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Analysis of Weaknesses in Hybrid Learning : A Case Study on Ilmu Kealamiahan Dasar (IKD) Courses

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Abstract: This study analyzed the weaknesses of hybrid learning implemented in IKD courses. This qualitative descriptive research was conducted within the Elementary School Teacher Education Program (PGSD) during preparation, planning, instruction, and learning outcomes assessment. Qualitative data were collected using observation and documentation methods. The collected data were analyzed using qualitative analysis techniques as proposed by Miles and Huberman. The weaknesses of hybrid learning identified in this study include coordination with senior lecturers whose expertise is not in science education, delays in submitting the SIMAKSI to the BKSDA, and limited CPMK to the science process skills (SPS). These objectives only encompass basic SPS, the absence of guidelines for report preparation, science topics restricted to ecosystems, multitasking challenges, a learning interval of only two weeks, assessment instruments relying solely on tests, and the implementation of tests conducted online. The findings of this study are expected to serve as evaluative material aimed at improving the implementation of hybrid learning in science courses, particularly in the context of IKD.

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Introduction

Hybrid learning serves as a solution to mitigate the negative impacts of prolonged online learning policies implemented during the pandemic. This approach has proven effective in assisting primary and secondary students and university students in achieving various learning objectives. These objectives encompass mastery of concepts, scientific attitudes, science process skills, and even scientific literacy and literacy in science (Alsalhi et al., 2019; Harahap et al., 2019; Li et al., 2019), competencies essential in the 21st century. Several advantages contribute to the effectiveness of hybrid learning in enhancing science learning outcomes, including the creation of active learners through more valid supervision and assessment compared to online learning (Rahmadi, 2021), the minimization of academic stress among digital generation students (Mucshini & Siswandari, 2020), and the preference of students for this method as it allows them to interact with peers and absorb material more effectively (Hidayati et al., 2022).

Despite its advantages, hybrid learning also presents several weaknesses. Fauzi and Setiawati (2021) identified observed weaknesses, including (1) the high cost of providing supporting devices, (2) the necessity for adequate devices and internet connectivity, (3) the difficulty in monitoring the academic progress of students who choose online learning, and

(4) a tendency for online learners to experience decreased motivation and responsibility for their studies. These issues can create disparities in the mastery of learning objectives between students learning offline and those studying online at home. Additional weaknesses include challenges in self-directed learning and the inability to ask questions directly when encountering material that is not understood (Kenney & Newcombe, 2011; Lestari et al., 2021).

Based on the discussion above, investigations into the weaknesses of hybrid learning have been limited to aspects of the teaching and learning process. This study compiles a list of weaknesses associated with hybrid learning implemented in the Basic Natural Science (IKD) course. This list is examined from the perspectives of preparation, planning, process, and assessment after the learning experience. Theoretically, the findings of this research can serve as a primary source for future studies, enriching knowledge and providing insights into the weaknesses of hybrid learning in science education at the higher education level. Practically, this information can assist educators in preparing, planning, teaching processes, and assessment stages. Hopefully, these efforts will improve all stages of the learning process, enabling students to be optimally facilitated over time.

Research Method

The research conducted in this study is classified as a qualitative descriptive study. The research was carried out within the Elementary School Teacher Education Program at Mataram University. Data regarding the weaknesses of hybrid learning were collected during the stages of preparation, planning, teaching activities, and assessment implementation in the IKD course during the odd semester of the 2020/2021 academic year. The methods employed included observation and documentation, as utilized by Mowat (2022) and Stratigos & Fenech (2021). The qualitative instruments comprised documents that included photographs, coordination notes, discussion notes, lesson plans (RPS), and assessment sheets. The qualitative data obtained were subsequently analyzed qualitatively based on the framework proposed by Miles and Huberman, which involves the following stages: (1) data reduction, (2) data visualization, and (3) concluding (Asipi et al., 2022).

Result and Discussion

In the context of educational and teaching duties, particularly in the realm of learning, the responsibilities of lecturers can be divided into three main categories: planning, implementing the plan, and conducting evaluations. Additionally, many lecturers engage in supplementary activities, such as preparation. During the planning process, lecturers develop lesson plans (RPS) based on an analysis of student needs, the characteristics of the material and students, and the availability of learning facilities. By considering these various variables, the quality of learning is enhanced in terms of the process and the learning outcomes that students can achieve. Several studies have confirmed this notion. One study emphasizes maximizing pedagogical functions by integrating social constructivism and critical theory into learning (Botes & Barnett, 2022). In the Elementary School Teacher Education Program (PGSD), the effectiveness of the RPS, particularly in science education, can be observed through student learning outcomes in science courses (Syazali & Umar, 2022).

In practice, learning is conducted over 16 face-to-face meetings, structured assignments, and independent study. During the implementation of distance learning (PJJ)

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amid the Covid-19 pandemic, face-to-face instruction was conducted online. Some utilized virtual meetings through video conferencing, while others engaged in online discussions via social media and the Unram online learning platform (spada). For evaluation, the instruments commonly used are essay tests.

Since face-to-face learning was suspended to prevent the spread of the COVID-19 virus, the immediate solution employed in the early stages of PJJ was online learning. Face-to-face interactions were replaced with virtual meetings utilizing Zoom, Google Meet, and other online platforms (Syazali, Erfan, et al., 2022). Research findings indicate that students expressed negative perceptions regarding implementing this approach (Rahmatih & Fauzi, 2020; Widodo et al., 2020). A combination of preparation, planning, implementation, and assessment was developed as a solution to this issue, which was not entirely online but integrated with offline learning (luring). This combination of online and offline learning subsequently became known as hybrid learning. In science education, offline learning was conducted using the surrounding environment as a Natural Laboratory. This laboratory serves as a learning resource through practice-based learning aimed at problem-solving. This approach has proven effective in developing science process skills and enhancing students' knowledge outcomes (Syazali et al., 2022).

Nevertheless, every learning approach has weaknesses, and hybrid learning implemented during PJJ is no exception. We identified at least ten weaknesses based on an analysis of various documents (see Table 1).

Table 1. Weaknesses of Hybrid Learning During the Implementation of Distance Learning

No	**Observed Aspects**	**Identified Weaknesses**
1	Learning Preparation	a. Coordination was conducted with senior lecturers whose expertise is not in science education. b. Management of SIMAKSI to the BKSDA (Natural Resources Conservation Agency).
2	Learning Planning	c. Course Learning Outcomes (CPMK) are limited to science process skills (SPS). d. Objectives only encompass basic SPS.
3	Learning Implementation	e. Absence of guidelines for report preparation. f. Science topics are restricted to ecosystems. g. Multitasking challenges. h. Learning intervals are limited to two weeks.
4	Learning Assessment	i. Assessment instruments rely solely on tests. j. Tests conducted online.

The drawbacks of hybrid learning, as enumerated in Table 1, diverge from the findings of prior research endeavours. Singh et al. (2021) identified several limitations inherent in hybrid learning, including technical difficulties, diminished interaction, inequitable access, and assessment challenges. Hybrid learning necessitates reliable internet access and technological resources, which may present obstacles for certain students and faculty members. The hybrid modality can potentially curtail face-to-face interactions between students and faculty, which may harm student engagement and motivation. Furthermore, hybrid learning may exacerbate disparities in access to dependable technology

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and internet connectivity, disproportionately impacting students from lower socioeconomic backgrounds. The assessment of student learning within the hybrid format can pose difficulties for faculty, particularly if assessments are not designed to accommodate this blended approach. An additional drawback lies in the difficulty of maintaining student engagement. Hybrid learning can challenge faculty to sustain student engagement and motivation, especially when students are not mandated to attend in-person classes (Ka'bai et al., 2022). It is imperative to acknowledge that the limitations of hybrid learning during the COVID-19 pandemic may exhibit variations contingent upon the specific context and implementation of the hybrid learning model.

1) Science Learning Preparation

Effective preparation is the key to successful science education. The following are some ways to prepare for science education. Observing students' diverse ideas about science is essential. Educators must observe the ideas that students bring to the science classroom and prepare a teaching plan to help students develop a more meaningful understanding of science (NSTA, 2017). Implementing and evaluating teaching plans is also crucial. Educators must implement their teaching plans, assess and reflect on the learning outcomes, and adjust their teaching to improve students' understanding. Being involved in data-driven decision-making is another vital aspect of science education. Educators must be involved in making data-driven decisions regarding teaching methods, strategies, and the selection of topics, activities, and materials. Developing a disposition for effective science teaching is also essential. Educators must develop a disposition for effective science teaching, including a sense of responsibility towards students and the community and a dedication to continuous improvement, partly through active engagement in the larger science education community.

Designing and conducting investigations is another way to prepare students for authentic science learning. Educators can help students prepare for science learning by providing opportunities to design and conduct their investigations, with guidance from educators and scientists (Dolan et al., 2008). Focusing on core practices that support ambitious science teaching is also crucial. Teacher preparation programs must focus on core practices that support ambitious science teaching, such as engaging students in scientific practices, supporting argumentation, and developing students' science literacy (Stroupe et al., 2020). Providing opportunities for various activities is also essential. To develop science skills, students must have opportunities to participate in various activities, including conducting investigations, sharing ideas with peers, and using specific ways of speaking and writing (Council, 2010). Pursuing a bachelor's degree program is also vital. Secondary science teacher preparation includes a bachelor's degree program that is a standalone major, taken concurrently with a teacher preparation program, or as part of a combined degree program (Olson, 2017). By following these guidelines, educators can help students develop a strong foundation in science and technology to succeed in the 21st century.

The implementation of hybrid learning in the IKD course we have conducted has fully adopted, and in some cases adapted, the essential aspects of science education preparation mentioned earlier. However, there are two weaknesses. Firstly, the coordination is done with fellow lecturers without a background in science education. This has resulted in less-than-maximal preparation, as evidenced by the poor quality of worksheets to help students construct their science knowledge. Although worksheets are essential in science education due to their empirically proven effectiveness (Mahyuny et al., 2022; Nuha et al., 2023), their quality has been compromised. Secondly, the management of SIMAKSI to BKSDA NTB is another weakness. Some locations chosen by students as a source of science learning through scientific investigation are conservation areas. To officially enter these areas, a SIMAKSI is required. Unfortunately, this has not been arranged, resulting in some student groups being rejected by field officers in each conservation area. This has become a technical obstacle, affecting the learning process in the field.

2) Lesson planning

Planning science education is crucial for effective teaching and learning. Several reasons underscore the importance of planning science education. Firstly, identifying learning objectives is a critical aspect of science education planning. It involves identifying learning objectives throughout various phases of the teaching sequence and addressing them through diverse types of classroom discussions (Scott, 2005). This enables educators to focus on what they want students to learn and how they can achieve it. Secondly, fostering engagement is another vital aspect of science education planning, which involves utilizing experimental learning models to encourage student engagement (Lahiri et al., 2022). This helps students become more interested in science, technology, engineering, and mathematics (STEM) subjects and careers. Thirdly, developing leadership skills is also an essential aspect of science education planning, which can be achieved by incorporating Service-Learning Projects (PPL) into the science curriculum, enabling students to acquire the leadership skills necessary to apply their traditional education on social determinants of health to targeted actions (Lahiri et al., 2022). Through PPL, students can hone their skills, which are not typically covered in the science curriculum, including program planning, fundraising, marketing, and more, and feel more capable of taking on significant leadership roles in the future. Lastly, improving retention is also a critical aspect of science education planning, which requires starting with students' experiences with the phenomenon and their connections to the subject and laboratory materials (Wishart & D'Elia, 2013). This helps engage students who are disadvantaged in science education and improves their retention in secondary school. In summary, planning science education is essential for identifying learning objectives, fostering engagement, developing leadership skills, and improving retention.

The implementation of hybrid learning has already adopted good practices in science education planning. However, there are still weaknesses. One of the weaknesses is that the CPMK is limited to the mastery of SPS, and SPS itself only covers the basic level. Science is not only comprised of SPS but also includes the product/knowledge aspect and the attitude aspect, which encompasses attitudes towards science and scientific attitudes. SPS also includes basic SPS and integrated or superior SPS (Can et al., 2017). Learning that focuses solely on one aspect of science can harm the mastery of the other two aspects. This has been the case with students at the Universitas Mataram, where science education only focuses on the product aspect. Although students have mastered this aspect well on the one hand (Syazali & Ilhamdi, 2022), their SPS is very low (Syazali et al., 2021). This is because the two aspects of science have a strong correlation (Artayasa et al., 2017). SPS is even considered a fundamental competence that students need to master other aspects of science (Prayitno et al., 2015). Similarly, learning solely on basic SPS can hurt students' mastery of integrated SPS. Nevertheless, students require good integrated SPS competence to gain more meaningful practical learning experiences.

3) Implementation of learning

The field of implementation science can assist educators in maximizing their efforts to enhance classroom functionality and student learning outcomes by providing strategies to ensure that practice-based learning is effectively applied. Below are several sources and strategies for implementing science education through the lens of implementation science: (a) Teach implementation science. Teaching tools have been developed to clearly define implementation science for novice learners (Curran, 2020). (b) Conceptualize instructors. Instructors should be conceptualized as implementers of evidence-based practices in higher education classrooms (Soicher et al., 2020). (c) Focus on strategies. Implementation science emphasizes the strategies employed to apply evidence-based practices rather than the research interventions. Maximizing successful outcomes is a key focus. Implementation science studies how evidence-based programs can be applied to maximize successful outcomes. Providing resources is also essential. The New York State Department of Education offers resources for implementing science standards to assist educators and administrators in applying the New York State Science Learning Standards (Department, 2023). Educators can effectively implement science learning and maximize successful outcomes by utilizing these resources and strategies.

As previously explained, science education has been effectively implemented by adopting the principles of implementation science. However, in practice, several weaknesses remain. One such weakness is that the science topics are limited to ecosystems. While not all topics can be effectively taught through specific learning methods, several topics with similar characteristics can be facilitated using the same instructional model. Another topic that shares relatively similar characteristics with ecosystems is biodiversity. Another limitation of the hybrid learning model we have implemented is multitasking. Multitasking refers to the process by which an individual performs multiple tasks simultaneously. However, research indicates that multitasking can negatively impact learning, particularly concerning students' academic performance (Limniou et al., 2020). Multitasking increases cognitive load, which can adversely affect learning. For instance, in a traditional classroom, students process information through listening and note-taking. Their cognitive efforts to retain information in long-term memory depend on the topic's complexity, the lecture's clarity, and their familiarity with the learning tasks. Studies have shown that students who engage in multitasking behaviors perform academically worse than those who do not (Gonzáles-Gutierrez et al., 2022). Conversely, students who participate in flipped classrooms, where they acquire foundational concepts and principles independently before class and then focus on application and discussion during class time, have been reported to engage in less multitasking behaviour and participate in more profound, more active learning (McLean et al., 2016). Multitasking can negatively impact learning by increasing cognitive load and decreasing academic performance. Therefore, students must avoid multitasking and concentrate on one task at a time to optimize their learning experience.

4) Assessment of science learning

In implementing the assessment results we conducted, a significant limitation lies in the instruments being restricted solely to tests. Several weaknesses of tests in measuring SPS can be examined from various aspects, including limited scope, emphasis on memorization, inadequate completion time, subjectivity in evaluation, lack of feedback, and the inability to measure real-world application. Tests often focus on specific content knowledge and may not fully assess students' abilities to apply scientific processes and skills in real-world situations

(Mat, 2019). They frequently prioritize memorizing facts and formulas over evaluating students' understanding of scientific concepts and their critical thinking and problem-solving abilities (Hendri & Setiawan, 2016). Tests are often time-constrained, which can pressure students and limit their ability to fully demonstrate their scientific process skills (Ituma & Twoli, 2011). Certain scientific process skills, such as communication and collaboration, are challenging to assess objectively and may introduce bias for test scorers (Stupnitskaya et al., 2022). Tests typically provide a single score without detailed feedback regarding students' strengths and weaknesses in scientific process skills, making it difficult for students to improve their competencies (Tegeh et al., 2021). Furthermore, tests may not accurately measure students' abilities to apply scientific process skills in real-world contexts, a crucial aspect of scientific literacy.

Another limitation pertains to tests conducted online. Some weaknesses of online tests include technical issues. Online assessments are susceptible to technical problems such as internet connectivity issues, server errors, and compatibility issues with different devices and browsers (Zaika et al., 2021). These problems can disrupt the testing process and affect the reliability and validity of the results. Online examinations are also more vulnerable to cheating compared to traditional paper-based tests. Students can easily access external resources, collaborate with others, or use unauthorized tools and software during the examination (Nagy & Warta, 2021). This can jeopardize the integrity of the assessment and lead to inaccurate results. Additionally, online tests often feature limited questions, which may not fully assess students' understanding and application of knowledge and skills (Zaika et al., 2021). For instance, multiple-choice questions are commonly used in online tests; however, these questions may not effectively measure higher-order thinking skills.

Another drawback is the lack of personal interaction. Online tests do not facilitate personal interaction between students and instructors, who can provide valuable feedback and support for learning (Nancy et al., 2022). This can hinder students' ability to understand their mistakes and improve their performance. The inability to assess practical skills also represents a limitation of online testing. Certain courses, such as science and engineering, require direct hands-on skills that cannot be effectively evaluated through online tests. This limitation can restrict the utility of online assessments in these disciplines. Furthermore, online tests may not be accessible to all students, particularly those with disabilities or limited access to technology (Zmiivskiy et al., 2021). This can create inequities in the assessment process and affect the validity of the results.

Conclusion

Based on the analysis of various documents, it has been identified that there are at least ten weaknesses associated with implementing hybrid learning in the IKD course during the Distance Learning (PJJ) period. These weaknesses are categorized into learning preparation, planning, implementation, and evaluation stages. Most of the weaknesses are concentrated in the implementation stage, accounting for four identified issues. In contrast, each of the other stages exhibits two weaknesses. The specific weaknesses identified include coordination being conducted with senior lecturers whose expertise is not in science education, the management of SIMAKSI directed to the BKSDA, limited CPMK focused solely on SPS, objectives that encompass only basic SPS, the absence of guidelines for report preparation, the restriction of science topics to ecosystems, multitasking, a learning interval

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of only two weeks, the use of tests as the sole instrument for assessing SPS, and the administration of tests being conducted online.

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