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APPLYING PERSONAL INQUIRY TO STRENGTHEN THINKING AND RESEARCH SKILLS AN ATL UPPER IB-PYP

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Abstract: *This study aims to examine the implementation of Personal Inquiry as a reflective learning approach to enhance Thinking Skills and Research Skills as part of the Approaches to Learning (ATL) framework within the International Baccalaureate Primary Years Programme (IB-PYP) curriculum. The research is motivated by the challenges of 21st-century learning, which demand that elementary school students develop higher-order thinking skills and independent research abilities. A descriptive qualitative method was employed over seven weeks at an international school in Bekasi, involving students from grades 4, 5, and 6. Data were collected through classroom observations, student project documentation, and reflective journals, and analyzed using Miles and Huberman's interactive model. The findings revealed that the six stages of Personal Inquiry; Identify, Inquire, Investigate, Innovate, Improve, and Reflection. Effectively fostered conceptual and analytical thinking, as well as learning autonomy. Students were able to formulate reflective questions, evaluate credible information sources, and communicate their findings through creative products such as PowerPoint presentations with themes including Microplastics, Fungus, and Dance. The process also strengthened students' metacognitive awareness and learner agency, aligning with the IB Learner Profile attributes of being reflective and knowledgeable. The study concludes that Personal Inquiry serves as an effective framework for integrating research with critical thinking. Future research is recommended to explore the implementation of this model within Indonesia's Kurikulum Merdeka and its potential to cultivate other IB learner attributes such as communicator and principled learner.*

Keywords: *Approaches to Learning, IB-PYP, Personal Inquiry, Research Skills, Thinking Skills.*

INTRODUCTION

The 21st century is an era in which technological, informational, and communicative changes are advancing at an extraordinary pace. Progress in Science and Technology (IPTEK) has brought the world into the age of globalization, characterized by unlimited access to information (Shepna et al., 2024). The 4.0 industrial revolution has ushered in an era of digitalization that has changed almost all aspects of human life, including the way we think, work, and learn (Sabaruddin, 2022). Automation, *artificial* intelligence, and virtual systems are now part of everyday life for modern society. As a result, education in the 21st century faces increasingly complex challenges, namely how to prepare the younger generation to adapt to change and compete globally (Shepna et al., 2024).

In this context, education is no longer sufficient to focus solely on mastering academic material, but must also foster higher-order thinking skills that include creativity, collaboration, communication, and critical thinking (Hapsari & Prasetyarini, 2023). 21st-century education also requires students to have social skills and strong character in order to face global challenges full of uncertainty (Rahmatiani et al., 2024).

21st-century education also requires students to have social skills and strong character in order to face global challenges full of uncertainty However, conditions in the field show that students' critical and reflective thinking skills are still relatively low. Based on observations at elementary schools in Yogyakarta, many students show a tendency to think superficially and rush to find answers. They are accustomed to obtaining information instantly. through gadgets

and social media without deep thinking. The questions asked by students are generally factual and simple, not yet touching on the realm of analysis or reflection. This phenomenon aligns with the notion that adaptive thinking can only develop if students have an interest in the phenomena around them and are trained to analyze the cause-and-effect of every decision they make (Hayati & Setiawan, 2022).

The emotional development of elementary school students, especially those in upper grades, is still at an unstable stage. Dependence on peers and the influence of gadgets further reinforce this condition. Excessive use of gadgets makes students prone to difficulty focusing, boredom, and seeking instant gratification rather than deep thinking (Hayati & Setiawan, 2022). On the other hand, their self-control skills are also immature, often resulting in impulsive behavior, difficulty managing emotions, and an inability to express ideas constructively (Relita et al., 2021). This condition has an impact on their low reflective thinking skills, effective communication, and social sensitivity in the learning process (Hidayat, 2022).

To address these challenges, a learning model is needed that focuses not only on results, but also on the process of thinking and searching for meaning. The International Baccalaureate (IB), as an international educational organization, seeks to address the challenges of the 21st century through the development of a curriculum that nurtures students to become active, reflective, and globally-minded learners. One of its programs is the Primary Years Program (PYP), a curriculum for children aged 3–12 that emphasizes concept-based and inquiry-based learning (Mutammimah et al., 2019). Through this approach, students are encouraged to build knowledge based on curiosity and real experiences, rather than simply memorizing information (Mutammimah et al., 2019).

In practice, one international school in Bekasi that implements the IB-PYP curriculum provides space for students to conduct in-depth exploration through Personal Inquiry activities. This approach gives students the opportunity to develop their personal interests and become active researchers of the questions they themselves have created. Through the six stages of learning: Identify, Inquire, Investigate, Innovate, Improve, and Reflection, students not only learn to research and organize information, but also develop Approaches to Learning (ATL Skills), particularly Thinking Skills and Research Skills.

Personal Inquiry serves as a bridge between 21st-century needs and the strengthening of critical thinking skills in elementary schools because it emphasizes a learning process based on questions, simple research, and deep reflection that is relevant to real life (Novitra et al., 2024). This approach is in line with the Approaches to Learning (ATL) principles in the IB-PYP curriculum, which foster independent thinking, reflection, and curiosity about the phenomena around us (IBO, 2020). Through questioning, researching, and presenting findings, students learn to construct knowledge and develop knowledgeable and inquisitive characters. Inquiry-based learning is effective for fostering higher-order thinking skills (HOTS) because students are trained to analyze, evaluate, and create based on direct experience. Thus, Personal Inquiry not only strengthens academic abilities but also shapes students who are knowledgeable, care about their social environment, and are able to use their knowledge to create positive change in the world (Tarigan et al., 2019).

RESEARCH METHODOLOGY

This study uses a descriptive qualitative approach that aims to describe in depth the application of Personal Inquiry and its impact on strengthening Thinking Skills and Research Skills in upper IB-PYP students. This approach was chosen because it is in line with the characteristics of research that focuses on the learning process, not just the final results. This research model allows researchers to observe naturally how students interact with their inquiry process, while also recording the dynamics of thinking that emerged during the activity. This qualitative design also provided a space for reflection for teachers and students to confirm findings through direct experience in an authentic classroom context, in line with the view that qualitative research emphasizes understanding the meaning behind human behavior and actions in real situations (Isra, 2024).

The research subjects were students in grades 4, 5, and 6 at the International School in Bekasi, an international school that implements the International Baccalaureate – Primary Years Programme (IB-PYP) curriculum. This school was chosen because it has implemented Personal Inquiry as an integral part of its learning program. The focus on upper grades is relevant because at this stage students begin to demonstrate independence in learning and more abstract thinking skills, allowing researchers to explore more deeply the relationship between the inquiry process and the strengthening of ATL skills. In addition, upper grades are the closest level to with the implementation of the PYP Exhibition, which requires students to comprehensively integrate their research and reflection skills. The sampling procedure used purposive sampling, in which students were selected based on their involvement in the structured Personal Inquiry program at school. The participants were three whole classes from Grades 4, 5, and 6, with 22, 22, and 21 students respectively (total n = 65). All students in these classes were included because Personal Inquiry is a compulsory component of the curriculum. No students were excluded from the sample. This approach ensured that the data reflected the natural dynamics of the classroom and the authentic engagement of students in the inquiry cycle.

The research was conducted over a period of 7 weeks, with two observations each week. A total of 14 learning sessions were observed, each lasting approximately 60 minutes. Each meeting focused on one or two stages of the Personal Inquiry process (Identify, Inquire, Investigate, Innovate, Improve, and Reflection). Observations were conducted longitudinally in order to capture changes in student behavior and thinking patterns over time. This approach provided depth of data and enabled progressive analysis of how students internalized Thinking and

Research Skills in a repetitive learning cycle.

Data collection was conducted using several techniques to obtain triangulation of information. First, direct observation was used to observe student involvement in each stage of inquiry, noting how they constructed questions, analyzed information, and compiled products. Second, field notes were systematically taken to record behavior, communication, and collaboration among students and between students and teachers. Third, documentation included student work (posters, reports, videos, or presentations) and individual reflection sheets. Fourth, teacher and student reflections were collected through unstructured interviews to confirm the researcher's interpretation of the observation results. This combination of techniques allowed for high data validity and provided a holistic picture of the learning dynamics.

Data analysis was conducted using an interactive model comprising three main stages. First, data reduction, which is the process of selecting and focusing on data relevant to the categories of Thinking Skills and Research Skills. Second, data presentation in the form of descriptive narratives, tables of student activities, and reflection quotes to illustrate the learning process that occurred contextually. Third, drawing conclusions and verification, carried out by identifying student thinking patterns, behavioral changes, and the relationship between the Personal Inquiry stage and improvements in Approaches to Learning (ATL). Validity was strengthened through triangulation of sources (observation, reflection, documentation) and discussions with classroom teachers to avoid interpretive bias (Muhu et al., 2024). To clarify the analysis process, this study operationalized coding categories for Thinking Skills and Research Skills based on the Approaches to Learning (ATL) framework in IB-PYP. Thinking Skills are classified into four main codes, namely TS1 (conceptual linking), TS2 (analytical reasoning), TS3 (creative thinking), and TS4 (metacognitive reflection). Meanwhile, Research Skills are operationalized through four categories, namely RS1 (formulating research questions), RS2 (finding and selecting credible sources), RS3 (recording and organizing data), and RS4 (synthesizing information and drawing conclusions). All of these codes are used consistently in the data reduction process to ensure accuracy of interpretation and maintain consistency of analysis in the Miles & Huberman interactive model (Cui & Zhao, 2024).

RESULTS AND DISCUSSION

This study found that the implementation of Personal Inquiry at an international school in Bekasi contributed to an improvement in the thinking skills and research skills of upper-level IB-PYP students. The seven-week observation process showed significant changes in the way students explored ideas, formulated questions, and processed data based on their learning experiences. The results of this study are described in two main sections. First, it describes the stages of Personal Inquiry and student activities at each stage. Second, it describes the improvement in thinking and research skills that was apparent during the activities.

Results

The Personal Inquiry activity at one of the international schools in Bekasi was conducted over seven weeks with two meetings each week. The research subjects consisted of students in grades 4, 5, and 6. During the activity, students were facilitated to go through six stages of inquiry: Identify, Inquire, Investigate, Innovate, Improve, and Reflection. This approach was designed to develop thinking and research skills as part of Approaches to Learning (ATL) in the IB-PYP curriculum. Over the seven weeks, the students' skills showed gradual and measurable progress. At the beginning of the learning process (weeks 1–2), students mostly demonstrated TS1 and RS1, but after week 4, more complex abilities such as TS2 and RS4 began to emerge as they were able to connect cause and effect, for example the impact of plastic use on marine pollution. Metacognitive reflection skills (TS4) were evident after the Improve stage, indicating that structured feedback helped students reveal their thought processes. Overall, there was a shift from surface inquiry to concept- and evidence-based reasoning, although the findings presented were still descriptive and did not fully explain the development of analytical and measurable skills.

Table 1. Personal Inquiry Stages and Student Activities

Tahap	Deskripsi Kegiatan	Thingking Skills	Research Skills
Identify	Students choose inquiry topics based on their interests and central idea.	Connect ideas with topic and real-life contexts.	Determining resea rch focus and problem boundaries of the problem.
Inquire	Students formulate critical and relevant questions about real-world issues.	Think divergently and analytically in formulating reflective questions.	Design strategies for searching for data and sources of information.
Investigate	Students conduct research through observation, interviews, and digital sources.	Analyzing the results observations and identify patterns.	Collecting and evaluating data from various sources. .
Innovate	Students produce products inquiry (posters, videos, reports, PPT).	Apply ideas and solutions based on data.	Organizing findings into systematic reports.
Improve	Students improve their work	Evaluate work results and	Refine the report based

	based on feedback from teachers and peers.	thinking strategies.	on input and evidence data.
Reflection	Students write reflections on the learning process.	Metacognitive reflection on thinking processes and learning outcomes.	Summarizing personal research results and planning follow-up actions.

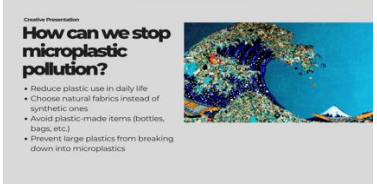
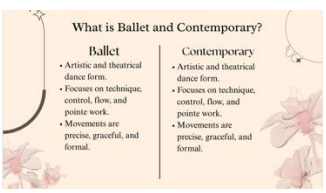
The Identify stage is the starting point for the formation of learner agency, where students determine topics based on personal interests. Teachers act as facilitators by providing stimuli in the form of documentary videos, environmental articles, and open discussions that stimulate students' curiosity. As a result, students chose diverse but contextual themes: 4th graders researched "Microplastics and How to Reduce Plastic Pollution," 5th graders explored "Fungus and Its Role in Nature," while 6th graders researched "Dance as a Universal Expression." At this stage, students began to demonstrate conceptual thinking skills by connecting global phenomena with the context of their lives. For example, the topic of microplastics was chosen because it is often found in the school environment, while the topic of fungus arose from the daily experience of seeing mold on food. Meanwhile, the topic of dance arose from the students' interest in cultural expression and art. In terms of research, this stage demonstrates the skills of determining the focus of the problem and setting the boundaries of the research that can be investigated (Sukma et al., 2022).

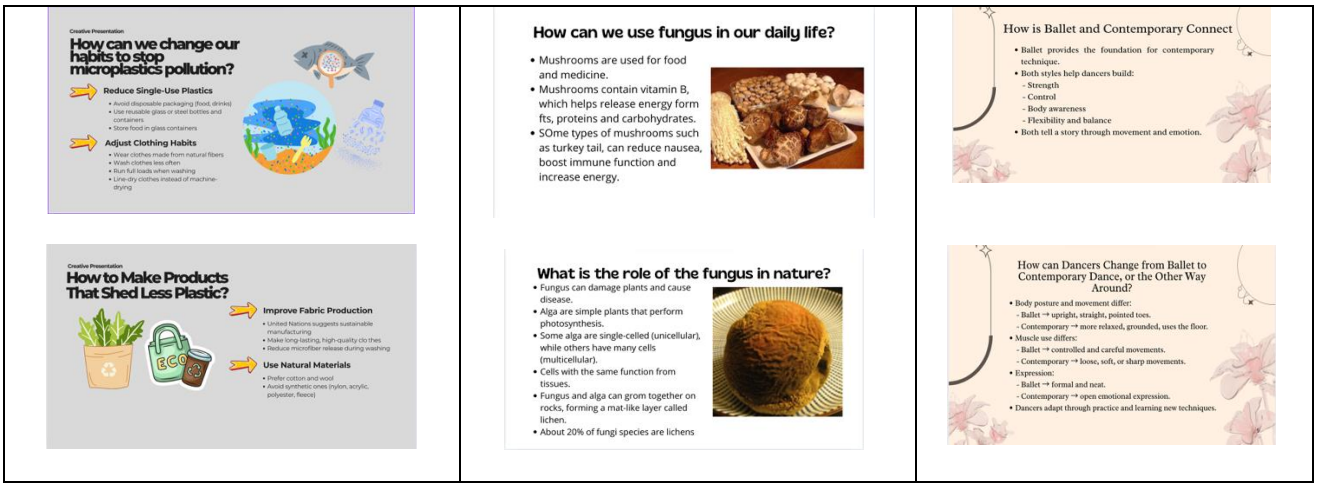
In the Inquire stage, students formulate reflective and challenging inquiry questions. Through question conferences, teachers help students distinguish between factual, conceptual, and reflective debate questions (Taufik et al., 2024). For example, fourth graders ask, "Why do people keep using plastic even though they know it's harmful?", while fifth graders write, "How do fungi help or harm other living things?", and sixth graders ask, "Why do people in different cultures dance differently?" These questions show that students have moved from descriptive to analytical and evaluative thinking, indicating the development of higher-order thinking skills.

The Investigate stage is the main data collection process. Students conduct observations, interviews, and digital literature searches with guidance from teachers. For example, 4th grade students research sources of microplastics through articles from WWF and National Geographic Kids, while 5th grade students observe the growth of mold on food and search for information from Britannica School and Kiddle about the types and functions of mold. Sixth graders researched traditional dances from various countries using online sources and interviews with their art teacher. At this stage, students practiced their analytical thinking and research skills in the form of selecting credible sources, recording data, and evaluating information (Fathya et al., 2023).

The Innovate stage is the culmination of inquiry activities, where students compile their research findings into creative products such as PowerPoint presentations, posters, or short videos. These products showcase data, interpretations, and research-based solutions. For example, fourth graders produced a presentation titled "Microplastics and How to Reduce Plastic Pollution," which included scientific explanations about the origins of microplastics, their impact on marine ecosystems, and mitigation strategies such as the use of eco bags and the "No Plastic Week" campaign. Fifth graders presented on the topic "Fungus and Its Role in Nature," explaining the role of fungi in ecosystems, the process of reproduction through spores, and their benefits as a source of natural antibiotics such as penicillin. Meanwhile, sixth graders presented their work "Dance as a Universal Expression," showcasing various world dances, their social function in building cultural harmony, and the emotional meaning behind the movements.

Figure 1. Grade 4-6 Students' Personal Inquiry PowerPoint

Grade 4-Microplastic	*Grade 5-Fungus*	*Grade 6-Dance*
 	 	 



These three products reflect the integration of critical thinking, creative problem solving, and scientific communication. Students not only present data, but also connect research results to real life, demonstrating mature conceptual understanding and argumentative skills.

The Improve stage serves to strengthen students' reflective and collaborative skills. Teachers and peers provide feedback on the content and presentation based on the ATL rubric. For example, fourth graders added statistical data from the Ministry of Environment after receiving advice to strengthen their arguments, while fifth graders corrected the writing of scientific terms such as spores and hyphae to be more accurate. This stage demonstrates metacognitive regulation when students assess and improve their thinking processes and research strategies (Kuhlthau et al., 2015). The Improve stage is an important moment for students to improve the quality of their analysis and presentation based on feedback from teachers and peers. The feedback provided generally covers three categories, namely content accuracy, argumentative structure, and visual communication quality. Content accuracy feedback takes the form of term corrections and suggestions for additional evidence, while structural feedback helps students clarify the logical flow of their explanations. Visual feedback encourages improvements in layout and diagram clarity. Of the three, content accuracy feedback appears to have the most impact because it triggers more in-depth revisions and improve students' accuracy in constructing arguments. This stage demonstrates how the revision process contributes to strengthening critical thinking skills and academic accuracy in inquiry.

The final stage, Reflection, guides students to write personal reflections using three guiding questions: What did I learn? What was challenging? What will I do next? Most students wrote meaningful reflections about the importance of critical thinking and social responsibility. One student wrote, “I realized that my daily habits can cause pollution. I want to start small by reducing plastic." This reflection illustrates metacognitive awareness and self-agency, where students understand the impact of their thinking process and commit to real behavioral change (Hubbard et al., 2020). This study systematically tracked student reflections in weeks 2, 5, and 7 to understand the relationship between reflection and real behavioral change across three grade levels. In 4th grade, which studied microplastics, students initially only had a general awareness that plastic is harmful, but tracking showed that by week 7, most had begun to take consistent real actions, such as bringing their own containers and reducing their use of single-use plastics. In Grade 5, which studied fungi, a similar pattern was observed: students who initially only wrote down the fact that fungi grow on moist food later reported new practices at home, such as storing food in closed containers and maintaining kitchen hygiene. Meanwhile, 6th grade students learning about contemporary dance showed progress from simply understanding the concept of freedom of movement to more concrete creative actions, such as creating their own movement sequences, practicing improvisation at home, and even showing significant improvement in posture (more upright) in their daily activities. Although this data is partly self-reported, these three findings show a consistent pattern of transition from awareness → intention → action and physical/behavioral change across all grade levels.

Based on the results of observation and reflective analysis, there has been a significant improvement in two key skills. First, students' reflective thinking skills have developed from simply describing facts to deeply analyzing causes and effects. Second, research skills have gradually improved as students begin to show initiative in finding credible sources, evaluating the reliability of information, and compiling data logically in the form of scientific presentations.

Critical thinking skills are evident in the ability to relate research topics to real-life contexts, such as the relationship between everyday plastic use and marine pollution, or the relationship between fungi and human health. On the other hand, scientific communication skills are evident in the way students organize their research results in visual forms such as graphs, diagrams, and logical narratives accompanied by argumentative conclusions.

These findings collectively indicate that the inquiry model enhances ATL because it provides space for exploration, reflection, and collaboration (Pujiana et al., 2024).

Discussion

The findings of this study reinforce that Personal Inquiry is conceptually and empirically aligned with the 21st-century learning paradigm that emphasizes four core competencies, namely Critical Thinking, Creativity, Collaboration, and Communication (Four Cs). The six stages of inquiry (Identify, Inquire, Investigate, Innovate, Improve, Reflection) train these four aspects in an integrated manner. In the initial phase (Identify–Inquire), students are trained to formulate meaningful questions and relate local issues to global concepts, thereby fostering critical thinking and creativity in formulating hypotheses. In the data collection phase (Investigate), they collaborate, select credible sources, and develop information literacy. in the product phase (Innovate– Improve), scientific communication skills are tested through visual presentations (graphs, diagrams, presentations) and written arguments; while the Reflection phase strengthens metacognition and planning for further action. This approach is not only consistent with pedagogical recommendations regarding the development of the 4Cs, but is also supported by empirical studies and systematic reviews that demonstrate the effectiveness of inquiry-based learning in improving 21st-century skills at the elementary to secondary levels (Trilling & Fadel, 2009). In the IB realm, this alignment is further reinforced by the IBO's Approaches to Learning (ATL) framework, which explicitly prioritizes Thinking and Research Skills as well as the domains of communication, social, and self- management—components that naturally develop through the inquiry cycle (IBO, 2020). Therefore, Personal Inquiry deserves to be positioned as a central pedagogical strategy to prepare students to become reflective, communicative, collaborative, and creative learners—competencies that are essential for their adaptation and contribution in the 21st century (Herlinawati, 2024). Although Personal Inquiry shows great potential in developing students' thinking and research skills, but this approach still faces a number of limitations in its application. In the context of schools with highly structured curricula or rigid assessment requirements, teachers often find it difficult to allocate time to carry out all stages of inquiry in depth. In addition, not all students have the literacy readiness or sufficient learning experience to engage in open inquiry, requiring more intensive scaffolding and differentiated learning. Another challenge is the increased workload for teachers in providing feedback and monitoring student progress. These arguments suggest that the implementation of Personal Inquiry requires contextual adaptation, teacher training, and structural support in order to function optimally.

Through the Identify–Investigate stage, students develop Thinking Skills in the form of conceptual, analytical, and reflective abilities, while in the Innovate–Reflection stage they strengthen their Research Skills by designing research questions, selecting credible sources, organizing data, and presenting research results scientifically. Projects such as Microplastics and Fungus show that students not only collect information but also assess its relevance and impact on real life, which indicates the practical application of Approaches to Learning (ATL) in the realm of thinking and research (IBO, 2020). This activity is in line with the 21st-century learning paradigm that emphasizes four key competencies—Critical Thinking, Creativity, Collaboration, and Communication—which are systematically integrated through six stages of Personal Inquiry (Trilling & Fadel, 2009). Students practice critical thinking in analyzing issues, creativity in designing solutions, collaboration in group discussions, and scientific communication through PowerPoint presentations and self-reflection. This process demonstrates that inquiry-based learning encourages students to become self-directed learners with high metacognitive awareness, as well as fostering the IB-PYP learner profile of Knowledgeable, Inquirer, and Reflective.

The results of this study are theoretically consistent with the constructivist approach developed by Jean Piaget and Lev Vygotsky. Piaget emphasized that children construct knowledge through assimilation and accommodation, while Vygotsky emphasized the role of social interaction and scaffolding in cognitive development (Sobita, 2019). In the context of inquiry-based learning, teachers act as scaffolders, providing appropriate cognitive stimuli and support so that students can explore on their own, formulate questions, design research, and ultimately construct their own understanding. For example, students choose topics based on personal interests in Personal Inquiry activities, then conduct research, discuss, and present their findings, demonstrating that they are not merely passive recipients of information but active agents of learning. Research by Ponomariovienė & Jakavonytė-Staškuvienė states that learner agency emerges when students are given the opportunity to choose, plan, and reflect on their own learning, a concept that is very much in line with the results of this study (Ponomariovienė & Jakavonytė, 2025). Although teachers are generally described as facilitators, this analysis found that the substantive role of teachers is as providers of strategic scaffolding tasked with bridging the gap between students' knowledge and the new skills to be mastered. This support is provided systematically throughout the Personal Inquiry cycle through three main actions: guiding questions to encourage conceptual thinking, procedural modeling to facilitate investigation and innovation, and reflective conferences where teachers act as collaborators through in-depth feedback. These three

actions confirm that teachers provide structured support that is gradually reduced to achieve student learning independence, in accordance with the principles of Intentionality and Appropriateness of scaffolding assistance (Retnodari et al., 2020). Thus, inquiry activities not only result in increased academic understanding but also foster awareness that students have control and responsibility over their own learning process (agency). From a practical perspective, this means that the six stages of Personal Inquiry (Identify, Inquire, Investigate, Innovate, Improve, Reflection) not only train cognitive skills but also build the identity of inquirer, reflective, and knowledgeable learners—the main characteristics of the learner profile in the International Baccalaureate Primary Years Curriculum Program (IB-PYP).

In addition to developing cognitive abilities, Personal Inquiry activities also strengthen the affective aspects that play an important role in shaping students' character as global learners. The Personal Inquiry approach not only develops cognitive aspects, but also strengthens students' affective dimensions in every topic studied. In Grade 4, which researched the issue of microplastics, the inquiry process encouraged the development of ecological empathy, as seen in the students' increased concern for the suffering of marine animals and the long-term effects of plastic pollution, which led to a sense of responsibility to change consumption habits. In Grade 5, which studied fungi, the affective dimension emerged in the form of personal awareness and responsibility for personal health and the home environment; students showed greater attention to hygiene, food safety, and the impact of daily behavior on fungal growth. Meanwhile, in the 6th grade class studying contemporary dance, inquiry strengthened cultural appreciation and sensitivity to diversity in bodily expression; students became more appreciative of various styles of movement, understood the cultural values behind dance, and showed empathy for the ways their friends expressed themselves through movement. Overall, inquiry on these three topics shows that learning does not stop at understanding concepts, but also shapes empathy, social awareness, and cultural appreciation as part of students' affective development. This process reflects the integration of knowledge, skills, and attitudes as emphasized in the International Baccalaureate (IB) philosophy, which aims to develop global citizens, individuals who are knowledgeable, reflective thinkers, and have the moral and social awareness to contribute to society (IBO, 2020). Thus, inquiry is not only a means of academic learning, but also a vehicle for shaping deep human values and ecological awareness, where students learn to understand, feel, and act based on the understanding they build themselves. In terms of scalability, the Personal Inquiry model has the potential to be applied to large classes (30–36 students) with some adjustments. Strategies such as rotating conference schedules, inquiry mentoring in small groups, and the use of digital technology to provide feedback can help maintain the quality of the inquiry process. However, effective implementation still requires teacher training related to the role of facilitators and the use of structured ATL rubrics so that monitoring of student skill development remains consistent and measurable.

CONCLUSION

Based on the results of this study, the implementation of Personal Inquiry at an international school in Bekasi has proven to be effective in developing Thinking Skills and Research Skills as part of Approaches to Learning (ATL) in upper IB-PYP students. Through six stages of inquiry, namely Identify, Inquire, Investigate, Innovate, Improve, and Reflection, students learn to construct knowledge based on personal interests and real experiences. This process encourages them to not only understand concepts, but also apply them in the context of everyday life through independent research, collaboration, and deep reflection.

The Personal Inquiry activity shows that students are able to transform from passive learners into active learners who have learner agency. They demonstrate reflective, analytical, and creative thinking skills, as well as systematic and independent research skills. The final products, in the form of PowerPoint presentations such as Microplastics and How to Reduce Plastic Pollution, Fungus and Its Role in Nature, and Dance as a Universal Expression, illustrate their ability to integrate critical thinking, scientific communication, and social awareness of environmental and cultural issues.

This study also reinforces Piaget's (1970) and Vygotsky's (1978) constructivist theory that meaningful learning occurs when students actively construct knowledge through experience and social interaction. These findings are in line with the IB philosophy that emphasizes the development of reflective, caring, and knowledgeable global citizens (IBO, 2020).

The practical implications of this research indicate that teachers need to expand the use of Personal Inquiry in various subjects as a reflective learning strategy that combines research, communication, and collaboration. Schools are also advised to provide technological support and structured ATL rubrics so that Future research prospects can be directed at the application of Personal Inquiry in the context of national or non-IB schools to see its adaptability to the Merdeka Belajar curriculum. In addition, further research can explore the relationship between Personal Inquiry and the development of other IB Learner profiles such as Communicator and Principled Learner, so that this model can be developed more broadly in 21st-century learning in Indonesia.

As a practical implication, this study recommends several strategies that teachers can apply to strengthen

students' thinking and research skills in the inquiry process. Teachers can use question stems such as "To what extent...?" or "Why does this happen...?" to encourage students to generate higher-level questions. In addition, providing weekly research logs can help students monitor the sources they use while practicing their information evaluation skills. The peer feedback process can also be improved through the use of simple protocols such as TAG (Tell–Ask–Give) so that students become accustomed to providing constructive feedback. In addition, teachers are advised to provide mini-lessons on digital literacy, including how to assess the credibility of sources and distinguish valid information from dubious information. Through this series of practices, students' critical thinking and research skills can be developed in a more focused and consistent manner.

Personal Inquiry In the future, several recommendations can be used as a focus for further research. Further research needs to develop valid and reliable quantitative instruments to measure IB attributes such as Communicator and Principled Learner, so that the impact of learning can be observed in a more measurable way. In addition, comparative studies between the implementation of Personal Inquiry in IB schools and non-IB schools as well as the Merdeka Curriculum are important to see the relevance and adaptability of this approach in the context of national education. Longitudinal research is also needed to trace long-term changes in student behavior, especially related to environmental literacy and cultural empathy developed through the inquiry process. In addition, analysis of teacher training needs is a crucial aspect of improving educators' capacity to implement ATL-based inquiry consistently, effectively, and sustainably.

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