the challenging and ever-evolving era of globalization. Teachers must implement teaching successfully, creatively, and with an awareness of learning models to improve student learning outcomes (Mufida, A. T. L., Widiastuti, D., Atmojo, I. R. W., & Kasanah 2024). Education has the power to transform and enhance a person's knowledge, skills, and behavior. Education is one of the most effective technical means of practically improving human intelligence and talent. A strong sense of responsibility is also cultivated thru education, especially when making decisions in the face of life's difficulties (Isnaini, H., & Fanreza 2024). The Natural and Social Sciences (IPAS) subject in elementary school is a subject that helps students improve their critical thinking skills regarding natural events occurring in their surroundings. One of the materials taught in elementary school is the process of photosynthesis. This material is an important process in green plants for producing their own food. From this material, students are expected to understand the concepts of the food chain, ecosystem balance, and the importance of protecting the environment.

At SD Muhammadiyah 1 Candi Labschool UMSIDA, the learning of photosynthesis material is still often theoretical and based on memorization, and does not yet encourage students to think critically. The teacher uses lecture and assignment methods, viewing image media, and has not yet provided learning experiences that help students understand the material in a real way. The impact of

purely theoretical learning results in students having difficulty scientifically explaining the process of photosynthesis and difficulty connecting the material to everyday life, for example, plants need to be placed in a location with sufficient sunlight.

The condition of the IPAS learning activities on the topic of photosynthesis indicates the need for the implementation of deep learning. In-depth learning can emphasize students' knowledge of conceptual understanding, critical thinking skills, and the application of knowledge in real-world contexts thru experimental activities. Thru learning strategies such as project-based inquiry, simple experiments, discussions, group observations, and mini-projects, students can actively engage in understanding the process of photosynthesis.

Therefore, this case study research is crucial to analyze how the implementation of in-depth learning activities in IPAS lessons on photosynthesis material in elementary school grade V can enhance students' critical thinking concept understanding and foster their scientific attitude toward the phenomenon of the photosynthesis process.

METHODS

This research employed a qualitative approach, employing a case study. This qualitative data collection approach was adopted because it aimed to deeply understand the implementation of the philosophical foundations in the fifth-grade learning process (deep learning) in the science subject at Muhammadiyah 1 Candi Elementary School.

Case studies are used to obtain data and explore learning events comprehensively, holistically, and in-depth in real-life experiments or activities, namely the practice of learning photosynthesis in science in an elementary school. This research focuses on a single case, allowing researchers to examine the ontological, epistemological, and axiological aspects of the learning process and its impact on students' experiences and understanding.

This research activity was conducted at SD Muhammadiyah 1 Candi Labschool UMSIDA, Sidoarjo Regency. Candi District, This school was chosen because it has implemented deep learning in the subject of science and has a learning planning document and practice of learning activities that are relevant to the focus of the research title. Subjects: Science teachers of grade V (five) at SD Muhammadiyah 1 Candi Labschool UMSIDA and 20 students involved in learning science on photosynthesis material. Object: Application of ontological, epistemological, and axiological foundations in deep learning of science on photosynthesis material.

Data Collection Techniques through Observation activities, namely: Observing the learning activities of the science learning experiment on photosynthesis material, Observing the interaction of teachers and students in the science learning

of photosynthesis material, Observing changes in plants in the science learning experiment on photosynthesis material. Interviews with fifth grade teachers regarding the application of deep learning related to science learning on photosynthesis material through ontology, epistemology, and axiology perspectives. Questionnaire Data collection activities using questionnaires were carried out on fifth grade students of SD Muhammadiyah 1 Candi Labschool UMSIDA which contained students' learning experiences in science lessons on photosynthesis material. Documentation, namely with documentation: Photos of experimental activities of fifth grade students in science lessons on photosynthesis material, fifth grade science lesson plans, observation sheets or journals of fifth grade students in science lessons Results of mini plant care projects on the photosynthesis process

The data analysis process technique in this case study uses data analysis with the Miles & Huberman model: Conducting data reduction, to filter information on the implementation of ontological, epistemological, and axiological foundations in the experimental activities of science learning, Data presentation, by displaying data findings in the field in the form of narratives and tables. Drawing conclusions from data processing, by drawing conclusions from the final process of activities regarding the philosophical foundations (ontology, epistemology and axiology) applied at SD Muhammadiyah 1 Candi labschool UMSIDA and its impact on students in science learning.

The data validity process was carried out using Triangulation techniques: Source triangulation: teachers and students of Muhammadiyah 1 Candi Labschool UMSIDA Elementary School, Technique triangulation: observation, interviews, documentation of class V Science learning. Time triangulation: observations at different times of both learning activities carried out by teachers and observations of students in class V Science lessons.

Provide a check by confirming the results of the temporary data processing with informants (teachers and fifth-grade students) to ensure the data is correct and in accordance with field conditions. The audit trail through all stages of the research process is recorded systematically and accurately so that the required data can be traced back.

RESULT AND DISCUSSION

This research uses a case study approach with a philosophical approach and Triangulation. The following are the results of data collection through interviews conducted with a fifth-grade teacher at Muhammadiyah 1 Candi Labschool Umsida Elementary School on December 2, 2025 at 10:00 WIB. The following is a direct quote from the interview with Mrs. Fitri Nuraeni, a fifth-grade teacher at Muhammadiyah 1 Candi Labschool Umsida Elementary School regarding the implementation of ontology, epistemology, and axiology philosophy in a case study

research on the subject of photosynthesis. From the indicators, teachers can understand the basic concepts of plant growth and photosynthesis.

Learning about the growth of water spinach in photosynthesis material in fifth grade elementary school is understood ontologically as an effort to understand biological concepts in a concrete and contextual way. Photosynthesis is a life process that can be directly observed through the growth of experimental plants that are not abstract. Learning about water spinach involves students in planting, observing, and caring for water spinach. This helps students understand the importance of the relationship between plant needs (water, light, and carbon dioxide) and their results, such as growth, food production, and oxygen. The essence of this learning emphasizes that scientific knowledge comes from students' direct experiences with the outside world.

From an epistemological perspective, the learning process emphasizes how students acquire knowledge scientifically. Through routine observation, measurement, data recording, simple experiments, comparison of results, and drawing conclusions, knowledge about photosynthesis is built. Students not only receive information from educators but also participate in the process of understanding through empirical experiences and inquiry. Students are trained to think logically, critically, and evidence-based through observation journals, simple hypotheses, and comparative analysis between plants that receive light and those that do not. This demonstrates that knowledge is gathered through a systematic and meaningful scientific process.

Axiologically, learning to grow kale yields numerous benefits. To be scientific, you must be objective, honest, and critical when collecting and analyzing data. The obligation to care for plants according to agreements instills responsibility and discipline. Enjoying the harvest together, working together, and sharing tasks are how social values emerge. Furthermore, learning instills religious values and concern for the environment. Students are taught about God's greatness through the regulation of the photosynthesis process and the importance of preserving the environment and plants as a form of gratitude and human responsibility as caliphs on earth.

The kale planting activity was designed as a significant ongoing inquiry project utilizing Deep Learning. Teachers considered planning, experimentation, discussion, reflection, and the connection of ideas to real-world situations. Through hands-on experience, students not only memorized the concept of photosynthesis but also gained an understanding of the cause-and-effect relationships between light, water, soil, and plant growth. Project reports, reflections, and group discussions helped students connect empirical data with scientific concepts and life values. Conducted holistically through process, product, and reflection, assessment demonstrated that education truly produced deep, contextual, and sustainable understanding.

The results of processing student questionnaire data on measuring student participation in the in-depth and meaningful IPAS learning process from 20 respondents across five questions using a Likert scale with scores from 1 to 4. Here is the scoring table:

Table 1. Questionnaire Assessment Scale

NO	Score	Description
1	4	Always
2	3	Often
3	2	Sometimes
4	1	Never

The processing of questionnaire data obtained from 20 respondents will be calculated using the formula:

$$\text{Persentase} = \frac{Jumlah\ skor}{skor\ maksimal}\ X\ 100\%$$

Using the following data effectiveness criteria:

Table 2. Data Effectiveness Criteria

Rentang Persentase (%)	Keterangan
81% - 100%	Very Good / Very Effective
61% - 80%	Good / Effective
41% - 60%	Fair / Fairly Effective
21% - 40%	Poor / Less Effective
0% - 20%	Very Poor / Not Effective

To determine the validity of the data on the IPAS learning process for the photosynthesis material from five questions.

Table 3. Categorization of student responses to IPAS learning activities

No	Statement	Frequency			
		4	3	2	1
1	I am often asked to conduct experiments or observations in IPAS class.	15	5	0	0
2	The teacher explains the relationship between IPAS lessons and daily life.	15	5	0	0
3	I learned to cooperate with friends during the IPAS project.	14	6	0	0

4	I feel that learning IPAS makes me get to know God's creations better.	14	6	0	0
5	I feel that IPAS helps me understand nature and the environment better.	18	2	0	0

The interpretation result for the first question among students is 93.75%. The students' responses indicate they very frequently conduct experiments in IPAS learning. This interpretation is considered very good/very effective. A total score of 75 out of a maximum of 80 indicates that almost all students felt the teacher successfully connected the IPAS lesson (photosynthesis material) to real-life contexts. The percentage results from the second question, with 93.75% of responses stating that when the teacher explained the relationship between the IPAS lesson and daily life, the interpretation was considered very good/very effective. The result of the percentage from the third question is 92.50%, indicating that students' responses to learning to work together with friends during the IPAS project are interpreted as very good/very effective. The result of the percentage from the fourth question is 92.50%, indicating that students feel IPAS learning makes them more familiar with God's creations, and the interpretation is very good/very effective. And the result of the percentage from the fifth question is 97.50%, indicating that students feel IPAS helps them understand nature and the environment very well/very effectively. This score shows that students feel IPAS learning is very effective in helping them understand nature and the environment very well.

Picture 1: Documentation of Activity Indoor and Outdoor plant observation

CONCLUSIONS AND RECOMMENDATIONS

The nature and purpose of learning activities indicate that learning involving real-life experiences can foster responsibility and social concern. From an ontological perspective, these results are supported by the results of a student questionnaire with five questions. The students felt they understood the IPAS learning activities on the topic of photosynthesis for 5th-grade students at SD Muhammadiyah 1 Candi labschool UMSIDA, with the highest percentage being

97.50%. Therefore, it can be concluded that the learning objectives can be achieved very well thru inquiry-based learning methods. In conclusion, students learn about the connection between plants and photosynthesis from an epistemological standpoint. Students can comprehend and gain from the process of photosynthesis in plants from an axiological perspective. From the standpoint of deep learning, students can learn from practical experiences obtained through experimentation and critical thinking.

The conclusion from the four aspects shows that the activity of planting water spinach in fifth grade elementary school teaches photosynthesis comprehensively and meaningfully. Learning depicts photosynthesis as a real-life process that can be directly observed by students ontologically. Epistemologically, scientific processes such as observation, experimentation, data recording, and drawing conclusions form knowledge. From an axiological perspective, learning instills scientific principles, responsibility, discipline, environmental concern, and faith. In terms of the application of deep learning, or immersive learning, activities are designed in the form of inquiry projects that engage students in talking, thinking, and connecting them to real-world situations. The goal of this activity is for students to gain a deep and meaningful understanding.

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