

Designing Digital Science Worksheets: A Needs-Based Analysis for E-LKPD Development Using iSpring Suite

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ABSTRACT

The integration of interactive digital media into science education is essential to address challenges in teaching abstract scientific concepts. However, the development of effective Electronic Student Worksheets (E-LKPD) requires alignment with students' needs, digital readiness, and classroom realities. This study employed a descriptive quantitative design to analyze the need for iSpring Suite-based E-LKPD on the topic of *Objects and Observation* in junior high school science. Data were collected from 56 eighth-grade students at SMP IT Ikhlas Cendekia Lahat using a structured questionnaire and supported by interviews, documentation, and classroom observation. The data were analyzed using frequency distribution and descriptive statistics. The findings reveal that 100% of students owned smartphones and showed strong preferences for digital, interactive learning materials. A total of 98.21% of respondents agreed that E-LKPD would improve their motivation and understanding. Key supporting factors include school infrastructure readiness, student independence, and a proactive learning environment. Students also reported consistent difficulties with abstract science concepts, highlighting the need for multimedia-supported learning tools. The study confirms the high potential and urgency of developing E-LKPD using iSpring Suite. The results emphasize the importance of designing context-responsive, mobile-accessible learning media that address both pedagogical challenges and technological feasibility in Indonesian classrooms.

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1. INTRODUCTION

The integration of digital technologies into education has become an essential response to the shifting demands of 21st-century learning. In the current era marked by rapid technological advancement and a digitally native student population, conventional printed learning materials often fail to accommodate students' expectations for interactive and engaging learning experiences (Granić, 2022; Ting et al., 2016). Specifically in science education, abstract concepts and complex processes require visualization and contextualization to support student understanding, which traditional

worksheets and textbooks cannot fully deliver (Zhang & Ma, 2023). To address this, educators and researchers have begun to explore the use of interactive digital media, particularly Electronic Student Worksheets (E-LKPD), as alternatives that leverage multimedia elements and promote deeper cognitive engagement.

Science education at the junior high school level frequently involves abstract and complex topics such as forces, energy, or natural phenomena, which are challenging to comprehend without the aid of visualizations or simulations. According to Dewi et al. (2022), interactive digital worksheets significantly enhance science process skills and student motivation when designed with multimedia features and scaffolded inquiry tasks. These findings align with the broader literature that supports technology-enhanced learning as a way to boost not only student engagement but also higher-order thinking and conceptual understanding (Brugliera, 2024; Roza et al., 2022).

However, the effective implementation of digital learning tools in Indonesian secondary schools remains constrained by infrastructural, pedagogical, and institutional challenges. Many teachers are still unfamiliar with digital authoring tools, lack sufficient training in instructional design, and face time constraints that limit innovation in the classroom (Boonmoh & Sanmuang, 2024). Moreover, the integration of digital media in schools often depends on the availability of appropriate devices, internet access, and institutional support (UNESCO, 2023). These systemic limitations hinder the widespread adoption of interactive learning media, despite the increasing awareness of its pedagogical benefits.

One emerging solution is the use of iSpring Suite, a commercial e-learning authoring tool that integrates with Microsoft PowerPoint to produce interactive learning content compatible with HTML5 and Learning Management Systems (LMS). iSpring Suite allows for the development of dynamic instructional materials such as simulations, quizzes, video lessons, dialogue-based activities, and branching scenarios. This platform has been recognized for its ease of use among teachers already familiar with PowerPoint and its capacity to produce mobile-accessible learning content (Ananda et al., 2024). With these features, iSpring Suite presents a promising opportunity to develop E-LKPDs that are both pedagogically sound and practically implementable.

Nevertheless, the adoption of any technology-driven instructional approach must be grounded in a systematic needs analysis that considers the learning context, student preferences, teacher readiness, and infrastructure availability (Tsai & Chai, 2012). Needs analysis serves as a foundational step in instructional design, ensuring that the developed media aligns with actual learner needs and classroom realities (Branch, 2009). In the case of Indonesian junior high schools, especially in under-resourced or private institutions, a thorough understanding of these contextual factors is critical before proposing digital media solutions.

Despite the growing body of research on mobile learning and interactive multimedia, few studies have specifically focused on the design and development of E-LKPDs using iSpring Suite in the context of Indonesian secondary science education. Most existing research has concentrated on general multimedia use or mobile learning applications without linking them explicitly to student needs or authoring tools (Yulianci et al., 2021; Su, 2023). Moreover, the unique characteristics of Indonesian classrooms—including varying levels of student digital literacy, unequal infrastructure, and differences in curriculum implementation—necessitate localized research that can inform the development of practical, scalable, and sustainable digital learning media (Indah et al., 2025).

In this regard, interactive E-LKPDs can offer multiple pedagogical benefits. Not only do they provide rich visualizations and multimedia integration to help explain complex science content, but they also support student-centered learning, allowing learners to progress at their own pace and explore content independently. Additionally, digital worksheets enable the inclusion of real-time feedback, formative assessment, and adaptive learning paths that traditional print materials cannot offer (Dewi et al., 2022). These characteristics make interactive digital media particularly relevant for addressing learning gaps and enhancing students' motivation and outcomes in science education (Zhang & Ma, 2023).

The increasing use of mobile devices among junior high school students further strengthens the feasibility of mobile-accessible E-LKPDs. Recent surveys show that smartphone ownership among Indonesian students is high, making mobile learning a realistic option, provided that the content is designed for mobile optimization (UNESCO, 2023; Roza et al., 2022). This condition, coupled with students' preference for visual and self-paced learning formats, suggests a strong alignment between mobile-based E-LKPDs and students' learning expectations.

In addition to the technical and infrastructural considerations, teacher competence in instructional design and technology integration plays a pivotal role in the success of E-LKPD adoption. The Technological Pedagogical Content Knowledge (TPACK) framework emphasizes the importance of integrating content knowledge, pedagogical strategies, and technological tools to create effective learning experiences (Kholid et al., 2023). Without adequate training in authoring tools and digital pedagogy, however, many teachers may struggle to design engaging and instructionally meaningful digital content. Therefore, professional development and collaborative support systems must accompany media development initiatives to ensure sustainable implementation (Tsai & Chai, 2012; Fullan, 2016).

Given these considerations, this study aims to conduct a systematic needs analysis to assess the feasibility, relevance, and urgency of developing an iSpring Suite-based E-LKPD on the topic of Objects and Observation for junior high school science learning. The research focuses on identifying key learning challenges faced by students, examining their access to digital tools, analyzing their preferences toward learning media, and evaluating the readiness of schools to adopt digital worksheets. By doing so, this study seeks to provide empirical evidence that can guide the design and development of interactive, mobile-accessible science learning materials tailored to the needs of Indonesian students and teachers.

In sum, this research responds to a critical gap in the literature by providing contextual data for the development of interactive science learning media using iSpring Suite, particularly within the Indonesian junior high school setting. It is anticipated that the findings of this needs analysis will contribute to both the theory and practice of digital learning design, offering a practical framework for the development of E-LKPDs that are engaging, effective, and sustainable in diverse educational contexts.

2. METHODS

This study adopted a descriptive quantitative survey approach to examine students' needs for Electronic Student Worksheets (E-LKPD) and to determine the feasibility of the learning media development. The research involved 56 eighth-grade students at SMP IT Ikhlas Cendekia Lahat. The study population comprised all eighth-grade students at the school, totaling 56 individuals. This decision was made to obtain comprehensive data that directly reflect the perceptions and needs of all students in the target group regarding the E-LKPD.

Primary data were collected through an online questionnaire distributed via Google Forms. The questionnaire was designed using a four-point Likert scale to measure students' perceptions, needs, and responses toward the E-LKPD. The aspects measured included ease of use, instructional effectiveness, design, and content delivery. In addition to the questionnaire, semi-structured interviews were conducted as a complementary instrument. These interviews involved three Natural Science teachers and one education practitioner, aiming to obtain in-depth qualitative data regarding the urgency, relevance, and feasibility of E-LKPD development from the perspectives of educators and education experts. A documentation method was also employed to collect data from various sources—literature, archives, written records, photographs, and research reports—to enhance the validity of the findings. Furthermore, direct non-participant observations were carried out to specifically observe science learning activities in the classroom environment, student interactions with existing instructional materials, and the use of instructional media by teachers, particularly regarding the potential integration of E-LKPD.

The collected data were analyzed using a descriptive quantitative method, focusing on Likert scale frequency distribution techniques. This analysis aimed to describe the research variables based on empirical data obtained from the 56 respondents. The quantitative data analyzed included students' perceptions, attitudes toward technology, and learning preferences, while qualitative data encompassed information such as gender, education level, and student classifications. The data were organized into frequency distribution tables for systematic presentation and analysis of the research findings.

3. FINDINGS AND DISCUSSION

3.1. Respondent Profile and Instrument Validity/Reliability Test

Respondent identification indicates that the entire eighth-grade student population (N=56) participated in the study. The respondent distribution consisted of 27 male students (48.20%) and 29 female students (51.80%). The validity of the questionnaire instrument was confirmed through Pearson correlation analysis at a 0.05 significance level, in which all items showed significance values of $p < 0.05$. The detailed validity test results for each construct are presented in Table 3.1.

Table 1. Summary of Validity Test Results by Construct

Assessed Construct	Number of Statement Items	Pearson Correlation Range	Notes
Learning Facilities	5	0.356 – 0.750	All Valid
Learning Problems	9	0.404 – 0.655	All Valid
Student Characteristics	14	0.347 – 0.710	All Valid
School Characteristics	6	0.553 – 0.787	All Valid
Characteristics of Teaching Materials	9	0.450 – 0.716	All Valid

Additional Notes:

Total items tested: 43

Critical r-value (DF = 55): 0.264

All items showed a p-value < 0.05 , thus all statements are statistically valid.

The reliability of the questionnaire instrument was confirmed by Cronbach's Alpha values exceeding 0.70 for each assessed construct, indicating strong internal consistency, Learning Facilities (0.8092), Learning Issues (0.7172), Student Characteristics (0.7269), School Characteristics (0.7465), Teaching Material Characteristics (0.7217).

3.2. Needs Analysis by Aspect

Data analysis using a four-point Likert scale frequency distribution revealed highly positive responses toward the development of the E-LKPD. A majority of students (75%) selected "Agree" and 23.21% selected "Strongly Agree," resulting in a total of 98.21% expressing a positive attitude. This figure reflects that most students rate the presence of E-LKPD as relevant to their learning needs. Quantitatively, the overall average score was 3.21 out of a maximum scale of 4.0, with a standard deviation of 0.45.

The average score indicates a tendency for answers to fall into the high category and remain relatively consistent among respondents, as shown by the small deviation value. This signals that students have a nearly uniform perception: E-LKPD is considered capable of facilitating conceptual understanding, increasing learning motivation, and providing a more interactive learning experience compared to conventional worksheets.

Thus, the results of this needs analysis confirm that the development of E-LKPD is not only necessary but also supported by student readiness to use it as a learning medium. This reinforces the

urgency of developing iSpring Suite-based E-LKPD for Science subjects, particularly the theme *Objects and Observation* at the junior high school level.

3.2.1. Access to Technology

Analysis results show that all respondents (100%) own Android smartphones. This condition reflects that the primary device for accessing E-LKPD is already owned by all students, meaning that barriers related to device ownership are practically non-existent. This fact also indicates student readiness to utilize mobile-based learning, aligning with the trend of educational digitalization among the younger generation.

In addition to personal device ownership, school environment support is also relatively adequate. Approximately 82.14% of students stated that school facilities support interactive learning, meaning the majority feel that the school's infrastructure sufficiently supports the implementation of digital media. Meanwhile, about 66.07% to 80.36% of respondents believe that the school has adequate ICT infrastructure and student handbooks. This data confirms that although a small proportion of students still doubt the sufficiency of facilities, the school generally has the basic infrastructure needed, ranging from internet networks and computer devices to written references that support learning.

Thus, it can be concluded that access to technology is not the main hindering factor in E-LKPD development and implementation. The uniform availability of individual devices and reasonably adequate school facility support are important assets for ensuring the success of integrating iSpring Suite-based E-LKPD into the Science learning process. However, there is still room for improvement in optimizing ICT infrastructure and enriching digital teaching materials to be more inclusive and capable of reaching all student needs.

3.2.2. Learning Preferences

The analysis results indicate a strong preference among students for the use of digital learning media. A total of 91.07% of students prefer to search for learning resources via the internet rather than using printed textbooks. This indicates a shift in the learning patterns of the younger generation, who are more accustomed to fast, visual, and interactive information. Additional support is seen from 96.43% of students who agree that subject material should be delivered in an engaging and easily understandable way.

Furthermore, the students' tendency for independent learning is also quite high, with 92.86% of respondents reporting being able to learn without relying on peers. This attitude shows their readiness to utilize digital resources to support the learning process. Moreover, 98.21% of students believe that E-LKPD will help them understand the material while increasing their learning motivation. Thus, student preferences point toward a more personal, visual, and flexible learning model, which can be facilitated by the development of iSpring Suite-based E-LKPD.

3.2.3. Challenges in Learning Science

Despite the high preference for digital media, students still face challenges in learning Science concepts. The main difficulty lies in understanding abstract concepts and the ability to solve complex problems. Interviews with Science teachers support this finding, particularly concerning topics such as the solar system, force, or energy, which are difficult to explain using only conventional methods.

This constraint implies low student engagement and reduced interest when learning is solely centered on textbooks or verbal explanations from the teacher. Therefore, E-LKPD equipped with visualizations, interactive simulations, and problem-solving based exercises becomes a crucial solution to bridge the gap between abstract concepts and students' concrete understanding.

3.2.4. Student Characteristics

Data analysis reveals that students are active, motivated, and independent learners. They have a high interest in innovative learning and show a tendency to use digital learning resources proactively. Student interaction with teachers is also open, reflecting a two-way communication pattern that supports the learning process.

These characteristics provide a strong foundation for E-LKPD development, as students already possess the attitudinal readiness to accept and use interactive learning media. This also presents an opportunity for teachers to maximize their role as facilitators, not just as information deliverers.

3.2.5. School Characteristics

The school where the research was conducted demonstrates a strong commitment to educational innovation. The learning environment is rated as conducive by students, marked by support for digital media development and the school's quick response in addressing student difficulties. Field observations also confirm that the school has basic infrastructure in place, such as projectors, stable electricity, and other supporting facilities.

This condition indicates institutional readiness to adopt technology-based learning. With minimum infrastructure already available, the implementation challenge is more focused on strengthening teacher capacity in using digital tools to optimize the Science learning process.

3.2.6 Characteristics of Teaching Materials

The conventional worksheets currently used at the school are considered easy enough for students to understand, but lack variation in content presentation. The static and monotonous presentation of the material leads to low motivation and student engagement in the learning process.

This data clearly shows a need for teaching materials that are more engaging, interactive, and rich in variety. By utilizing the multimedia features in iSpring Suite, E-LKPD can present content in the form of text, images, videos, interactive quizzes, and simulations, thereby improving the quality of student learning experiences.

Discussion

The findings of this study highlight a significant readiness among junior high school students to adopt interactive digital learning tools, particularly Electronic Student Worksheets (E-LKPD) developed using iSpring Suite. A key indicator of this readiness is the complete ownership of Android smartphones (100%) among students, supported by adequate school infrastructure such as internet access, projectors, and computer facilities. These results suggest that access to personal digital devices is no longer a major barrier to digital learning implementation in this context, which aligns with broader national trends in student digital behavior (UNESCO, 2023). In line with the Technology Acceptance Model (TAM), perceived ease of use and perceived usefulness are crucial for technology adoption, and the findings of this study demonstrate that students not only have access but also perceive E-LKPD as useful and easy to adopt (Granić, 2022).

In terms of student learning preferences, the study revealed a clear inclination toward digital content. Over 91% of respondents prefer to search for learning resources online rather than using printed textbooks, indicating a shift in information-seeking behavior consistent with the characteristics of Generation Z learners (Roza et al., 2022). Furthermore, the high percentage (98.21%) of students who believe that interactive worksheets can enhance their understanding and motivation underscores the urgency of developing digital media tailored to their needs. This aligns with existing research that supports the role of multimedia and interactive features in fostering deeper cognitive engagement and enhancing conceptual understanding in science learning (Zhang & Ma, 2023; Dewi et al., 2022).

Additionally, the finding that a majority of students demonstrate strong independent learning tendencies—such as the ability to study without peer assistance—suggests that digital materials can effectively support self-paced learning. This is particularly relevant in contexts where classroom learning time is limited or where teachers face high workloads that hinder personalized instruction (Boonmoh & Sanmuang, 2024). These findings further validate the need for learning materials that accommodate individual learning preferences and allow flexible engagement, such as E-LKPD with interactive simulations and visual representations.

From the perspective of pedagogical challenges, students reported consistent difficulties in understanding abstract science topics, such as the solar system or force and motion. These difficulties are corroborated by teacher interviews, which confirm that traditional instructional methods often fall short in delivering content that requires visualization or experimentation. This observation reinforces earlier studies that emphasized the limitations of conventional print-based materials in explaining complex scientific concepts and the benefits of using multimedia to provide virtual representations (Ananda et al., 2024; Ting et al., 2016). Therefore, integrating animations, interactive quizzes, and simulations within E-LKPD becomes essential in bridging the gap between abstract concepts and concrete understanding.

Importantly, the school environment in which this study was conducted shows strong institutional readiness to support the adoption of digital learning media. Students perceived their school as proactive and responsive in addressing academic challenges, and field observations confirmed the availability of essential facilities such as stable electricity and classroom projectors. This finding supports the argument by Fullan (2016) that school leadership and support structures are critical enablers of innovation in teaching and learning. The presence of supportive infrastructure, however, must be complemented by sustained teacher capacity building to ensure that available tools are used effectively.

Despite the readiness at the student and school levels, the successful implementation of E-LKPD also depends heavily on teacher competence in digital instructional design. The TPACK (Technological Pedagogical Content Knowledge) framework emphasizes that meaningful integration of technology in education requires more than technical proficiency—it requires the ability to design content that aligns with pedagogical goals and subject matter (Kholid et al., 2023; Su, 2023). Teachers who lack training in instructional design may struggle to move beyond superficial media features and fail to fully exploit the potential of platforms like iSpring Suite. This reinforces the need for professional development programs that focus not only on operating authoring tools but also on applying instructional frameworks such as ADDIE or SAM for iterative content development (Branch, 2009).

Furthermore, while iSpring Suite offers robust features for interactive content creation, its proprietary nature and licensing model raise questions about scalability and long-term sustainability. Over-reliance on a commercial platform may result in access limitations, particularly for underfunded schools. To mitigate these risks, a platform-agnostic development approach is recommended, using open standards such as SCORM or HTML5 and ensuring content portability across learning management systems (Tsai & Chai, 2012). Alternative tools like H5P or Adapt Learning, which are open-source, should also be explored in parallel, especially when aiming for broader implementation across schools with varying resource levels.

Equity concerns must also be addressed. Although all students in this study owned smartphones, this may not be the case in more remote or underserved regions. UNESCO (2023) warns against assuming digital readiness based solely on isolated success cases, as digital divides persist across geographic and socioeconomic lines. Therefore, the design of E-LKPD must consider accessibility features, including offline access options, compatibility with low-bandwidth environments, and inclusive design for students with special needs. Without these considerations, technology-enhanced learning risks amplifying educational inequality rather than bridging it.

Another important consideration is the assessment design embedded within E-LKPD. While the current study focuses on student perceptions and readiness, future iterations of E-LKPD should move

beyond basic quizzes and incorporate adaptive feedback, open-ended inquiry, and performance-based tasks. This would allow assessment to serve not just as an evaluation tool but as an integral part of the learning process, promoting critical thinking and reflective learning (Zhang & Ma, 2023).

In summary, the findings affirm that the development of an iSpring Suite-based E-LKPD is both feasible and necessary, given the strong student readiness, school infrastructure, and learning needs. However, successful implementation will depend on broader systemic support—including teacher training, accessible design, and sustainable technological choices. This study, therefore, provides foundational insight for developing a responsive, interactive digital worksheet that addresses current gaps in junior high school science education in Indonesia.

4. CONCLUSION

Based on the needs analysis regarding the use of iSpring Suite-based E-LKPD on the topic of *Objects and Observation* for junior high school Science subjects, it can be concluded that there is a high demand for interactive learning media. Factors such as learning facilities, learning challenges, student characteristics, school environment, and the nature of the teaching materials support the development of interactive digital E-LKPD. The majority of respondents (98.21%) expressed positive attitudes toward the use of user-friendly interactive E-LKPD. These findings indicate that the use of E-LKPD is not only relevant to the demands of the digital era but also provides a practical solution to help students overcome difficulties in understanding abstract science concepts, as well as enhance their motivation and learning outcomes. In addition, the results of this study provide an important foundation for designing contextual, effective, and sustainable digital learning media within Indonesian school environments.

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