



Needs Analysis of Google Sites-Based Learning Media for Independent Learning in Junior High School Informatics

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Abstract

This study analyzed the self-directed learning needs of junior high school students in Informatics and identified potential obstacles in using Google Sites as a self-directed learning medium, corresponding to the Analysis stage of the ADDIE instructional design model. A mixed-methods approach with an explanatory sequential design was employed, where a descriptive quantitative method was supported and contextualized by qualitative data from interviews, observations, and documentation involving 90 seventh-grade students and 3 Informatics teachers from three public junior high schools in Balapulang District, Tegal Regency, selected through purposive sampling. Results showed that students had strong technological readiness and high interest in interactive website-based learning (81%), particularly through smartphone access (84%), yet had limited prior experience using website-based learning media (38%), revealing a 43-point interest-experience gap. The main obstacles identified were infrastructural, namely unstable internet connectivity (61%) and limited data quota (54%), alongside literacy-related barriers such as unfamiliarity with digital platform navigation and limited technical guidance. Teacher interviews reinforced these findings, underscoring the importance of structured onboarding and digital scaffolding during initial implementation. These findings contribute theoretically to strengthening the needs analysis stage within the ADDIE framework and practically as an empirical basis for designing a lightweight, guided, low-bandwidth-friendly Google Sites platform suited to junior high school students in areas with limited technological infrastructure.

Keywords: ADDIE Model; Google Sites; Informatics Education; Junior High School; Learning Needs Analysis; Self-Directed Learning

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INTRODUCTION | مقدمة

The digital transformation in education is driving a shift in learning orientation from teacher-centered to student-centered and self-directed learning. In Indonesia, this direction is reinforced through the Independent Curriculum policy, which provides teachers and students with the freedom to manage the learning process more flexibly and contextually, including through the use of digital technology (Hartawati & Karim, 2024; Yunita et al., 2023). Strengthening independent learning is one indicator of the successful implementation of this curriculum, but also presents a challenge for educational institutions with limited technological support.

The Informatics subject at the Junior High School level has unique characteristics because it combines conceptual and practical aspects, including strengthening computational thinking, which remains a challenge for most students in the implementation of the Independent

Curriculum (Monalisa, 2023). Therefore, it requires interactive, easily accessible learning media that are not technically or financially burdensome. One platform that is widely researched to meet these needs is Google Sites, a simple website creation service from the Google Workspace ecosystem.

Studies on Google Sites-based media development spanning various subjects and levels of education, from Informatics in junior high schools to physics, consistently demonstrate that the products developed are deemed valid and practical by both subject matter experts and media experts (Faizah et al., 2025; Sevtia et al., 2022). Similar patterns were also found in arts and culture and English, where the developed media received positive responses from students and teachers in field trials (Adzkiya & Suryaman, 2021; Triratna & Sudjana, 2023). At different levels, the implementation of Google Sites through the PJBL model in mathematics and thematic learning in elementary schools also demonstrated consistent practicality and effectiveness (Piryanto et al., 2025; Sari & Rochmiyati, 2023). The consistency of results across subjects and levels confirms that Google Sites' flexibility, ease of use, multimedia integration, and accessibility at no additional cost are determining factors in its acceptance across various learning contexts, not simply its unique advantages in a particular subject. Beyond classroom learning, Google Sites' flexibility has also been reported to be beneficial for information management and digital archiving (Herawati et al., 2023), further underscoring the platform's broad potential for use across a variety of educational contexts.

However, most of these studies focus on the final product testing phase, while the analysis phase, or needs analysis, which is the foundation of the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model, is generally reported briefly without in-depth exploration of student needs characteristics and contextual constraints in the field. However, a thorough needs analysis determines the accuracy of product specifications developed in subsequent stages (Aini et al., 2023). Furthermore, recent studies on interactive learning media emphasize that integrating technology-based solutions significantly improves student engagement and learning outcomes when aligned with student needs (Bakiruddin et al., 2026; Nafisah et al., 2025). This gap becomes even more relevant in the context of schools in non-urban areas, which still face various limitations in access to technology, network infrastructure, and technical assistance (Haniko et al., 2023).

Theoretically, technological support for independent learning is closely related to students' digital literacy. Chiu et al. (2022) demonstrated that technology-based learning support contributes to improved digital literacy by strengthening students' autonomous motivation. Specifically, at the junior high school level, independent learning has also been shown to be enhanced through the use of structured, technology-based teaching tools, such as discovery learning worksheets assisted by augmented reality (Nurhidayanti et al., 2022). Similar findings were seen in the implementation of contextual, values-based independent learning models, which demonstrated a significant impact on student learning outcomes (Puspita et al., 2024). Various studies of the broader application of self-directed learning at the secondary school level also demonstrated increased student activity and learning outcomes when independent learning is facilitated in a structured manner (Balu et al., 2025; Khotimah, 2022). These findings point to the same conclusion: independent learning is not merely a byproduct of technology use, but rather an achievement that needs to be facilitated in a structured manner through appropriate media design. However, the success of implementing independent learning based on digital platforms is very dependent on the suitability of the media design to the real needs and conditions of its users, so that needs analysis is a step that cannot be ignored.

Based on the description, this research is important to be conducted to empirically map the independent learning needs of junior high school students in Informatics subjects and identify potential obstacles in the use of Google Sites, before the media design and development stage is carried out. The novelty of this research lies in the special focus on the Analysis stage in the ADDIE framework which is studied in depth through a combination of quantitative and qualitative data from three schools at once, in contrast to previous studies which generally directly present the results of product testing in a single school.

Specifically, this study aims to: (1) identify the independent learning needs of students in Informatics subjects in junior high schools in the context of utilizing Google Sites, and (2) analyze the potential obstacles faced in utilizing Google Sites as an independent learning medium. The results of this study are expected to provide theoretical contributions to the development of educational technology studies, especially at the needs analysis stage in the ADDIE model, as well as practical contributions in the form of empirical data that can be a reference for teachers and media developers in designing an independent learning platform based on Google Sites that is appropriate to the characteristics of junior high school students in areas with limited technological infrastructure. Based on these objectives, the formulation of the research problem is structured as follows: (1) What is the level of readiness and interest of junior high school students in Google Sites-based independent learning in Informatics subjects? (2) What obstacles are potentially faced by students and teachers in utilizing Google Sites as an independent learning medium in schools with limited technological infrastructure?

METHOD

منهج

Research Design

This research is part of a research and development (R&D) program using the ADDIE model, with the scope of discussion limited to the Analysis stage (needs analysis). This stage is considered the most crucial foundation in the entire ADDIE cycle, because the accuracy of the needs analysis in the initial stage will significantly influence the accuracy of the product specifications designed in subsequent stages (Misesani et al., 2020). This study employed a mixed-methods approach with an explanatory sequential design, in which descriptive quantitative serves as the primary method, reinforced and contextualized by qualitative data from interviews, observations, and documentation studies. Qualitative data plays a role in explaining and deepening the interpretation of quantitative findings, rather than standing as an equal and separate strand. This integration pattern is used to obtain a comprehensive picture of students' independent learning needs and the obstacles to utilizing Google Sites before the product is designed and developed. This kind of integration pattern is a common strategy used when one type of data serves to deepen the contextual understanding of another type of data in a single, simultaneous collection stage (Åkerblad et al., 2021).

Population and Sample

The study population was all seventh-grade students at public junior high schools in Balapulang District, Tegal Regency, for the 2025/2026 academic year. The sample was determined using a purposive sampling technique in three public junior high schools representing varying geographic conditions and technological accessibility. This technique was chosen because it allowed the researcher to align the sample with the research objectives more precisely, thereby increasing the rigor and reliability of the resulting data (Campbell et al., 2020). The number of student respondents was 90 (30 students per school). In addition, the study involved three

Informatics teachers as interview informants, one per school, selected based on a minimum of three years of teaching experience.

Research Instruments

The instruments used included: (1) a Likert-scale student needs questionnaire (4 points) that measured aspects of technology access, interest in independent learning, and preferences for using website-based media; (2) a semi-structured interview guide for teachers to explore obstacles to Informatics learning and expectations regarding digital media; (3) an observation sheet on learning conditions and supporting facilities in the classroom; and (4) a documentation study of the curriculum, learning outcomes, and Informatics teaching tools for grade VII. The questionnaire instrument was compiled based on a grid that included indicators of device and network access, digital literacy readiness, interest in independent learning, and expectations regarding learning media features, and was reviewed by experts before use.

The expert validation procedure was conducted by two validators on the questionnaire instruments on student readiness and interest and the questionnaire on potential obstacles to the use of Google Sites by assessing two main aspects, namely the content validation aspect and the language and writing aspect. The content validation aspect includes indicators of the questionnaire's suitability with the indicators, the clarity of the questionnaire's instructions, and the questionnaire's suitability with the school level and grade level. Meanwhile, the language and writing aspect includes indicators of suitability with Indonesian language rules, the clarity of statements to avoid double interpretation, and the use of simple and easy-to-understand language. The assessment was carried out using a scale of 1 to 5, which was then averaged and converted into qualitative categories based on Widoyoko (2019) guidelines with a score range of 4.50–5.00 (Very high), 4.00–4.49 (high), 3.25–3.99 (moderate), 2.75–3.24 (low), and 0.00–2.74 (very low).

The expert assessment results showed that the student readiness and interest questionnaire obtained an average total score of 4.58 (Very high), making it suitable for use without significant revision. The questionnaire instrument on potential obstacles to using Google Sites obtained an average total score of 4.50 (Very high), making it valid and suitable for use. Both assessment results prove that the developed instrument has met the eligibility criteria, both in terms of content suitability and language clarity.

Data Collection Procedures

Data collection was carried out in three stages. The first stage was a study of curriculum documentation and teaching materials to map relevant learning outcomes. The second stage was direct observation of the Informatics learning conditions in each school, including device availability, internet connection, and student interaction patterns during learning. The third stage was the distribution of questionnaires to students and interviews with teachers, which were conducted simultaneously in the even semester of the 2025/2026 academic year. Each stage was documented to support data triangulation.

Variables and Operational Definitions

The main variables in this needs analysis stage consist of two things: the need for self-directed learning and obstacles to utilizing Google Sites. The need for self-directed learning is operationally defined as the level of student readiness and preference for independent learning through website-based media, as measured by indicators of device access, self-directed learning habits, and interest in interactive features. This definition refers to the concept of self-directed

learning readiness, which has been proven to be enhanced through knowledge management-based learning models that utilize digital media to strengthen users' digital literacy (Silamut & Petsangsri, 2020). Obstacles to utilizing Google Sites are defined as technical and non-technical barriers that have the potential to hinder media use, as measured by indicators of internet connectivity, data quota, familiarity with digital interfaces, and the availability of mentoring. These indicators refer to the finding that the main obstacles students face in digital technology-based learning generally center on limited internet connections and minimal mentoring from others during the learning process (Noviansyah & Mujiono, 2021).

Data Analysis Techniques

Quantitative data from the questionnaire were analyzed descriptively using percentages for each indicator, then categorized into very high, high, moderate, and low ranges. To interpret the percentage of achievement for each indicator, this study adapted the criteria guidelines from Widoyoko (2019) which are divided into five intervals, namely 0%–20% (Very Low), 21%–40% (Low), 41%–60% (Moderate), 61%–80% (High), and 81%–100% (Very High). As an illustration of its application, the personal internet access indicator which achieved 76% is categorized as High because it is in the 61%–80% range, while the smartphone use indicator as the main device which reached 84% is categorized as Very High because it is in the 81%–100% interval.

Qualitative data from interviews, observations, and documentation were analyzed using thematic analysis through the stages of data reduction, theme categorization, and drawing conclusions, following Miles et al. (2014) interactive analysis flow. Triangulation of sources and techniques is used to ensure the credibility of findings, by comparing the results of questionnaires, interviews, observations and documentation on the same aspects.

Ethical Considerations

This study obtained permission from the school before data collection. All student and teacher respondents were given an explanation of the research objectives and participated voluntarily through informed consent. Respondent identities were kept confidential, and data were used solely for research purposes.

RESULT | نتائج

A needs questionnaire was distributed to 90 seventh grade students at three public junior high schools in Balapulang District to map students' readiness and interest in website-based independent learning (Table 1).

Table 1. Student Readiness and Interest in Website-Based Independent Learning

Indicator	Percentage	Category
Have personal internet access (quota/home wifi)	76%	High
Accessing the internet via smartphone as the main device	84%	Very High
Have you ever used website-based learning media	38%	Low
Get used to studying independently outside of school hours	47%	Moderate
Interested in learning Informatics through interactive websites	81%	Very High

The data in Table 1 demonstrates a pattern of gaps, which is a key finding: student infrastructural readiness and interest are in the very high category (84% smartphone access and 81% interest in interactive websites), but students' actual experience using website-based learning media is the lowest (38%). This 43-point gap between interest and experience indicates

that the primary obstacle to media development lies not in student acceptance or interest, but rather in their limited exposure to digital learning platforms. This finding reinforces the urgency of developing Google Sites as a self-directed learning medium, as students are technically ready but not yet practically accustomed to it.

Furthermore, the results of interviews with teachers and classroom observations identified potential obstacles that need to be anticipated in utilizing Google Sites as a learning medium (Table 2).

Table 2. Potential Obstacles to Using Google Sites as a Learning Medium

Constraint	Percentage of Students Affected	Category
Unstable internet connection at home/school	61%	High
Limited internet data quota	54%	Moderate
Not yet accustomed to navigating new digital platforms	40%	Low
Minimal technical assistance from teachers/parents	35%	Low
Devices (cellphones/laptops) must be shared with family members.	29%	Low

The constraints in Table 2 can be grouped into two categories with different implications for media design. Infrastructural constraints of internet connectivity (61%) and limited data quotas (54%) potentially impact more than half of the student population and are beyond the direct control of media designers, so media needs to be designed to remain accessible under limited network conditions, for example by reducing heavy multimedia elements or providing lightweight (low-bandwidth) versions of materials. Meanwhile, digital literacy and social support constraints such as unfamiliarity with platform navigation (40%), lack of mentoring (35%), and device sharing (29%), although at a lower percentage, are cumulative and can widen learning gaps between students if not anticipated from the design stage, for example by providing initial navigation guidance and strengthening the role of teachers as facilitators.

Qualitative findings from teacher interviews corroborate the quantitative data. Teachers reported high student enthusiasm for multimedia-based materials, but also noted the need for an adaptation period during the initial meeting to understand the site's navigation structure. Teachers also observed a trend of disparity in independent learning activities between students with stable internet access and those with limited access: students with stable access explored additional materials independently, while students with limited access relied more on face-to-face sessions. This pattern confirms that the successful implementation of Google Sites as a self-directed learning medium is inseparable from strengthening the digital competency of teachers as the primary companions to students during the transition to technology-based learning.

Overall, these findings indicate that students are in a condition that supports the development of website-based independent learning media, with the note that media design needs to explicitly accommodate access/quota limitations and provide navigation scaffolding at the initial stage of use so that the potential for high interest is not hampered by technical constraints and low experience.

DISCUSSION

مناقشة

The findings in Table 1 indicate that junior high school students in Balapulang District have sufficient basic capital to participate in website-based independent learning, as reflected in the high number of private internet access users and the dominant use of smartphones as the primary access device. This condition aligns with Chiu (2022) findings regarding digital support

for student engagement through the fulfillment of basic psychological needs in self-determination theory, and is in line with the study of Geng et al. (2019) which showed a positive correlation between technology readiness and student learning independence in a blended learning environment. This high smartphone ownership is also consistent with the results of a study by Pardede et al. (2025) on high school students in the developing region of North Sumatra, which found that private smartphone ownership reached more than 96% of students regardless of socio-economic background, while also confirming the shift of digital devices from mere status symbols to basic needs for the younger generation. However, Pardede et al. (2025) critically noted that high smartphone ownership does not automatically translate into productive independent learning behavior, due to a gap between student beliefs and actual practice, which is more focused on the use of entertainment and social communication applications. In other words, high technology access is a necessary condition, but not a sufficient condition, for the success of website-based independent learning.

Meanwhile, the indicator of independent learning habits outside of school hours, which is in the moderate category, confirms the findings of Geng et al. (2019) that independent learning (self-directed learning) develops along with technological readiness and motivation, rather than as an innate condition that arises spontaneously. This pattern aligns with the results of research by Laoli et al. (2025) on junior high school students in Gunungsitoli, which showed that digital learning media contributes to increased independent learning when accompanied by a clear guiding structure. The implication is that the developed Google Sites media needs to include learning guiding elements, such as material maps, achievement indicators per topic, and automatic feedback, to be able to stimulate independent learning gradually. These guiding elements align with the findings of Yang et al. (2025) that a sense of relatedness mediates increased motivation and engagement in independent learning. Therefore, the automatic feedback feature on Google Sites should ideally convey the sense of educator presence through personalized reflective notes.

The high level of student interest in interactive websites aligns with the results of Google Sites-based media development at various levels, which consistently receive positive responses from students, both in high school physics learning (Islanda & Darmawan, 2023), elementary school Informatics learning (Qori et al., 2025), and high school Informatics learning, which even reported a practicality level of up to 88.73% and an effectiveness of 87% in field tests (Dewanti et al., 2026). This aligns with findings showing that interactive digital media systematically designed for secondary school students positively influence learning engagement and motivation (Nafisah et al., 2025). However, upon closer examination, there is a quite striking gap between the high level of student interest and their low actual experience in using website-based learning media. This interest-experience gap risks creating obstacles to initial media use, as emphasized in self-determination theory that autonomous motivation needs to be accompanied by a sense of competence in using the system (Chiu, 2022). Structural equation modeling by Yang et al. (2025) in the context of self-directed e-learning showed that flow experience and self-regulated learning significantly influence the need for competence, connectedness, and autonomy, whereas social support alone without being accompanied by structured learning experiences is not strong enough to influence students' sense of competence.

These findings underscore that technical competence does not develop automatically from initial motivation, but rather is formed through repeated and purposeful user experiences. This argument reinforces the recommendation that onboarding sessions should not be one-off, but rather should be designed repeatedly over several initial meetings to truly establish a robust user

experience. In line with this, a study by Barz et al. (2024) found that self-regulated learning and affinity for technology were positively related to perceived ease and usefulness of technology use, while digital self-efficacy alone without structured experience was insufficient to significantly drive technology acceptance. This perspective is supported by a Technology Acceptance Model (TAM)-based study by García et al. (2024) that found a positive relationship between perceived ease of use, user satisfaction, attitudes, and intention to continue using a self-paced learning system. However, García et al. (2024) also provide the important nuance that the effects of TAM constructs are not always uniform across user groups, so the effectiveness of onboarding needs to be tested in stages. Collectively, these findings confirm that student enthusiasm for Google Sites cannot be a sole guarantee of success without repeated onboarding scenarios and structured usage familiarization early in implementation.

The data in Table 2 shows that infrastructural constraints, namely unstable internet connections and limited data quotas, account for the highest proportion of barriers. This finding reinforces the argument of Haniko et al. (2023) regarding the importance of equitable access to technology, training, and support as prerequisites for digital inclusion for groups with limited telecommunications infrastructure. A similar pattern of constraints was reported by Fajriatin et al. (2025) for junior high school students, who recommended providing offline materials that can be downloaded once and optimizing data-efficient applications as mitigation solutions. These findings align with the results of Gemiharto and Priyadarshani (2022) qualitative study on the digital divide in Indonesia, which emphasized that infrastructure issues are not solely technical but also a matter of institutional collaboration between the government, community, and private sector. The high proportion of infrastructural constraints compared to literacy constraints, such as platform navigation, minimal technical assistance, and device sharing, indicates that students' primary barriers are structural-external in nature. The implication is that mitigation strategies are not only focused on digital literacy training, but also touch on aspects of technical media design and institutional advocacy at the school and local government levels.

Specifically, the high proportion of data quota constraints indicates the need for Google Sites to be designed with low-bandwidth principles, such as optimizing media size, providing a main-text version of core materials, and providing a single-download option for offline learning (Fajriatin et al., 2025; Haniko et al., 2023). This data-light design recommendation is empirically supported by Umar and Argungu (2025) study on offline-capable mobile learning solutions, which showed that approaches such as local caching, pre-downloaded content modules, and lightweight user interfaces were effective in maintaining continuous learning access. Although Umar and Argungu (2025) study was conducted in the context of a specific mobile application, the application of similar principles to Google Sites could be adapted by providing download links for PDF files or compressed videos as complements. This approach aligns with the spirit of the Independent Curriculum, which emphasizes flexible learning tailored to students' real-world conditions and school readiness (Rahayu et al., 2022). Meanwhile, to address platform navigation challenges, Google Sites' navigation structure needs to be linear and consistent, equipped with guiding icons and a short self-guided user guide on the homepage. This is consistent with the findings of Barz et al. (2024) and García et al. (2024) regarding the importance of perceived ease of use in encouraging student technology adoption.

Overall, the findings from this analysis phase provide an empirical basis for the development of Google Sites-based learning media for junior high school Informatics in Balapulang District. The first principle is iterative user onboarding in several initial meetings to bridge the gap between interest and technical experience through flow experience mechanisms

and self-regulated learning (Yang et al., 2025). The second principle emphasizes the importance of an explicit learning guide structure with social connections to stimulate gradual learning independence. The third principle focuses on technical optimization in the form of low-bandwidth design and the availability of semi-offline access options to anticipate connectivity limitations, accompanied by institutional advocacy considering the structural nature of digital infrastructure issues (Gemiharto & Priyadarshani, 2022; Umar & Argungu, 2025). The fourth principle is the provision of a simple and consistent navigation interface accompanied by self-guided user guides validated for ease of use across various student groups (García et al., 2024).

These four principles are consistent with the ADDIE framework, where the output of the Analysis stage serves as a direct reference for product specifications in the Design and Development stage (Cahyadi, 2019), as applied to the development of Google Sites at the secondary school level (Dewanti et al., 2026; Islanda & Darmawan, 2023). However, it is important to honestly acknowledge that some supporting studies were conducted at different levels or contexts, such as university students, high school students, or in other countries. Therefore, direct generalization to the context of junior high school students in Balapulang District still requires caution and ideally should be further validated through limited trials. More broadly, strengthening independent learning through appropriately designed digital media aligns with the demands of mastering 21st-century skills, namely creativity, critical thinking, communication, and collaboration, as preparation for students facing the world of work and further education (Thornhill-Miller et al., 2023).

It should be noted that the findings at this stage are still descriptive and limited to three schools in one sub-district, so generalizations should be made with caution. Further research at the Design and Development stage is recommended to validate the four design principles through expert testing of media and materials, as well as limited trials on small groups of students before wider implementation.

CONCLUSION

خاتمة

This study analyzes the independent learning needs of junior high school students in Informatics and the potential obstacles in utilizing Google Sites as part of the Analysis phase of the ADDIE development model. The results of the study answer both research questions: first, junior high school students in Balapulang District have high technological readiness and interest in independent learning, but their actual experience in using website-based learning media is still low, leaving a gap that needs to be anticipated through onboarding scenarios in the early stages of implementation; second, the obstacles faced by students and teachers are dominated by infrastructural factors in the form of limited internet connections and data quotas, followed by digital literacy constraints and minimal technical assistance, as reinforced by the findings of teacher interviews regarding the importance of strengthening teachers' digital competence as student mentors. These findings provide a theoretical contribution to strengthening the study of the needs analysis phase within the ADDIE framework, as well as a practical contribution in the form of a design reference for the development of simple, data-light Google Sites-based learning media equipped with self-guided guidance for junior high school students in areas with limited technological infrastructure. Recommendations for further research are to use the findings of this needs analysis as the basis for the Design and Development phase, accompanied by trials on a wider population to strengthen the generalizability of the results.

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