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IJORER, Vol. 6, No. 5, September 2025
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Analysis of pedagogical competences in Natural and Social Sciences (IPAS): A case study at SDN Ngaliyan 04

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DOI: https://doi.org/10.46245/ijorer.v6i5.890

Sections Info

Article history:
Submitted: May 15, 2025
Final Revised: June 26, 2025
Accepted: July 01, 2025
Published: September 30, 2025

Keywords:
Pedagogic Competence; Natural and Social Sciences (IPAS) Learning; Upper Primary Teacher; Primary School

ABSTRACT

Objective: This study analyzes the pedagogical competence of upper primary teachers in natural and social sciences (IPAS) at SDN Ngaliyan 04, identifies encountered barriers, and explores strategies for improvement. **Method**: Using a descriptive qualitative approach, the research involved grade IV, V, and VI teachers and the principal. Data were collected through structured interviews, observations, and documentation. Credibility was maintained through source and method triangulation. Data analysis followed the Miles and Huberman model: data collection, condensation, presentation, and drawing conclusions. **Results**: Findings suggest that teachers' pedagogical competence is generally adequate; however, challenges remain, including limited resources, lack of school support, uneven ICT proficiency among teachers, and diverse student characteristics. Enhancing competence includes targeted training, collaborative activities, mentoring, and self-reflection. **Novelty**: This study provides a new perspective by examining upper primary teachers' pedagogical competence in IPAS at SDN Ngaliyan 04 and emphasizing the effects of limited infrastructure and ICT utilization.

INTRODUCTION

Based on the Regulation of the Minister of National Education of the Republic of Indonesia Number 16 of 2007 (Permendiknas No.16/2007) on Standards for Academic Qualifications and Teacher Competencies, there are various competencies that teachers must possess: pedagogical, personality, professional, and social competencies. The term "pedagogical competence" refers to a teacher's ability to manage, deliver, and assess the learning process effectively to support students' development and learning (Hasanah et al., 2023). Mastery of pedagogical competence is a key factor that influences teachers' success in delivering quality education (Amaliah et al., 2024), because a teacher needs to experience a change in role, shifting from merely delivering subject matter to becoming a role model capable of inspiring and motivating students to develop their creativity (Supa'at & Ihsan, 2023).

Natural and social sciences (IPAS) are subjects that discuss living organisms, inanimate objects, interactions, and human life in their environment (Betari, 2023). In the Merdeka Curriculum, IPAS learning is introduced at upper grades because, at this stage, students have developed a more mature cognitive ability, allowing them to connect new knowledge with everyday experiences more meaningfully. The implementation of IPAS at SDN Ngaliyan 04 aligns with Jean Piaget's theory of cognitive development, especially the Concrete Operational stage, typically experienced by children aged 7 to 11 years. At this stage, students start to think logically about concrete objects and events, including understanding concepts such as conservation, classification, and cause-and-effect relationships (Nainggolan & Daeli, 2021). This cognitive maturity enables students to study scientific phenomena systematically, making upper primary school the right time

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to deepen their understanding of natural and social sciences. This developmental framework supports the main goals of IPAS learning, which are to foster students' curiosity about various phenomena in their environment and to develop scientific attitudes such as asking questions, critical thinking, and reasoning based on evidence (Ferdiansyah et al., 2024). By encouraging students to observe, ask questions, and experiment, IPAS helps shape a scientific mindset that is essential for lifelong learning.

Information and Communication Technology (ICT) and learning media are also important to IPAS education. Besides enhancing access to information, ICT enriches the learning process by offering interactivity, collaboration, and learning opportunities that can be customized to students' needs. Digital tools like simulations, virtual laboratories, and multimedia presentations help make abstract scientific concepts more tangible and easier to grasp (Ghory & Ghafory, 2021). Furthermore, ICT supports a student-centered learning paradigm, where teachers act as facilitators guiding students to actively develop their understanding, rather than merely as content providers (Rivalina & Siahaan, 2020).

Permendiknas No. 16/2007 outlines ten pedagogic competencies that teachers must possess, including implementing educational learning, utilizing information and communication technology, and conducting assessment and evaluation. These three competencies are interconnected in creating effective education. ICT supports interactive, accessible, and engaging learning, while assessment and evaluation measure learning success more efficiently through technology. Together, they help educators improve teaching quality continuously and better meet students' needs in the modern era.

Research on teachers' pedagogical competence has been conducted before. A previous study at Muhammadiyah Sokonandi Primary School showed that teachers have met most aspects of pedagogical competence in music learning according to the Curriculum 2013. However, there are still weaknesses in understanding theory and developing students' musical potential (Siswanti & Sularso, 2024). This finding aligns with research at SD Negeri 2 Pejawaran, where teachers have applied pedagogical competence in multiliteracy learning but still face challenges due to limited library books; increasing the supporting facilities is necessary (Sukma et al., 2024).

Implementing ideal pedagogic competence and utilizing technology in learning do not always proceed smoothly. Despite mandatory policies, many teachers continue to rely on traditional methods due to limited resources, time, and financial support. SDN Ngaliyan 04 is a primary school located on Jl. Raya Pucung, Ngaliyan, Ngaliyan Sub-district, Semarang City, Central Java. When observing the learning process of IPAS, we found that teachers in the upper grades (IV, V, and VI) tend to use conventional teaching methods. Moreover, the facilities and infrastructure at SDN Ngaliyan 04 still do not meet the standards set by the Regulation of the Minister of National Education of the Republic of Indonesia Number 24 of 2007 (Permendiknas No.24/2007). The limited facilities at SDN Ngaliyan 04 remain a major concern for the researchers because one of the pedagogic competencies for teachers is the use of information and communication technology for learning. As a result, the learning process becomes monotonous, and teacher centered.

While previous research has broadly addressed pedagogical competence, few studies have critically examined how limited infrastructure and ICT access specifically affect IPAS teaching in primary schools. This study provides a more critical and comprehensive perspective by not only assessing teachers' pedagogical competence in the context of

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IPAS subjects but also highlighting the real impact of limited facilities, infrastructure, and access to technology on teaching practices at SDN Ngaliyan 04. By exploring the interaction between limited resources and teachers' ability to design and implement effective learning, this research offers a new perspective that stresses the importance of understanding the entire school environment when developing pedagogical competence. The study's results are expected to fill the knowledge gap regarding strategies to enhance pedagogical competence in resource-limited school settings, thereby offering practical insights to improve the quality of IPAS education in primary schools facing similar challenges.

Therefore, this study aims to analyze the pedagogical competence of upper-grade teachers at IPAS in SDN Ngaliyan 04, identify the challenges they encounter, and examine efforts to improve their pedagogical competences, especially in the context of limited resources and ICT use.

RESEARCH METHOD

General Method

This study used a descriptive qualitative approach to analyze the pedagogical competence of upper-grade teachers at SDN Ngaliyan 04.

Participants

The primary participants were teachers of grades IV, V, and VI, with the school principal acting as an additional informant.

Instrument and Data Type

The instrument used in this study included both open and closed questions, totaling 50 items related to teacher pedagogical competence, the challenges teachers face in developing Natural and Social Sciences (IPAS) learning, and efforts that can be made to enhance teachers' pedagogical competences. The types of data collected in this study are:

a. Primary data
   Primary data consists of data collected directly by the researcher from original sources. This data is also called original or new data and is up to date. To gather primary data, the researcher must collect it firsthand. Techniques that can be used by the researcher to gather primary data include structured interviews.

b. Secondary data
   Secondary data refers to data not collected directly by the researcher. This information includes documents such as lesson plans, syllabi, annual programs, semester programs, IPAS learning materials, student attendance records, and other official archives.

Place and Time

The study was conducted at SDN Ngaliyan 04 during the even semester of the academic year (February 27, 2025 - March 20, 2025).

Data Collection

Interviews were conducted with teachers and the principal to gather detailed information on pedagogical competences, challenges teachers face in developing Natural and Social Sciences (IPAS) learning, and potential strategies for improving teachers' pedagogical

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abilities. Observations focused on how teachers implement IPAS learning, while documentation supported and enhanced the field data.

Ethical Consideration

In conducting this qualitative study, ethical considerations were prioritized. Before starting data collection, the researcher obtained informed consent from all participants, ensuring they understood the objectives, procedures, and their rights, including confidentiality and the right to withdraw at any time without penalty. Throughout the study, participant anonymity was preserved, and data was securely stored to protect their privacy. These ethical principles aimed to respect participants' rights and build trust in the study results.

Data Analysis

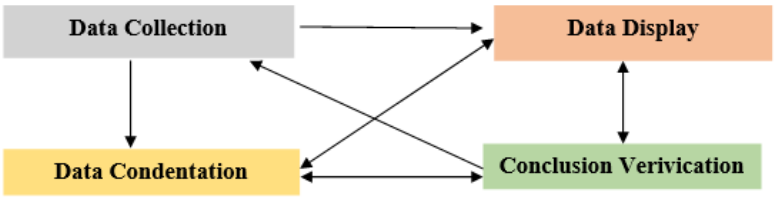

Figure 1. Miles and Huberman's model data analysis technique (Ahmad & Muslimah, 2021)

Figure 1 shows Miles and Huberman (1992) mapping the qualitative data analysis process into several main stages: data collection, condensation or reduction, data presentation, and conclusion drawing or verification. After collecting the raw data, the researcher carried out the reduction process by selecting and focusing on information relevant to teachers' pedagogical competencies. The simplified data was then organized and presented in a clear structure to help with interpretation. Next, conclusions were drawn and verified by cross-checking different data sources to ensure the accuracy and credibility of the study results. In analyzing teachers' pedagogical competences, researchers used indicators of SD/MI teachers' pedagogical competences based on Permendiknas No. 16/2007, which include implementing educational learning; using information and communication technology for teaching and learning purposes; and conducting assessments and evaluations of the learning process and outcomes, as shown in Table 1.

Table 1. Indicators of Pedagogical competences

Teacher's pedagogical competences	Indicators of teacher's pedagogical competences
a. Implementing educational learning	1. Understanding the principles in designing educational learning. 2. Developing various components of the lesson plan. 3. Developing a complete learning plan for classroom, laboratory, and field activities. 4. Carrying out educational learning in the classroom, laboratory, and field. 5. Using learning media that are appropriate to the characteristics of students and the five subjects in SD/MI to achieve overall learning objectives.

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Teacher's pedagogical competences	Indicators of teacher's pedagogical competences
	6. Making transactional decisions within five subjects in SD/MI in accordance with the developing situation.
b. Using information and communication technology for teaching and learning purposes.	Using technology information and communication technology in the learning process.
c. Conducting assessments and evaluations of the learning process and outcomes.	1. Understanding the principles of assessment and evaluation of learning processes and outcomes in accordance with the characteristics of five SD/MI subjects. 2. Determining the aspects of learning processes and outcomes that are important to assess and evaluate according to the characteristics of the five SD/MI subjects. 3. Determining procedures for assessing and evaluating the learning process and outcomes. 4. Developing assessment instruments and evaluating the learning process and outcomes. 5. Administering continuous assessment of learning processes and outcomes using various instruments. 6. Analyzing the results of the assessment of learning processes and outcomes for various purposes. 7. Evaluating the learning process and outcomes.

Source: Permendiknas No. 16/2007

Data Validity

Validity was confirmed through the triangulation of data sources and methods, enhancing the comprehensiveness and accuracy of findings (Susanto & Jailani, 2023).

RESULTS AND DISCUSSION

Results

Teacher's Pedagogical competences

a. Implementing Educational Learning.

The implementation of educational learning at SDN Ngaliyan 04 emphasizes developing student potential through active learning experiences, utilizing interactive technology, and adjusting teaching methods to fit student characteristics and abilities. This is based on interview and observation data from informants RD (Grade IV teacher), BG (Grade V teacher), and SR (Grade VI teacher). Teachers used a student-centered learning approach by creating flexible and varied lesson plans. They focused on active and engaging learning experiences through methods such as project-based learning, problem-based learning, group discussions, and independent exploration. The use of technology and interactive media was observed as a way to boost student engagement and comprehension. Teachers also implemented differentiation in teaching, tailoring strategies and tasks to match students' characteristics and abilities (Interview, 27 February - 20 March 2025).

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The learning activities conducted by upper-grade teachers at SDN Ngaliyan 04 in IPAS learning were designed to be interactive, inspiring, fun, and challenging. They aimed to motivate active participation and provide ample space for students. Observed activities included singing, watching educational videos, ice-breaking, using interactive teaching aids, and integrating technology. Additionally, the teachers demonstrated fundamental teaching skills such as opening and closing lessons, questioning, offering reinforcement, explaining concepts, varying instructional methods, managing the classroom, guiding small group discussions, and teaching both small groups and individual students. Observations took place from February 27 to March 20, 2025.

b. Using information and communication technology for teaching and learning purposes

The use of information and communication technology (ICT) for learning involved digital tools and platforms such as multimedia, online applications, and electronic learning resources to improve interactivity, effectiveness, and accessibility in teaching and learning. This was observed and reported by informants RD, BG, and SR. Teachers used various digital platforms, including interactive presentations, videos, and online learning applications, to deliver materials. Constraints like limited access to devices among students were noted, prompting teachers to adapt by providing printed materials and offering extra training to improve students' technical skills. Teachers also gave instructions on digital etiquette and internet safety and involved parents in supporting learning at home (Interview, 27 February - 20 March 2025). Observations of learning activities in upper grades (IV, V, and VI) confirmed these practices:

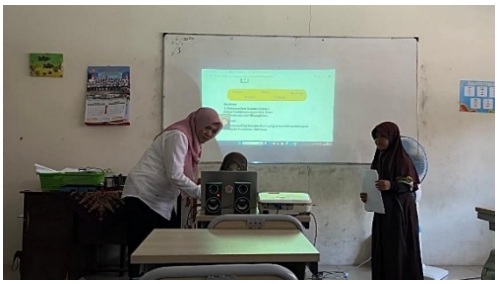

Figure 2. IPAS learning activities in grade IV at SDN Ngaliyan 04 using YouTube Edu and Liveworksheets, with physical worksheets as an alternative.

Based on Figure 2, the grade IV teacher (RD) is teaching the subject of natural and social sciences (IPAS) with the topic of Indonesian Cultural Wealth. First, RD uses YouTube Edu as an engaging audiovisual medium that can attract and motivate students visually and auditorily, aligning with their various learning styles. This also helps make abstract cultural concepts more concrete and easier to understand. Additionally, RD uses the Liveworksheets platform as an interactive tool for students to work on their worksheets with different activities such as drag and drop, matching, and short answers. Considering the limited technological resources among students, RD also provides physical worksheets as an alternative. During the demonstration session, students had the opportunity to practice using the worksheets on the Liveworksheets platform. This activity aims to introduce technology use in learning from an early age, encouraging students to become more interested in and accustomed to tech-based learning.

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Figure 3. IPAS learning activities in grade V at SDN Ngaliyan 04 combining Canva digital media, physical aids, and Wordwall for an interactive quiz.

Figure 3 shows that the Grade V teacher (BG) teaches the subject of natural and social sciences (IPAS) with the topic of the Human Digestive System. BG uses a learning style that enhances student effectiveness and engagement. First, BG combines Canva-based digital learning media with simple props like posters of the human digestive system and food-shaped magnetic ornaments to help students understand abstract concepts more concretely and visually. The magnetic ornaments are actively moved above the poster depicting the digestive system, allowing for an interactive explanation of the food digestion process. Second, BG incorporates technology by using the Wordwall application for formative assessment, providing an engaging learning experience. Wordwall's features allow students to preview questions without immediately answering, creating a smooth quiz flow. Students write their answers in notebooks, helping bridge the technology gap among students and ensuring that the learning process remains inclusive, interactive, and equitable. Feedback from students indicated increased enthusiasm and motivation during the quiz, further confirming the effectiveness of this approach.

Figure 4. IPAS learning activities in Grade VI at SDN Ngaliyan 04 using Canva digital media and whiteboards to support interactive lessons despite limited technology.

In Figure 4, the Grade VI teacher (SR) teaches the subject of natural and social sciences (IPAS) with the topic of Knowing the Solar System. The learning style used by SR offers several advantages that enhance students' learning effectiveness and participation. First, the use of Canva-based learning media that is attractively designed and supported by LCD technology enables clear visual presentation of the material, making it easier for students to understand. This helps accommodate different learning styles, especially visual learners. Second, combining digital media with traditional whiteboards provides flexibility in the learning process. By still using whiteboards, SR can adjust explanations directly and interactively—for example, when asking students to fill in and write the names of the planets in the solar system. This approach also addresses the limited technological resources some students may have, ensuring that learning remains inclusive and engaging. Third, this method encourages active student involvement

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through direct interaction with the material and the teacher, which helps boost motivation and memory. The use of technology is not just a substitute but a complement that enriches the learning experience.

The three teaching styles involving technology demonstrate different but complementary approaches to enhancing learning quality (Observation, 27 February - 20 March 2025).

c. Conducting assessments and evaluations of the learning process and outcomes

Assessing and evaluating the learning process and outcomes involves comprehensively measuring students' achievements across cognitive, affective, and psychomotor domains using various methods such as tests, observations, projects, and formative and summative assessments. This helps monitor students' progress, adjust teaching strategies, and enhance the effectiveness of the teaching and learning process. This approach is based on interviews and observations of learning activities with informants RD, BG, and SR, which include the Grade IV teacher, the Grade V teacher, and the Grade VI teacher. Teachers highlight the importance of a comprehensive assessment in the learning process, covering cognitive, affective, and psychomotor aspects. They employ diverse assessment methods, including formative and summative assessments, to evaluate students' understanding of concepts, critical thinking, communication, and collaboration skills. Assessment is conducted continuously through observations, written tests, projects, and group discussions, allowing teachers to systematically monitor students' progress and modify teaching strategies based on their needs. By analyzing assessment results and providing constructive feedback, teachers can identify students' learning difficulties, offer enrichment or remedial support, and implement necessary improvements to boost learning effectiveness. The advantages of using this comprehensive assessment approach for students include increased motivation to learn, as they feel personally supported; understanding of stronger concepts through timely feedback; and the development of social and emotional skills through the assessment of affective and psychomotor domains. Therefore, assessment is not only a tool for evaluation but also a means to support students' holistic development sustainably (Interview, 27 February - 20 March 2025).

Challenges in Developing Learning Programs

SDN Ngaliyan 04 faced several challenges in developing learning, including limited resources, lack of support from the school environment, issues with teachers' skills and knowledge, and concerns related to student characteristics. This information was collected through interviews with informants RD, BG, SR, and DN (the school principal). First, limited resources were identified, especially in equipment and technology such as projectors and computers. Inventory data indicated the school had only one LCD projector for technology-based learning, which required sharing among teachers.

Secondly, there is a lack of support from the school environment. This school has several key facilities that aid the teaching and learning process. The school building includes six classrooms, one teacher's room, one principal's room, and one library. Additionally, there is a prayer room, a School Health Enterprises (UKS), three bathrooms for female students, two for male students, and a special bathroom for teachers. SDN Ngaliyan 04 is also equipped with a healthy canteen and a motorbike parking area for teachers and staff. However, SDN Ngaliyan 04 has some shortcomings in terms of facilities and infrastructure that could better support teaching and learning. According

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to available information, the school does not yet have a science or computer laboratory, which is important for practical and technological knowledge (Observation, 27 February - 20 March 2025). The lack of these facilities is due to the limited School Operational Assistance (BOS) funds allocated to SDN Ngaliyan 04, which are based on the number of students enrolled. Meanwhile, the school has approximately 104 students, resulting in relatively small funding. This is based on the interview (20 March 2024) with informant DN, the principal of SDN Ngaliyan 04.

> *"Ya untuk keterbatasan di sekolah kami tentunya keterbatasan sarana, prasarana dan anggaran yang minim yang diperoleh karena jumlah siswa kami juga masih minim."*
> *("Yes, the limitations in our school are, of course, limited facilities, infrastructure, and the minimal budget obtained because the number of our students is also still minimal.")*

Third, teachers' skills and knowledge in using technology were reported as limited. This condition was caused by a lack of adequate technological facilities and infrastructure, which led to uneven mastery of technology among teachers. As a result, the use of technology in the learning process appeared simple and not optimal.

Fourth, challenges related to student characteristics included diverse learning styles, varying levels of motivation, and different socio-economic backgrounds. Socio-economic conditions and parenting styles were identified as factors influencing children's engagement in learning. Some parents viewed school mainly as childcare, which led to less active involvement and oversight of children's learning activities at home. This reportedly resulted in lower student motivation and more irregular school attendance. Additionally, different socio-economic backgrounds contributed to disparities in students' access to and receipt of educational support (Interview, 27 February - 20 March 2025).

Efforts to Improve Pedagogical competences

SDN Ngaliyan 04 undertook various efforts to improve the pedagogical competence of its teachers. These efforts, identified through interviews with informants RD, BG, SR, and DN, included facilitating training and workshops, fostering collaboration and learning communities, providing mentoring and coaching, and encouraging reflection and self-evaluation.

Firstly, training and workshops were identified as effective when practice-based and relevant to classroom needs, such as the use of technology, active learning methods, and classroom management. SDN Ngaliyan 04's schoolwork plan detailed competency development programs for teachers and education personnel, focusing on training in educational technology, learning differentiation, and strategies to improve student literacy.

Secondly, collaboration and learning communities were observed through teachers' participation in teacher working group (KKG) activities, held weekly at the cluster or sub-district level. These forums provided opportunities for teachers from various schools to discuss problems, share experiences, and find solutions. Schools also held weekly briefings for communication and coordination regarding learning issues and pedagogical development.

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Third, mentoring and coaching efforts involved a peer tutor model, where senior or more experienced teachers provided direct personal guidance. This process included observing teaching, offering specific and data-driven constructive feedback, and suggesting practical solutions. Mentoring also included reflection and guidance sessions aimed at helping teachers understand classroom dynamics and improve their teaching skills.

Finally, reflection and self-evaluation were carried out through keeping teaching journals, which recorded successes and challenges during the learning process. Teachers also held regular reflective discussions to periodically assess their performance and gathered direct feedback from students and peers to obtain objective perspectives on teaching effectiveness. The results from these evaluations guided the planning of professional development (Interview, 27 February - 20 March 2025).

Discussion

Teacher's Pedagogical Competences

The findings show that upper-grade teachers at SDN Ngaliyan 04 demonstrate commendable pedagogical competences in implementing educational learning by fostering a student-centered approach environment. Zulkarnain et al. (2025) highlighted that a conducive and engaging learning atmosphere tailored to students' needs is paramount for optimal academic and potential development. In IPAS (Natural and Social Sciences) classes at SDN Ngaliyan 04, upper-grade teachers conduct learning activities that align with national educational standards. These activities are designed to be engaging, stimulating, and enjoyable, fostering active student involvement and providing ample opportunities for participation, consistent with Regulation of the Minister of Education, Culture, Research and Technology of the Republic of Indonesia Number 16 of 2022 (Permendikbudristek No.16/2022) on the Process Standards in Early Childhood Education, Primary Education, and Secondary Education, specifically, Article 9, Paragraph 1. The observed practices, such as creating flexible lesson plans and focusing on active learning experiences (project-based learning, problem-based learning, group discussions, and independent exploration), directly align with constructivist principles. These principles strongly resonate with Piaget's emphasis on teaching children based on their cognitive development stages, where the teacher acts as a facilitator and motivator to enrich experiences (Nainggolan & Daeli, 2021). The use of differentiated learning, where teaching methods and activities are tailored to students' characteristics and abilities, further supports this student-centered approach. This practice is consistent with Qorib (2024), who posited that differentiated learning places students at the core of the learning process, thereby boosting motivation.

Furthermore, it supports Howard Gardner's theory of multiple intelligences, which acknowledges different types of intelligence and unique combinations within individuals (Goyibova et al., 2024). By designing learning experiences that cater to different intelligences, teachers at SDN Ngaliyan 04 improve learning effectiveness and motivation. This adaptation of content, processes, products, and learning environments, as described by Nahdhiah & Suciptaningsih (2024), supports an individualized and inclusive educational approach, contributing to effectively achieving learning objectives. The observed use of problem-based learning (PBL) and project-based learning (PjBL) is also well-supported by Karimi et al. (2023), emphasizing their role as student-centered approaches that enable students to acquire knowledge and skills through solving real-

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p-ISSN : 2721-852X ; e-ISSN : 2721-7965
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world problems and participating in interactive projects. Essentially, the pedagogical practices at SDN Ngaliyan 04 show a strong dedication to creating a dynamic and responsive learning environment that addresses the diverse needs of students.

The integration of technology in learning, as observed at SDN Ngaliyan 04, is crucial for fostering student engagement and maintaining focus, as noted by Haleem et al. (2022). In the context of 21st-century education, preparing educators to effectively incorporate technology for innovative learning is a common imperative. However, the successful utilization of technology hinges significantly on teachers' pedagogical competences in integrating it into the teaching-learning process (Santos & Castro, 2021 in Mariscal et al., 2023). This underscores the continuous need for teachers to enhance their mastery and operational skills in ICT, as advocated by Rudini & Saputra (2022). The findings show that teachers at SDN Ngaliyan 04 use various digital platforms such as Wordwall, Liveworksheets, Canva-based learning media, and YouTube. This aligns with research that shows the effectiveness of such digital media in enhancing student motivation, engagement, and achievement (Ariyani et al., 2025; Astutie, 2024; Setiawati et al., 2024; Widiantho et al., 2023). For example, Canva supports visual learning and helps make abstract ideas more concrete, catering to different learning styles through differentiated instruction. Wordwall's gamified quizzes encourage active participation and problem-solving. However, the observations also revealed challenges like unequal access to devices among students. Teachers addressed this by adjusting activities, such as having students write answers by hand, to promote inclusivity. Liveworksheets offer immediate feedback, aiding adaptive learning, but their effectiveness depends on students' digital literacy. Similarly, YouTube provides a flexible tool for independent learning, though its open nature requires teachers to guide students toward relevant and accurate content. These observations suggest that while digital platforms greatly enhance learning and support student-centered teaching, their success relies on infrastructure, access, and teacher proficiency. The adaptive strategies used by teachers at SDN Ngaliyan 04 show a growing pedagogical skill in incorporating technology, balancing innovation with practical concerns for equity.

In terms of assessment and evaluation, teachers at SDN Ngaliyan 04 conduct both formative and summative assessments through written tests, observations, and projects to monitor students' development continuously. Summative assessment is an evaluation carried out after the completion of learning programs and is considered final. Meanwhile, formative assessment involves collecting data to evaluate students' progress in understanding competencies or materials that have been learned (Adinda et al., 2021). Formative assessment monitors students' progress regularly and help teachers adjust their teaching methods. Summative assessment is used to measure students' final achievement through exams, major assignments, or projects. By combining the two types of assessment, teachers can implement varied teaching methods, provide comprehensive support for students' development, and make informed decisions regarding learning strategies and curriculum design (Chand & Pillay, 2024).

The ability of teachers to analyze assessment results to identify students who have mastered the material versus those who require additional support is critical, as highlighted by Asrul et al. (2022). Based on the results of the assessment analysis, teachers can group students into two categories: students who need remedial programs and students who are ready to continue learning to the next stage. Remedial programs involve special teaching methods aimed at students with learning difficulties and low

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p-ISSN : 2721-852X ; e-ISSN : 2721-7965
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scores. In contrast, enrichment programs are provided to students who learn quickly and achieve high scores as a form of additional learning (Wahyu et al., 2021). Overall, both activities aim to expand knowledge and increase student engagement, for those who have not yet achieved mastery and those who have reached it (Sari et al., 2021). The evaluation practices align with Bloom's principles of continuous and varied assessment (Jha, 2023), which emphasize tailoring assessment tasks to taxonomic levels to measure cognitive skills mastery and teaching effectiveness. This approach enables targeted feedback and continuous improvement of teaching strategies. Therefore, teachers at SDN Ngaliyan 04 demonstrate improved pedagogical competence in assessment, effectively managing learning processes and outcomes to enhance overall learning quality.

The pedagogical competence of upper-grade teachers at SDN Ngaliyan 04 demonstrates strong efforts to create a conducive and engaging learning environment, design instruction focused on student needs and characteristics and apply diverse assessment methods.

Challenges Faced by Teachers in Developing Learning Programs

Despite notable efforts, teachers at SDN Ngaliyan 04 face significant challenges in developing learning. The main issues include limited resources and insufficient support for the school environment. The lack of essential equipment like projectors and computers—only one LCD projector for the entire school—greatly hinders technology-based learning. The absence of dedicated science and computer laboratories means that learning remains mostly theoretical, which can reduce students' conceptual understanding and limit opportunities for hands-on, experimental, or practical learning. This aligns with Rismayani et al. (2021), who emphasize the importance of making the best use of teaching aids and useful tools to boost student motivation and interest. The lack of science and computer labs at SDN Ngaliyan 04 also makes it hard for teachers to fully incorporate technology into their lessons. Additionally, it affects teachers' skills in managing and using new technologies and applying innovative teaching methods. Previous research noted that one barrier to ICT integration in 21st-century learning is inadequate infrastructure, such as the limited availability and quantity of technological devices, especially in remote-area schools (Sajdah et al., 2025). Communities in these areas typically have low economic levels, which makes funding school infrastructure development difficult (Yusup, 2024). This resource shortage impacts not only the adoption of innovative teaching approaches but also teachers' technological skills and knowledge. The lack of proper facilities leads to uneven mastery of technology among teachers, resulting in simpler and less effective technology integration.

Another significant challenge is the variation in students' learning styles (visual, auditory, kinesthetic) and their socio-economic backgrounds, which pose a big challenge in creating inclusive learning. Teachers need to adapt learning methods to meet the different needs of students, but with limited resources, this becomes difficult to implement effectively. Additionally, students' low motivation to learn and behavioral issues also hinder learning. Some students have trouble concentrating, while others lack parental support in the learning process. The lack of parental involvement in children's education impacts students' participation in learning activities. Previous research concluded that the more support parents provide, the more students' motivation to learn increases (Ardiansyah et al., 2023). Therefore, parents are expected to act as the main

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p-ISSN : 2721-852X ; e-ISSN : 2721-7965
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support system to keep students excited and motivated in their learning process (Anggraini & Sukartono, 2022).

Efforts Made to Improve Pedagogical Competence

SDN Ngaliyan 04 has implemented various efforts to improve teachers' pedagogical competence, demonstrating a proactive approach to professional development. Training sessions and workshops are key to these initiatives, focusing on practical content relevant to classroom needs, such as technology integration, active learning techniques, and classroom management. This aligns with Fitriawati (2024), who emphasized the vital role of training in responding to technological updates, curriculum changes, and complex student needs. Professional development programs have been proven to significantly enhance teaching abilities, including pedagogical skills and technology use (Manjakani, 2024). However, the effectiveness of these training programs heavily relies on a comprehensive needs assessment to tailor the training content properly.

Collaboration among teachers fosters the exchange of ideas and experiences in developing more innovative learning methods. The teachers' working group (KKG) forum at the sub-district and school levels provides a platform for sharing ideas and collaboratively solving problems. Previous research has indicated that teachers' working groups play a vital role in enhancing pedagogical competence as well as providing a forum for teachers to collaborate, share knowledge, and address learning challenges. Teachers' abilities in lesson planning, teaching strategies, and student assessment can be strengthened through these groups (Feriansyah et al., 2024). These efforts align with Bandura's social learning theory, highlighting the reciprocal interaction among the environment, personal factors, and behaviors in the learning process (Mujahidah & Yusdiana, 2023).

Mentoring is a process of guidance to enhance performance by transferring knowledge, experience, and skills from more experienced individuals to those in the same field (Sugiarti, 2024). Mentoring involves providing guidance to new or less experienced teachers through peers, senior teachers, and principals. To improve teachers' pedagogical competence, principals play a role in offering direction and guidance in managing the learning process, planning learning activities, and evaluating student learning outcomes (Sartika, 2023). Meanwhile, peer mentoring is a collaborative professional relationship between colleagues aimed at developing capacity and improving practice, with mentors sharing expertise to support mentees' continuous learning (Ridgway et al., 2024). Additionally, teachers can self-evaluate their skills through online training or discussions with more experienced peers. This self-evaluation helps to identify teacher competencies that can serve as a basis for school principals or professional development coordinators to design continuing professional development programs that teachers need to implement (Muslim et al., 2018).

CONCLUSION

Fundamental Findings: The pedagogical competence of upper-grade teachers at SDN Ngaliyan 04 in IPAS learning is notably good, demonstrated by their ability to understand student characteristics, design active and differentiated lessons, effectively use technology, and conduct continuous assessments. However, teachers face significant challenges, including limited resources, inadequate supporting facilities, uneven ICT skills among staff, and variations in student characteristics. Efforts to improve

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p-ISSN : 2721-852X ; e-ISSN : 2721-7965
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competence are being made through targeted training, collaborative learning in Teacher Working Groups (KKG), direct mentoring, and regular self-evaluation. **Implications:** This study is highly important for education as it provides a valuable reference for policymakers. It can guide the development of more effective training programs, workshops, and strategies for strengthening learning communities, specifically tailored to meet the needs of teachers in schools with limited facilities. Furthermore, the findings can provide practical insights for other schools looking to adopt and implement effective strategies for improving pedagogical competence in similar settings.

Limitations: This study was conducted at a single school (SDN Ngaliyan 04), which limits its generalizability. As a qualitative, descriptive study, it depends on subjective interpretations and self-reported data, which may introduce researcher and social desirability biases. The presence of an observer could have influenced teacher behavior (Hawthorne effect). The study provides a snapshot of pedagogical competence without quantitatively measuring improvements or their effects on student outcomes, and it lacks empirical evidence of causality.

Future Research: Future studies should compare different schools with diverse backgrounds, such as urban versus rural areas or varying ICT infrastructure levels. These studies could explore factors like teacher ICT skills, the availability of learning materials, and student diversity to better understand their combined effects on pedagogical competence. Additionally, there is a need for quantitative research to empirically assess how improvements in pedagogical competence lead to tangible student outcomes, such as academic achievement and engagement. This would offer stronger, more generalizable evidence to guide educational policy and practice.

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p-ISSN : 2721-852X ; e-ISSN : 2721-7965
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p-ISSN : 2721-852X ; e-ISSN : 2721-7965
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