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Analysis Of Students' Higher Order Thinking Skills (HOTS) In Designing School Garden Ecosystems: A Case Study At SDN 1 Wanasari, Purwakarta Regency

Nana Herdiana Abdurrahman[1]✉, Revita Yanuarsari [2], Anas Nasrudin [3], Andris Hadiansyah[4], Ati Rahmawati[5], Dewi Setiawati[6], Euis Latipah Kurnayati[7], Novan Novtiansyah[8], Wily Aulia Rahman[9]

Universitas Islam Nusantara

Email : [1]nanaherdiana@uninus.ac.id

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ABSTRACT
The abstract section serves as a comprehensive summary of the entire research regarding students' Higher Order Thinking Skills (HOTS) in designing a school garden ecosystem. The abstract begins with a brief explanation of the background of the problem, namely the dominance of learning oriented towards Lower Order Thinking Skills (LOTS) in elementary schools, resulting in students not being accustomed to analyzing real problems, evaluating alternative solutions, and creating original designs. Furthermore, it is explained that the school garden has great potential as a contextual learning medium and a natural laboratory that allows students to learn through direct experience. However, this potential is often not utilized optimally because it is not integrated with a systematic learning management approach. The purpose of this study is to analyze how students' HOTS emerge and develop through school garden ecosystem design activities managed using the POAC (Planning, Organizing, Actuating, Controlling) management approach. The research method uses a descriptive qualitative approach with data collection techniques in the form of participatory observation, in-depth interviews with teachers and students, and documentation studies of garden design results and learning notes. The results show that school garden design activities are able to stimulate students' analysis (C4), evaluation (C5), and creation (C6) skills gradually. In addition, the process also encourages the internalisation of character values, such as responsibility, environmental care, cooperation, and systemic thinking. This study concludes that the school garden is not just a physical facility, but an effective intellectual tool for developing HOTS if managed through structured learning management.

Keywords: *higher order thinking skills, school garden, POAC management, contextual learning, elementary education*

INTRODUCTION

In the 21st-century era, education faces a major challenge to produce a generation that not only masters facts but is also capable of critical, creative, and adaptive thinking in the face of global change. The learning paradigm has shifted from merely memorizing information to developing Higher Order Thinking Skills (HOTS), as explained in the Revised Bloom's Taxonomy by Anderson and Krathwohl (2001). HOTS includes three main cognitive levels: analyzing (C4), evaluating (C5), and creating (C6), which allow students to break down complex information, assess its effectiveness, and generate original solutions. However, in practice, many schools remain trapped in LOTS (Lower Order Thinking Skills) approaches that are theoretical and textual, causing a gap between classroom theory and real-world application. Students often struggle to apply scientific knowledge in everyday situations, such as solving environmental problems, due to a lack of contextual learning media that actively stimulates their thinking power.

To overcome this, school gardening has emerged as an innovative solution, functioning not only as an aesthetic green area but as a "living laboratory" that allows students to experiment, observe, and solve ecological problems independently. Designing an independent school garden ecosystem is a complex task requiring students to analyze soil conditions and water needs, evaluate plant types suitable for the school's microclimate, and create sustainable layout designs. This process naturally forces students to activate all levels of Bloom's cognitive taxonomy, specifically at the highest level: creating (C6). Although the potential of school gardens is significant, research on how HOTS specifically emerges when students interact with nature remains limited, with a primary focus often on harvest yields or affective aspects only. Therefore, this qualitative research is crucial to capture the dynamics of students' higher-order thinking in designing their own school garden ecosystems. The achievement of HOTS is supported by the optimal utilization of educational facilities and infrastructure. As regulated in the Regulation of the Minister of National Education (Permendiknas) No. 24 of 2007 concerning Standards for Facilities and Infrastructure, every educational unit is required to have land that meets a certain area to support comfortable and healthy learning. However, the implementation of this regulation often only fulfills physical and aesthetic aspects, without utilizing the land as a cognitive laboratory. There is a real gap in the utilization of school land, where garden areas often become mere scenery without being managed pedagogically. In fact, the school land mandated by this regulation has great potential as a contextual learning medium. Designing an independent school garden ecosystem is a tangible form of transforming physical facilities into intellectual tools, requiring students to analyze (C4), evaluate (C5), and create (C6) according to Bloom's Taxonomy. This study aims to explore how compliance with infrastructure standards can be optimized to stimulate HOTS through the management of independent and planned school gardens, in line with the spirit of the Movement for Caring and Cultured Environment in Schools (PBLHS) in the Ministry of Environment and Forestry Regulation No. 52 of 2019.

This context is relevant to global environmental issues, where elementary schools like SDN 1 Wanasari in Purwakarta become ideal arenas for integrating ecological education. With a rapidly growing student population, school gardens not only support learning but also build long-term environmental awareness. This research is expected to make a practical contribution to Indonesian education, where HOTS is key to facing challenges such as climate change and resource sustainability. To understand the phenomenon of HOTS in the context of school garden design, this theoretical foundation integrates Revised Bloom's Taxonomy with ecosystem concepts and philosophical value systems. HOTS, as the ability to manipulate information for new meaning, occupies levels C4-C6: analyzing (breaking material into parts and relationships), evaluating (judging based on criteria), and creating (combining elements into a functional whole). In modern education, HOTS is essential for navigating 21st-century complexity, where students must think systemically, not reactively.

The school garden ecosystem is defined as a functional unity between biotic components (plants, soil organisms) and abiotic components (nutrients, water, sunlight) within an educational environment. Theoretically, the school garden serves as a "living laboratory" that transforms scientific abstraction into empirical experience, where students interact directly with natural dynamics. The "Independent School Garden" concept emphasizes a design that sustains itself through closed cycles, such as composting and water conservation, requiring students to think systemically to harmonize environmental variables. The use of this garden in education aims to bridge the theory-practice gap, stimulating cognitive domains (problem-solving such as efficient planting patterns) and affective domains (empathy through interaction with living things). This environment creates a holistic learning ecosystem, where intellectual development aligns with character building.

HOTS analysis is also influenced by the philosophical value system underlying student interaction with the environment. These six values interact dynamically in the POAC management process: 1) Theological Value: The activity of designing the garden as a devotion to the Creator, realizing the order of nature as God's creation, which strengthens responsibility as environmental stewards. 2) Ethical Value: Relates to standards of correct behavior, such as integrity and concern for the survival of organisms, forming ecological morality. 3) Aesthetic Value: Focuses on harmony and design beauty, where students combine function with artistic form for a comfortable layout. 4) Logical Value: The core of HOTS, emphasizing scientific truth and rational reasoning based on empirical data, such as the cause-and-effect relationship between water and soil fertility. 5) Physical-Physiological

Value: Related to bodily needs, where the selection of beneficial plants (medicinal, vegetables) supports students' physical health and psychomotor skills. 6) Teleological Value: Viewing everything based on its final purpose (telos), such as environmental sustainability for future generations, encouraging long-term systemic thinking. The integration of these values makes school garden design not just a physical activity, but a holistic process that shapes the character of Pelajar Pancasila (Pancasila Students) who care for the environment. This foundation supports the research, where HOTS serves as a bridge between theory and practice, with the school garden as a contextual medium.

METHODOLOGY

This research uses a descriptive qualitative approach to deeply dissect the phenomenon of the emergence of students' HOTS when interacting directly in designing an independent school garden ecosystem. The focus is not on statistical data generalization, but on interpreting the students' cognitive management processes, with data triangulation for credibility. The research was conducted at SDN 1 Wanasari, Purwakarta Regency, involving upper-grade students (Grades IV and VI) as main subjects, supervising teachers as facilitators, and the school principal as the policy person in charge. Data collection techniques included participatory observation (researchers observing student behavior in the garden to record C4-C6 indicators), in-depth interviews (to dig into the logical reasons behind designs and value system perspectives), and documentation studies (design drawings, activity photos, student daily journals as evidence of C6). The interview instrument was designed based on POAC, with in-depth questions for teachers and students, such as "How do students determine the garden design?" or "Is the idea purely theirs or an instruction?" to reveal originality. The data analysis framework adopts a systems approach (input-process-output-outcome), integrating Raw Input (student conditions), Instrumental Input (Permendiknas and Permen LHK regulations), and Environmental Input (synergy of school citizens). Data were analyzed qualitatively through reduction, triangulation, and interpretation, with a HOTS rubric to measure analysis, evaluation, and creation skills. This study ensures validity through triangulation, where findings from observations, interviews, and documentation complement each other for a complete picture.

RESULT AND DISCUSSION

The implementation of POAC management provides a space for students to actualize their thinking skills in managing real challenges in the field. Based on interview results with Grade IV and VI teachers, HOTS dynamics emerged gradually through the following phases:

Planning

At this stage, students were challenged to determine their own garden designs, which triggered the ability to create (C6) through original ideas. Teachers noted that students developed designs through group discussions, with teachers only providing general direction without direct regulation, so ideas stemmed from student creativity. Students provided logical reasons (C5) in plant selection, such as habitat suitability and ease of care, although there were also emotional considerations such as plant uniqueness. This process forced students to analyze (C4) land conditions deeply, such as soil quality and the school's microclimate, transforming theory into practical plans.

Organizing

The ability to analyze (C4) was seen when students divided tasks within groups, where initially the division was based on friendship, but slowly moved to an analysis of team member competencies for specific roles. Students discussed the relationships between components, such as different water needs for certain soil types, through complementary analytical interactions. Teachers observed that this task division encouraged collaboration, where students analyzed who was suitable for physical tasks (planting) or analytical tasks (mapping), thereby increasing team efficiency.

Actuating (Execution)

During the planting practice, unexpected obstacles such as pests or water shortages appeared, triggering problem-solving abilities (C6). Students tended to actively seek solutions through discussion and alternatives, rather than complaining or staying silent, showing rapid adaptation. Teachers reported that students implemented plans with relative precision, and when failing, they adjusted strategies instantly, such as changing the layout without overhauling the initial concept. This activity trained not only physical skills but also cognitive ones, where students integrated theoretical knowledge with field practice.

Controlling (Supervision)

The evaluation stage was carried out through self-reflection, where students assessed their work through discussion and observation, being quite capable of finding flaws without teacher direction. Teachers observed that the POAC approach was more effective in provoking critical thinking compared to the lecture method because students were responsible for the final result. This process created feedback that strengthened the quality of individual input, turning the learning cycle into something dynamic and sustainable.

This study found that HOTS does not stand alone but is rooted in a strong value system, which shapes students' holistic character. The integration of six values in school garden design contributed to the formation of an environmentally caring character: 1) Logical and Aesthetic Values: Became the driving force for the ability to create (C6), where students combined scientific reasoning (plant growth logic) with artistic sensitivity for a beautiful and functional layout. Teachers reported that students often discussed visual harmony, such as plant symmetry, reflecting aesthetic values. 2) Ethical and Theological Values: Emerged through a sense of responsibility towards living things, where students realized plants are God's creations requiring consistent care. This fostered integrity and empathy, such as natural concern for pests, which became the basis of ecological morality. 3) Physical and Teleological Values: Physical activity in the garden supported physical health, while teleological values trained long-term thinking, where students evaluated the impact of designs for future generations. Teachers observed that students often thought about sustainability, such as composting cycles, reflecting teleological values.

The internalization of these values shifted student orientation from passive tasks to self-awareness (outcome) to maintain nature's sustainability, forming a holistic Pelajar Pancasila character. Evaluation results showed that the utilization of school land as a "living laboratory" succeeded in transforming physical facilities into intellectual tools. Students showed consistent progress in cognitive indicators: analyzing (C4) through soil-sun-water relationship mapping; evaluating (C5) with logical arguments on design effectiveness and critique of obstacles; and creating (C6) in original and independent design portfolios. Land optimization according to Permendiknas No. 24 of 2007 proved to be not just aesthetic, but a prerequisite for cognitive function, where independent school gardens trained students to manage complex systems, improving overall learning quality.

CONCLUSION

This study concludes that designing school garden ecosystems through POAC is an effective pedagogical strategy to stimulate HOTS in elementary students, enabling them to analyze, evaluate, and create real environmental solutions. Furthermore, the integration of philosophical values shapes a holistic character, transforming school grounds into a catalyst for 21st-century education. These findings confirm the potential of school gardens as a contextual medium supporting environmental sustainability. For Principals: Optimize Open Green Space (RTH) as a natural laboratory integrated into the curriculum, not just as scenery. For Teachers: Adopt the POAC model for outdoor learning and provide space for student self-evaluation. For Future Researchers: Develop emotional-spiritual assessment instruments for holistic character.

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