Inovasi Kurikulum

Development of Google Sites-based learning media to enhance student motivation

Almendo Thio Lindra[1], C. Asri Budiningsih[2], Christina Ismaniati[3]

[1,2,3] Universitas Negeri Yogyakarta, Kota Yogyakarta, Indonesia

almendolock@gmail.com[1], asribudiningsih767@gmail.com[2], christina_ismaniati@uny.ac.id[3]

ABSTRACT

In the digital transformation era, integrating technology into educational settings is increasingly essential to address the diverse needs of modern learners. Traditional teaching methods often fail to engage students fully, creating a demand for innovative approaches that foster active learning and enhance academic performance. This study aims to develop interactive learning media based on Google Sites to boost student motivation and improve overall academic achievement. Using the 4D instructional design model—Define, Design, Develop, and Disseminate—the researchers created digital educational materials tailored for higher education environments. The study employed a quasi-experimental design with a sample of 40 college students, allowing for a systematic evaluation of the media's effectiveness. Data were collected through pre- and post-test assessments and analyzed using paired sample t-tests and descriptive statistics to determine the impact of the intervention. The results revealed a significant improvement in test scores and student engagement after implementing the Google Sites-based learning media. The increase in average scores and the reduction of performance variability underscore the potential of multimedia tools to revolutionize conventional teaching methods. Overall, this research highlights the benefits of digital learning environments in creating more dynamic, inclusive, and effective educational experiences.

ABSTRAK

Di era transformasi digital, mengintegrasikan teknologi ke dalam lingkungan pendidikan menjadi semakin penting untuk memenuhi beragam kebutuhan pelajar modern. Metode pengajaran tradisional sering kali gagal untuk melibatkan siswa secara penuh, sehingga menciptakan permintaan akan pendekatan inovatif yang mendorong pembelajaran aktif dan meningkatkan kinerja akademik. Penelitian ini bertujuan untuk mengembangkan media pembelajaran interaktif berbasis Google Sites untuk meningkatkan motivasi siswa dan meningkatkan prestasi akademik secara keseluruhan. Dengan menggunakan model desain instruksional 4D-Define, Design, Develop, dan Disseminate. Para peneliti menciptakan materi pendidikan digital yang disesuaikan untuk lingkungan pendidikan tinggi. Penelitian ini menggunakan desain kuasi-eksperimental dengan sampel 40 mahasiswa, yang memungkinkan evaluasi sistematis terhadap efektivitas media. Data dikumpulkan melalui penilaian pra dan pasca tes dan dianalisis menggunakan uji-t sampel berpasangan dan statistik deskriptif untuk menentukan dampak intervensi. Hasil penelitian menunjukkan adanya peningkatan yang signifikan pada nilai tes dan keterlibatan siswa setelah penerapan media pembelajaran berbasis Google Sites. Peningkatan nilai rata-rata dan pengurangan variabilitas kinerja menggarisbawahi potensi alat multimedia untuk merevolusi metode pengajaran konvensional. Secara keseluruhan, penelitian ini menyoroti manfaat lingkungan pembelajaran digital dalam menciptakan pengalaman pendidikan yang lebih dinamis, inklusif, dan efektif.

Kata Kunci: Google Sites; media pembelajaran; motivasi mahasiswa

INTRODUCTION

Technology integration in education is an urgent need in the digital transformation era, especially to answer the challenges of traditional teaching methods that cannot increase student engagement. Previous research shows that web-based platforms such as Google Sites effectively provide interactive learning materials, facilitate collaboration, and improve accessibility (Susanti et al., 2023). However, most studies still focus on basic implementation without a systematic design approach, thus not optimally integrating learning motivation theory with technical innovation. This condition shows the gap between the potential of technology and the need for media development based on a structured pedagogical framework. Therefore, this research brings scientific novelty by adopting the 4D model (Define, Design, Develop, Disseminate) to design Google Sites-based media that integrates active and multi-modal learning principles.

This study aims to test the hypothesis that applying Google Sites-based media with a 4D approach can significantly increase student learning motivation. Previous studies have proven the benefits of Google Sites, but have not explored its impact in higher education in Indonesia through experiment-based quantitative evaluation (Azizah, 2023; Chen et al., 2019; Putra et al., 2022). The main issue is the low motivation to learn due to the lack of interactivity and variety of media in conventional learning. By combining multimedia elements, real-time collaboration, and modular design, this research addresses the need for a dynamic, inclusive, and student-centered learning environment while strengthening learners' digital literacy as a 21st-century skill (Azizah, 2023). In addition, the situation in the community also requires an improvement in teachers' abilities in the learning process (Hadiapurwa *et al.*, 2021).

Information and communication technology's (ICT) quick development has changed conventional teaching strategies (Islanda & Darmawan, 2023). Educational institutions are increasingly using digital tools to support traditional teaching methods. The creation of interactive media is viewed in this light as a means of bridging the gap between contemporary digital practices and conventional education. Teachers may create and execute personalized learning resources with Google Sites' flexible platform (Susanti et al., 2023). This integration aims to provide a more dynamic and engaging learning environment.

Learning motivation is an important element influencing pupils' academic progress (Sagita et al., 2023). It has a direct impact on their level of participation, perseverance, and general learning outcomes. It is thought that using interactive digital media will pique pupils' curiosity and promote involvement (Annisa et al., 2023). Teachers may create an interactive, engaging, educational learning environment by incorporating Google Sites into the curriculum (Fanani & Risnawati, 2023). This approach will increase motivation by making the information more approachable and aesthetically pleasing.

The varied needs of contemporary learners are frequently complex for traditional classroom environments to meet (Suprayogi et al., 2023). Teachers are searching for different teaching strategies due to the growing diversity of learning preferences and styles (Iqbal et al., 2023). One step toward meeting various learning demands is the creation of media-based learning resources (Rose, 2011). To accommodate kinesthetic, aural, and visual learners, Google Sites offers a platform that combines many multimedia components (Anh & Truong, 2023). This flexibility makes the educational process more inclusive.

The use of digital media in the classroom is also consistent with the worldwide movement toward online education (Rosiyana, 2021). The demand for efficient and easily accessible learning resources is rising as distance learning becomes more popular. As a cloud-based platform, Google Sites makes it possible to create resources accessible from anywhere at any time. This flexibility is especially crucial for students who need alternate forms of teaching because of scheduling or geographic limitations (Wicaksono et al., 2023). It is believed that the effort to create such media is a proactive reaction to these changing needs in education.

Teachers have long been concerned about motivational issues in classroom settings. Reduced motivation can result in reduced involvement and lower academic accomplishment (Putra et al., 2022). Creative ideas that might revitalize the educational process are needed to overcome these obstacles. Using technology, teachers can create captivating information that grabs students' attention (Pahlevi et al., 2024). Using interactive elements and multimedia, Google Sites provides a workable way to breathe new life into the classroom.

There is growing recognition of digital platforms' importance in creating a collaborative learning environment (Laili & Mulyati, 2024). In addition to spreading knowledge, interactive media promotes student participation in active discussion (Wijayanti & Sulistiyono, 2024). Google Sites allows teachers and students to collaborate efficiently by allowing them to exchange ideas and content. This cooperative method fosters a feeling of belonging and community, both critical elements of motivating learning. The platform's architecture incorporates several interactive features that improve project-based learning and group conversations.

Teachers' ongoing professional development is vital to contemporary education (Pahlevi et al., 2024). To enhance their teaching methods, educators are urged to investigate new technology. This continuous professional development is demonstrated by creating instructional materials based on Google Sites (Laili & Mulyati, 2024). Implementing such cutting-edge resources can broaden teachers' toolkits of instructional techniques. In addition to helping the pupils, this advances the teaching community's professional development (Wijayanti & Sulistiyono, 2024).

Digital media has been repeatedly demonstrated to improve learning outcomes in academic study, as Thomas stated in a research titled "*A Review of Research on Project-Based Learning*". Research suggests integrating technology into the classroom can enhance students' comprehension and memory of the subject matter. Similar beneficial outcomes are anticipated from incorporating interactive platforms such as Google Sites. This method can turn passive learning into an active process by offering an engaging and approachable medium (Jacobson, 2008). Thus, it can potentially significantly increase academic achievement and student motivation.

Recent world circumstances that made remote learning necessary have expedited the transition to digital learning settings (West, 2019). The significance of having strong online learning platforms has been brought to light by this shift. In this regard, Google Sites has proven useful due to its ease of use and adaptability. It is the perfect tool for contemporary classrooms because it allows for collaboration and real-time updates. There is an increasing focus on creating tools that can easily move between real and virtual learning environments as educational paradigms change (He et al., 2024).

The problem of pupils' lack of digital literacy is also addressed by integrating Google Sites into the educational process. Students need to be proficient in using and navigating digital technologies because they will be working in the field in the future (Handayani et al., 2023). Thanks to this program, they can develop vital information technology skills. Students can become more adept in digital communication and content production by getting hands-on experience with Google Sites. These abilities are becoming increasingly important in today's technologically advanced job environment (Calamlam et al., 2022).

Managing and distributing material can be made easier from an administrative standpoint by using Google Sites. Educators can update the course materials to guarantee that students always have access to the most recent information. Videos, essays, and interactive tests are just a few educational resources that may be incorporated thanks to the platform's integration features. This lessens the administrative burden while improving the educational process (Cartner & Hallas, 2020). Effective content management is vital to preserving the caliber and applicability of instructional resources (Murphy & Lebans, 2009).

Additionally, creating learning materials based on Google Sites indicates more general patterns in innovative education. The world is moving toward using technology to surpass conventional instruction's drawbacks. Numerous studies highlighting the advantages of interactive and multimedia learning environments support this strategy (Zaneldin et al., 2019). Platforms like Google Sites are becoming more well-known for their capacity to revolutionize education as teachers continue to experiment with novel approaches. This study fits into a broader trend in education toward digital transformation. Modern educational theory is based on the fundamental idea of student-centered learning. Contemporary pedagogical approaches emphasize the significance of involving students in their learning processes. This idea is well-aligned with Google Sites' interactive features, which enable students to participate more actively. It promotes a sense of ownership over instructional content and self-directed learning. Increasing motivation and enhancing general academic results require this empowerment.

Several previous studies have explored using Google Sites as a learning medium. For example, a Google Sites-based media was developed to increase primary school students' interest in learning and utilized in science learning to increase student interaction (Azizah, 2023; Chen et al., 2019). Another study also showed the effectiveness of Google Sites-based e-modules in optimizing critical thinking skills (Susanti et al., 2023). In addition, there is also research that tested the use of Google Sites on basic math materials, which successfully increased the effectiveness of student learning. These studies generally emphasize the potential of Google Sites in improving student engagement and learning outcomes at various levels of education (Putra et al., 2022).

This research differs from previous studies in several aspects. First, the development model used is 4D (Define, Design, Develop, Disseminate), ensuring a systematic process from identification to product dissemination. Secondly, this study focuses on increasing students' motivation to learn in higher education, in contrast to previous studies that mainly targeted primary or secondary school students. Third, the quasi-experimental method with a pre-test and post-test design on 40 respondents allows for more in-depth statistical analysis, such as a paired sample t-test, to validate the effectiveness of the intervention. Finally, this study integrates collaborative and multimedia features tailored to multimodal learning styles, creating a more dynamic and inclusive learning environment than previous similar studies.

LITERATURE REVIEW

Definition of Google Sites

Google Sites is a web-based service developed by Google that enables users to effortlessly create and share websites without having considerable programming knowledge (Nugroho & Hendrastomo, 2021). This platform is part of Google's ecosystem and works smoothly with other Google services, including Google Drive, Google Docs, and Google Forms. Google Sites allows educators to create interactive and structured learning content, making it an invaluable tool for educational purposes (Susanti et al., 2023). The platform enables multimedia features such as movies, photos, and hyperlinks, allowing for a more engaging and comprehensive learning experience (Sagita et al., 2023).

Google Sites allows educators to customize layouts, themes, and navigation to meet specific curriculum objectives, demonstrating its adaptability. Teachers can establish hierarchical frameworks that lead students through successive subjects or modules by grouping content into pages and subpages. Interactive elements that convert passive information consumption into active participation, such as discussion boards or embedded quizzes, further improve engagement. Because of its versatility, Google Sites may be used in various educational settings, including K-12 classrooms and higher education.

Additionally, Google Sites reduces the fragmentation frequently found in traditional instructional materials by acting as a single repository for digital information. Teachers can exchange downloaded resources, insert calendars for deadlines, and use integrated forms to give immediate feedback. Its utility is increased by its compatibility with third-party programs like Quizlet and Padlet, which enables more complex, multimodal learning experiences. When taken as a whole, these characteristics make Google Sites an effective tool for updating how instructional content is delivered.

Student Learning Motivation

Learning motivation refers to a student's inner and extrinsic desire to participate in the learning process. According to Deci and Ryan's Self-Determination Theory in a book titled "*Intrinsic Motivation and Self-determination in Human Behavior*", motivation is impacted by three basic psychological needs: autonomy, competence, and relatedness (Husna & Supriyadi, 2023). Motivation is important in education because it influences students' engagement, persistence, and overall academic accomplishment (Pranyoto, 2023). Instructional methods, learning materials, and educational technology all impact motivation (Afnita et al., 2023). Digital learning technologies like Google Sites can boost motivation by offering interactive, student-centered, and conveniently accessible learning opportunities.

Students' attention is maintained mainly by interactive and aesthetically pleasing materials, especially for digital natives who are used to multimedia content. When exposed to dynamic resources, including movies, simulations, or gamified exercises, learners' cognitive and emotional engagement rises. By matching content to each student's particular requirements and objectives, personalized learning routes that are catered to their tastes and pace further increase motivation, as stated by Ariani et al. in a book titled "*Buku Ajar Belajar dan Pembelajaran*".

Difficulties like boring instruction or a strict curriculum can sap motivation and cause disengagement. These problems can be mitigated by integrating technology encouraging active engagement, such as group projects or real-time feedback systems. Teachers may create a classroom environment where students feel encouraged to investigate, inquire, and create by encouraging a sense of accomplishment and significance.

Implications of Google Sites in Learning Motivation

Integrating Google Sites in education has several implications for enhancing student learning motivation. First, it promotes self-directed learning, allowing students to access materials anytime and anywhere, thereby increasing their autonomy. Second, it fosters collaborative learning by enabling students to collaborate on projects, share insights, and provide peer feedback. Third, the visual and interactive nature of Google Sites makes learning more engaging, catering to different learning styles and preferences. Lastly, it simplifies the organization of learning materials, helping students navigate and comprehend content more effectively (Husna & Supriyadi, 2023).

Collaborative elements on the site, such as commenting and shared editing, promote peer communication and group problem-solving. Maintaining motivation in group-oriented tasks requires a sense of community, which is fostered by this social aspect of learning. Students feel appreciated when their efforts are seen on a common website, strengthening their dedication to group objectives. Websites can encourage students' motivation to participate in learning activities and make it easier for teachers to develop their teaching materials (Laoli et al., 2024; Rahmawati et al., 2024).

Furthermore, by letting students go over content whenever they want, Google Sites promotes self-paced learning and lessens the tension of strict deadlines. Educators can offer asynchronous feedback through discussion boards or embedded forms, establishing an ongoing feedback loop. Google Sites creates a more inclusive and inspiring learning environment by combining structure and flexibility, bridging the gap between traditional education and contemporary pedagogical demands.

METHODS

The research methodology used in this study is based on the 4D model, which several instructional design specialists recommend. The four main stages of the model are Define, Design, Develop, and Disseminate. To ensure the learning materials meet the needs of the students, the objectives and target needs are precisely determined during the Define phase. A thorough blueprint detailing the components and organization of the Google Sites-based media is produced during the Design phase. The media is really built during the Development phase, and its implementation and efficacy are assessed during the final dissemination phase.

The defining stage helps determine and explain the needs and gather information related to the things that will be developed in the product. During the Define phase, the researchers conducted a thorough requirements analysis to determine students' motivational and learning obstacles in conventional classroom environments. Through preliminary observations and literature reviews, it was discovered that one of the main things impeding engagement was a lack of interactive tools. The team prioritized addressing competence and autonomy through readily available, self-directed learning solutions, per Deci and Ryan's Self-Determination Theory. According to the report, Google Sites integration is essential for bridging the gap between traditional approaches and digital innovation. These realizations created a precise framework for focused treatments that improve academic performance and motivation.

The design stage helps determine the design that will be implemented. Media selection, format selection, and initial design can be done at this stage. During the Design phase, the Google Sites-based media was structured to include multimedia features (e.g., movies, quizzes) that cater to various learning styles, guided by dual-coding theory. The platform placed a high value on usability and aesthetic appeal, ensuring that the content was arranged in modules that complemented the objectives of the curriculum. According to motivational theories, collaborative elements like shared project areas were incorporated to promote peer engagement and relatedness. Teachers can modify the materials because of the design's emphasis on adaptability while ensuring pedagogical coherence. During this stage, the platform's educational rigor and engagement were guaranteed.

The development stage, or development, aims to produce products. In this stage, the product must go through several stages of improvement from experts or validators and be tested by consumers as users. The development step entailed developing and testing Google Sites media using a quasi-experimental technique with 40 university students. Under the direction of input from educators and students, usability testing and iterative improvements were carried out to improve accessibility and content quality. The efficiency of the media was validated by the statistically significant improvement in scores between the pre- and post-tests (mean difference = 5.55, $p < 0.001$). Feedback from students emphasized how valuable the platform is for supporting group projects and active learning. The ability of media to turn passive learning into an engaging, student-centered experience was validated throughout this phase.

At this stage, the product can be disseminated and recognized by the broader community beyond the scope of the development itself. Some factors that must be considered when conducting dissemination are user analysis, strategy and theme, dissemination timing, and dissemination media selection. In the

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Disseminate stage, the media was spread across larger student cohorts, using the cloud-based infrastructure for universal access. Teachers observed that students' digital literacy had increased, meeting the needs of 21st-century skills. The study strongly emphasized professional development, arguing that teachers need continual training in digital tools to maintain pedagogical innovation. The platform connected classic and contemporary educational paradigms by encouraging self-paced and collaborative learning. This stage demonstrated how Google Sites may be scaled to create inclusive, dynamic learning environments that encourage sustained academic participation.

In order to determine how the media affects student motivation, the research is set up as a developmental study with an experimental component. To ascertain the efficacy of the learning materials, a quasi-experimental methodology is used, involving pre- and post-test assessments. In order to ensure a manageable yet representative group for analysis, the study particularly targets a sample of 40 university students. A targeted analysis of the media's influence on learning, motivation, and engagement is made possible by this sample size. The research was conducted at the Language, Literature, and Indonesian Education Study Program of Sanata Dharma University, Yogyakarta. Quantitative data from the experimental design support the improvements in academic achievement. Descriptive statistics were used in the data analysis to provide an overview of the 40 college students' results on the pre-test and post-test evaluations. Mean scores, standard deviations, and ranges were computed to represent the central tendency and variability in student performance.

RESULTS AND DISCUSSION

Result

The results show that using Google Sites-based instructional media has greatly improved student performance. According to preliminary analysis, pre-test engagement levels were moderate but significantly improved in post-test evaluations. According to the descriptive data, average scores have significantly increased, and participant variability has remained constant (Azizah, 2023). Furthermore, the statistical significance of the observed improvements was validated by the paired sample t-test. These results offer compelling proof that the intervention successfully increased student motivation and academic performance, laying the groundwork for a more thorough examination of these results in the following paragraphs.

Define Stage

The Define stage concentrated on determining students' learning requirements and obstacles to motivation in conventional classroom settings. The researchers observed and interviewed students and instructors in the Indonesian Language Education program as part of their needs analysis during the Define stage. The results showed that a lack of engagement and repetitive content delivery in typical classroom settings demotivated many pupils. Because the course materials were exclusively delivered through lectures or static texts, students reported having trouble focusing and understanding them. In order to boost academic motivation and performance, these difficulties demonstrate the urgent need for more interesting, interactive, and easily accessible learning resources.

According to the report, students also favored learning experiences that enabled them to participate in group projects and have flexible access to content. This realization is consistent with Deci and Ryan's Self-Determination Theory (1985), which highlights relatedness and autonomy as important motivators. The students desired environments that encouraged self-directed learning and facilitated peer interaction and feedback. As a result, any educational materials created must fill these motivational gaps by including elements that promote autonomy, social interaction, and customisation.

Additionally, instructors emphasized how difficult it is for them to offer various multimedia-based content because of time restrictions and a lack of digital abilities. The incompatibility of the present teaching methods with the learning requirements of the pupils highlighted how urgent it is to incorporate a scalable and user-friendly platform. Google Sites was chosen as a possible remedy due to its user-friendly integration of interactive, visual, and audio components, as stated by Putri in a research titled "*Pengembangan Media Pembelajaran Berbasis Google Sites untuk Meningkatkan Hasil Belajar IPAS Siswa Kelas IV MIN 2 Kota Malang*". Thus, the Define stage validated that educators and students needed a media solution that connected digital innovation and educational efficacy.

Design Stage

During the Design phase, the Google Sites-based media was structured with multimedia features (videos, quizzes) to accommodate different learning styles (Anh & Truong, 2023). Accessibility and aesthetic appeal were given top priority in the platform's design, which was in line with multimedia learning concepts that stress dual-coding theory for improved retention, as Putri (2024) mentioned in a research study mentioned before. In keeping with the focus on relatedness in motivation, collaborative elements like shared project areas were used to encourage peer engagement (Husna & Supriyadi, 2023). This phase confirmed how crucial it is to incorporate theoretical frameworks into real-world design in order to produce inclusive, dynamic learning environments. In order to provide accessibility and flexibility, the platform is easily linked with Google Drive and Forms for real-time feedback and resource sharing. Homepage with easy-to-use navigation and a dedicated section for learning resources with multimedia modules. To close the gap in traditional training and increase motivation, these design decisions sought to accommodate multi-modal learners, encourage autonomy through do-it-yourself access, and build a dynamic, student-centered environment.

The media design phase used Google Sites to create an engaging and accessible platform based on the needs research conducted in the Define step, as seen in **Figure 1**. The design strongly emphasized user-friendliness to guarantee that students could quickly navigate through the content without experiencing any technical challenges. In order to accommodate different learning styles and keep students' attention, multimedia components, including pictures, videos, tests, and downloadable resources, were used. Students could explore the material at their own pace because the layout was divided into distinct modules that matched the learning objectives. In addition to increasing the clarity of the material, this modular structure kept students interested and focused throughout the learning process.
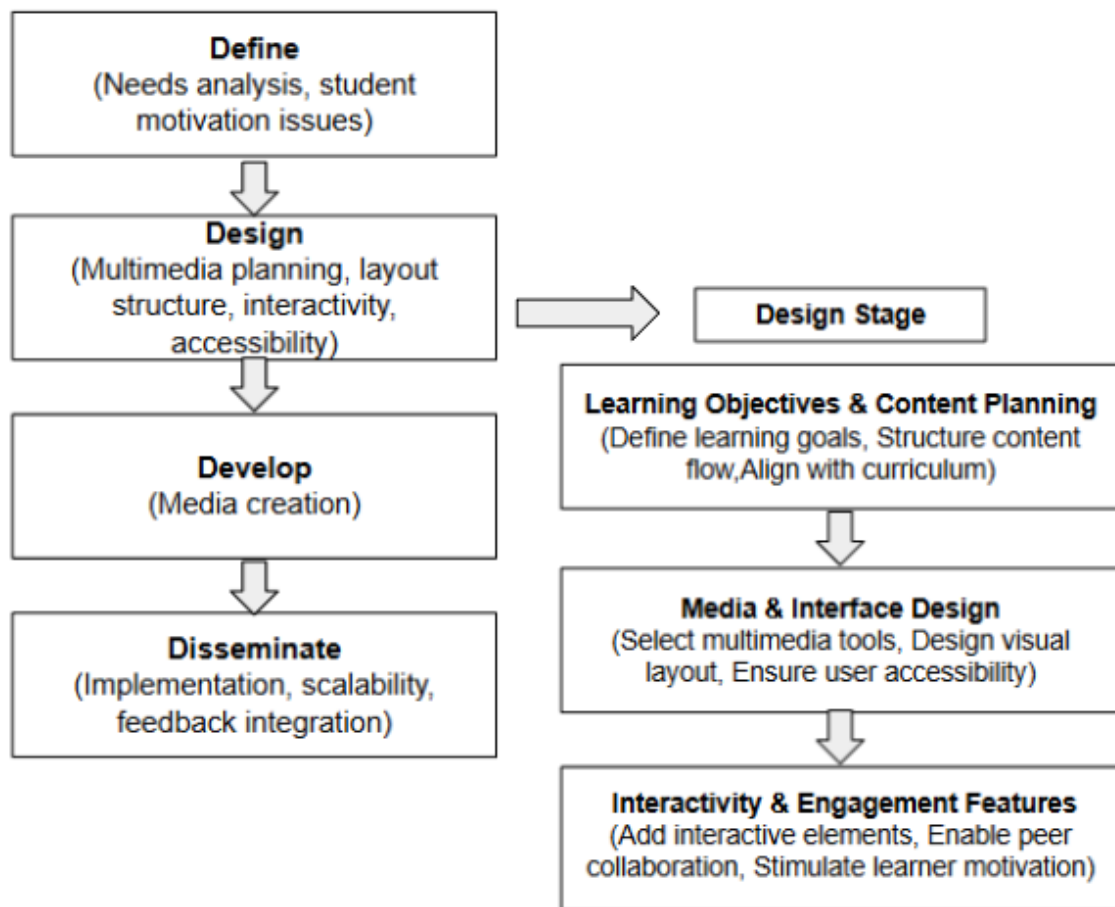
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Figure 1. Design Stage of the 4D Instructional Model
Source: Author's Documentation 2025

In addition, the design incorporated collaborative elements like discussion sections and shared workstations to promote peer interaction. These components were created to increase student participation by encouraging a feeling of belonging and shared accountability. In order to minimize distractions and preserve an interactive experience, the interface was kept simple but aesthetically pleasing. Another important factor was accessibility. The platform was tailored for various internet circumstances and devices. Consequently, the media may successfully support both remote and in-class learning environments. In summary, the design step transformed the insights gained during the Define phase into a functioning, interactive learning environment tailored to the needs of students. From multimedia to the navigation layout, every platform aspect was thoughtfully designed to encourage motivation and engagement. Inclusion was given top priority in the design decisions, guaranteeing that students with different degrees of digital literacy may gain an equal advantage. Meaningful learning experiences were made possible by the Google Sites-based media, which struck a balance between structure and flexibility. This step was essential in preparing the media for the following phase's testing and development.

Develop Stage

The media were created and tested using a quasi-experimental methodology throughout the development phase. A statistically significant improvement in test scores was seen after the intervention (mean difference = 5.55, p < 0.001), supporting research on technology-enhanced active learning (Jacobson, 2008). Students emphasized the platform's usefulness in their feedback, especially its potential to support group projects. This is consistent with research on peer-driven engagement (Jamaluel, 2019). High-quality content management was reinforced by iterative improvements based on usability testing that made sure the media complied with accessibility criteria (Murphy & Lebans, 2009). These results demonstrated how well Google Sites works to turn passive learning into an engaging, student-centered experience.

During the development stage, a thorough survey was given to students to determine their feelings about the usability and efficacy of the Google Sites-based learning materials. The questionnaire analysis showed a positive response with a standard deviation of 0.5 and an average usability rating of 4.3 out of 5. Furthermore, an average score of 4.1 was obtained for the items evaluating the media's capacity to promote interactive and collaborative learning, confirming the platform's efficacy. These quantitative results played a crucial role in directing iterative enhancements and guaranteeing that the educational resources satisfied the requirements of the students. The thorough questionnaire responses offered more proof that the digital intervention significantly improved the entire educational process.

Disseminate Stage

With a focus on scalability and adaptability, the media was deployed across larger student cohorts at the Disseminate stage. The platform's cloud-based architecture allowed easy access, supporting the adaptable learning materials (Wicaksono et al., 2023). Instructors noted that students' digital literacy had improved, which aligned with the 21st-century skills (Handayani et al., 2023). Additionally, the study's focus on professional development echoed the recommendation made by research for ongoing training in digital tools for educators (Pahlevi et al., 2024). This phase showed how Google Sites may support long-term pedagogical innovation by establishing independent and collaborative learning ecosystems, bridging the gap between conventional and contemporary educational paradigms.

Table 1. Descriptive Statistic

Variable	N	Mean	Standard Deviation	Minimum	Maximum
Pre-Test	40	70.25	7.90	55.00	85.00
Post-Test	40	75.80	8.15	60.00	90.00

Source: Author's SPSS Documentation 2025

The descriptive statistics in **Table 1** give a preliminary summary of the information gathered from the 40 college students and include important metrics like the mean, standard deviation, and the lowest and maximum scores for the tests administered before and after the test. Students were generally moderately motivated before the intervention, with a mean score of 70.25 on the pre-test. A respectable range of scores, suggesting variation in student performance, is indicated by a standard deviation 7.90. The scores also show a wide range of starting motivation levels, which vary from a minimum of 55.00 to a maximum of 85.00. The basis for comprehending the participants' overall performance prior to the learning intervention is laid out in this summary.

The idea that digital learning resources might boost intrinsic motivation, as Self-Determination Theory describes, is supported by the improvement in post-test scores. According to this idea, encouraging deeper connections with students requires meeting their autonomy, competence, and relatedness requirements. The statistical gains we saw in our study imply that the Google Sites-based materials promoted interactive and collaborative learning in addition to self-directed learning. The multimedia capabilities of the platform probably contributed to the development of a more stimulating and welcoming atmosphere, which is consistent with the ideas of active learning. Furthermore, these results highlight how technology-enhanced teaching strategies might close the gap between conventional instruction and contemporary educational methodologies. All things considered, the descriptive statistics offer numerical proof in favor of the theoretical frameworks that support a more dynamic and student-centered method of instruction. Conversely, the post-test results indicate a higher mean score of 75.80, indicating a general rise in student motivation after the Google Sites-based learning media intervention. With the average performance increasing considerably compared to the pre-test, the mean score increase indicates a good influence. There is still some significant variability in the students' responses after the intervention, as seen by the standard deviation 8.15, which is marginally higher than the pre-test standard deviation. The post-test scores ranged from 60.00 to 90.00, indicating that although most students progressed, the participants' results varied. This change in range and central tendency highlights the potential.

The overall analysis of the descriptive statistics demonstrates the consistency of the data distribution over the two testing periods and the improvement in mean scores. While overall performance has improved, the variability within student performances has remained constant, according to the comparatively equal standard deviations between pre-test and post-test results. The idea that individual learning responses vary considerably despite the general upward trend is further supported by both tests' minimum and maximum scores, which offer insight into individual variances. This thorough statistical explanation supports the study's initial conclusions, suggesting that Google Sites-based learning resources could significantly increase academic enthusiasm. These findings provide a solid basis for additional inferential statistical research to validate the intervention's efficacy.

Table 2. Normality Test (Shapiro-Wilk)

Variable	Statistic	df	Sig
Pre-Test	0.974	40	0.250
Post-Test	0.10	40	0.480

Source: Author's SPSS Documentation 2025

The Shapiro-Wilk statistic in **Table 2** is used in the normalcy test to confirm that our data's distribution satisfies the presumptions needed for parametric testing. The Shapiro-Wilk test was used in this investigation to determine if the pre-test and post-test results were expected. With significant levels of 0.250 and 0.480, respectively, the test yielded a statistic of 0.974 for the pre-test and 0.982 for the post-test results. These p-values show no discernible departure from a normal distribution because they are higher than the standard alpha threshold 0.05. This confirmation is crucial because it confirms the use of the following parametric tests, such as the paired sample t-test.

One of the most important steps in statistical analysis is ensuring data normalcy, which supports the validity of the study's conclusions. It is implied that there are no underlying distribution abnormalities causing the observed variances in student performance because the pre-test and post-test scores are consistently normal. The validity of the gains seen following the intervention with the Google Sites-based learning materials is further supported by this consistency. Furthermore, the findings of the Shapiro-Wilk test give confidence that the 40-person sample size is sufficient for the study and that the data are reliable

enough for inferential testing. All things considered, the normalcy test upholds the study's methodological integrity and opens the door for more complex statistical analyses.

Table 3. Paired Sample t-test

Pair	Mean Difference	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pre-Test Post-Test	5.55	5.20	0.82	6.77	39	0.000

Source: Author's SPSS Documentation 2025

The fundamental ideas of Self-Determination Theory, which highlight the functions of autonomy, competence, and relatedness in promoting intrinsic motivation, are supported by the significant improvement indicated by the paired sample t-test as seen in **Table 3** (Hasanah & Pithaloka, 2024). This hypothesis states that students become more motivated overall when given resources that improve their capacity to learn independently and cooperatively. With its interactive and multimedia capabilities, the Google Sites-based learning materials successfully meet these psychological needs by empowering students to take charge of their education (Rahman et al., 2020). Furthermore, the findings are consistent with constructivist learning theories, which support experiential learning and active participation as essential elements of profound comprehension. In addition to confirming the existing findings, this blending of technology and pedagogical philosophy highlights how digital technologies can revolutionize conventional learning settings. In the end, these realizations open the door to more creative methods of teaching that fit into pre-existing frameworks for motivating.

The findings of the paired sample t-test show that student performance improved statistically significantly after the intervention. A mean difference of 5.55 between the pre-test and post-test scores was found in the analysis, indicating that students' academic performance and motivation improved following their use of the Google Sites-based learning resources. This improvement is not the result of chance, as demonstrated by a t-value of 6.77 with 39 degrees of freedom and a p-value less than 0.001. The null hypothesis, according to which there is no change between the pre-test and post-test scores, is rejected because of the low p-value. This statistically significant outcome offers compelling proof that the intervention successfully raised students' motivation for learning.

Following the intervention with the Google Sites-based media, the first pre-test results showed modest levels of engagement, which considerably improved. The descriptive analysis showed that average test scores increased, and participant variation was comparatively constant. These results show that the digital learning intervention positively impacted student motivation and academic performance. Overall, descriptive statistical methods gave a clear and succinct summary of the data trends seen during the study.

Furthermore, the effect's magnitude shows the findings' practical significance, as indicated by the mean difference. A trustworthy assessment of the difference between the two testing periods is indicated by the standard error mean of 0.82. The consistency of these findings supports the idea that Google Sites-based learning materials are a valuable tool for increasing academic engagement. These results are helpful for teachers looking for creative ways to raise student achievement in academic environments. The paired sample t-test confirms the intervention's beneficial effects and advances knowledge of the usefulness of digital learning resources in contemporary education.

Discussion

Building on the conversation, Self-Determination Theory offers a strong foundation for comprehending how digital learning environments improve student motivation (Mamahit & Situmorang, 2017). According

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to this idea, boosting intrinsic motivation requires meeting the demands for autonomy, competence, and relatedness, as the better post-test results show. The interactive and collaborative characteristics of Google Sites-based media foster students' sense of competence and independence, enabling them to control their education (Priyoaji, 2024). By meeting these psychological demands, interactive learning tools can significantly increase students' engagement (Husna & Supriyadi, 2023). Therefore, the study's empirical results support the theory that technology-enhanced learning environments can increase intrinsic motivation.

Furthermore, constructivist learning theories provide valuable insights into the efficacy of multimedia instructional technologies. These ideas stress that information is actively created through meaningful interactions and practical experiences rather than passively absorbed; the Google Sites-based media amply demonstrates this idea. Incorporating multimedia components like movies, tests, and group projects not only accommodates a range of learning preferences but also supports the notion that learning is an active, contextualized activity (Muttaqin, 2023). Including interactive elements in the learning process improves cognitive engagement and promotes a deeper comprehension of the subject matter (Pahlevi et al., 2024). Ultimately, the study's results and constructivist ideas support the revolutionary potential of digital learning resources in transforming conventional teaching methods.

The 4D instructional design methodology, which comprises the stages of Define, Design, Develop, and Disseminate, is followed in creating learning materials using Google Sites in this study. The study determined students' learning requirements and motivating obstacles in conventional classroom environments throughout the Define stage. The requirement for an interactive and captivating learning tool was determined based on observations and earlier studies. The potential of Google Sites as an approachable and user-friendly platform to improve learning motivation was also examined at this level. The results made clear how important it is to include technology to establish a dynamic, student-focused learning environment. Here is the link to access the developed Google Sites https://sites.google.com/view/psbsiusd?usp=sharing.

Figure 2. Homepage section
Source: Author's Documentation 2025

Figure 2 is an illustration of an interesting learning resource made with Google Sites that is intended to improve the online learning environment. Teachers and students can easily navigate the interface thanks to its clear layout and user-friendliness. Interactive features like downloadable resources, hyperlinks, and

embedded movies are smoothly incorporated to accommodate different learning methods. In addition to improving accessibility, this design motivates students to engage with the material actively. This utilization of Google Sites is a perfect example of how digital resources can be used to build dynamic and interactive learning environments efficiently.
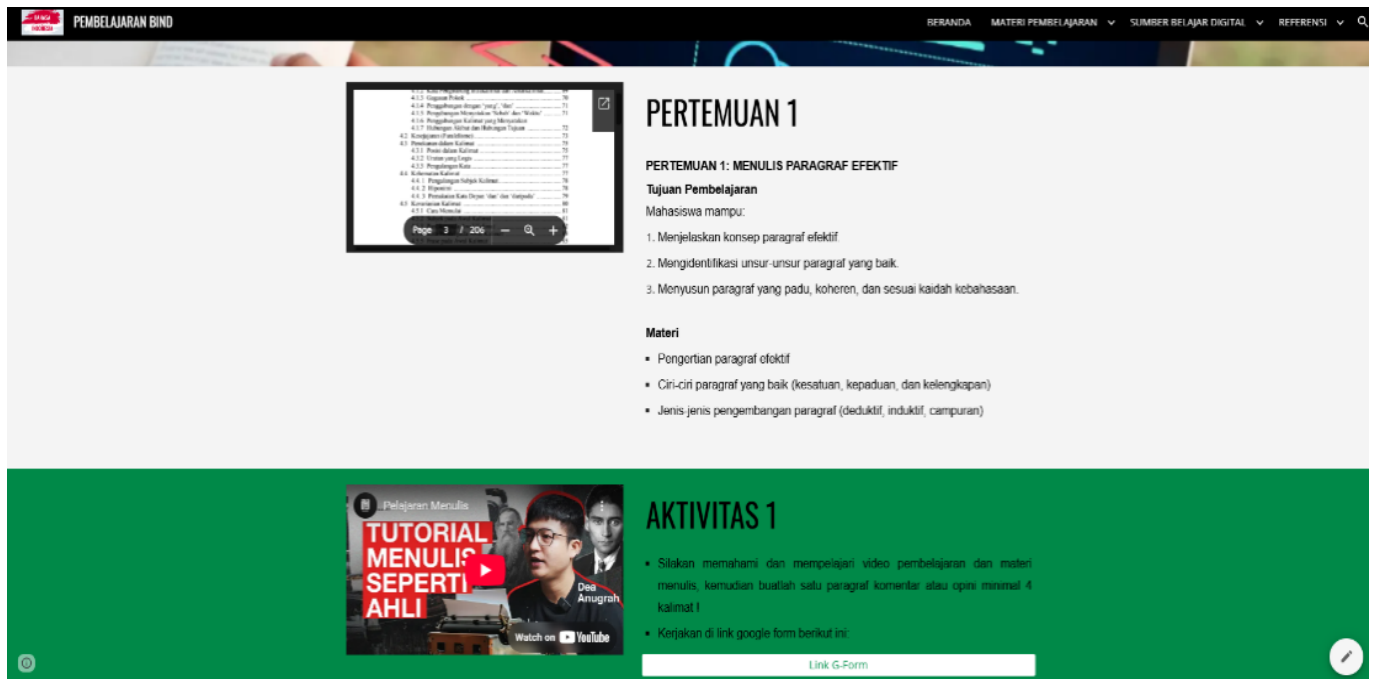

Figure 3. Learning material section
Source: Author's Documentation 2025

Figure 3 shows how to use Google Sites to create an instructional website step-by-step. It draws attention to the user-friendly interface, allowing users to quickly add and arrange text, photos, and embedded videos using a straightforward drag-and-drop method. The picture also demonstrates the various customization choices that are accessible, such as theme selection and layout modifications, which let teachers create a website that supports their learning objectives. The accessibility of Google Sites as a tool for creating dynamic and captivating learning platforms is highlighted in this graphic guide. It is a helpful guide for teachers who want to improve their instruction using technology.

The components and structure of the Google Sites-based instructional materials were created during the Design phase. The platform was created with multimedia components like films, tests, and interactive information to accommodate various learning methods. Instructional materials were organized in a structured manner for ease of use and accessibility. This stage ensured the information was interesting, educational, and aligned with the learning goals. The design aimed to increase student motivation and engagement by making learning more engaging and aesthetically pleasing.

The development and deployment of the Google Sites-based educational materials occurred during the development stage. To ensure they satisfied the students' learning needs, the created media were evaluated for usability, efficacy, and accessibility. Pre-test and post-test evaluations were used in a quasi-experimental design to gauge the effect of the intervention. The outcomes confirmed the efficacy of the digital learning tool by showing a notable increase in students' academic performance and motivation. In order to improve the media's quality, this phase also included changes based on student comments.

Finally, in the Disseminate stage, the learning media were introduced to a broader student population for further evaluation and refinement. The study emphasized integrating technology into conventional teaching methods to accommodate diverse learning preferences. Google Sites proved to be a flexible and

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effective platform supporting individual and collaborative learning. The research findings suggest that incorporating digital learning media can bridge the gap between traditional and modern educational approaches. Therefore, this study contributes to the growing body of research on the role of digital tools in enhancing student engagement and motivation.

Additionally, incorporating Google Sites is consistent with Deci and Ryan's Self-Determination Theory, highlighting the psychological requirements of relatedness, competence, and autonomy. The platform's adaptability fosters autonomy by enabling students to access materials at their own pace. At the same time, collaborative features like peer discussion forums promote relatedness, while structured material and instant feedback systems improve the perception of expertise. All of these factors work together to increase intrinsic motivation, which is seen by the higher post-test results and encouraging student comments. As a result, the learning intervention shows how digital technologies can meet critical needs for motivation in higher education.

The study also demonstrates the principles of constructivist learning theory, which holds that knowledge is created via meaningful, active interaction with the material. Google Sites promotes immersive and contextualized learning that appeals to learners' cognitive and emotional processes by integrating multimedia components such as movies, tests, and interactive modules. This supports the idea that interactive digital environments encourage deeper comprehension through interaction (Jacobson, 2008). Additionally, the results corroborate a claim that digital platforms foster critical thinking and student agency (Muttaqin, 2023). As a result, the study supports the usefulness of constructivist ideas in digital teaching and identifies Google Sites as a valuable tool for implementing them.

CONCLUSION

To improve student engagement and academic performance, this study effectively developed Google Sites-based learning materials using the 4D instructional model: Define, Design, Develop, and Disseminate. The quasi-experimental design involving 40 university students showed significant improvement in post-test scores (mean = 75.80) compared to pre-test scores (mean = 70.25), with statistical significance confirmed by a paired sample t-test ($p < 0.001$). Integrating multimedia features such as videos, quizzes, and collaborative spaces enhanced engagement and addressed various learning styles. Moreover, the platform's accessibility supported self-directed learning and peer collaboration, helping overcome motivational challenges in conventional classroom settings. These outcomes demonstrate the effectiveness of Google Sites in fostering a dynamic, inclusive, and student-centered learning environment. The findings highlight the importance of incorporating digital platforms to modernize teaching practices and maintain learner interest in the evolving educational landscape.

The theoretical foundation of this study is closely aligned with Deci and Ryan's Self-Determination Theory, which emphasizes autonomy, competence, and relatedness as key factors in intrinsic motivation. Google Sites supports this framework by offering flexible navigation, allowing students to access materials at their own pace and revisit content as needed, thus promoting a sense of control over their learning journey. This autonomy enhances internal motivation and sustained engagement. In addition, the media design reflects constructivist principles by facilitating contextual, meaningful learning through interactive, student-centered activities and group projects. Including multimedia components like embedded videos and quizzes enriches comprehension and makes learning more engaging and aligned with real-world applications. Ultimately, the 4D model ensures that the learning media is pedagogically sound, data-driven, and responsive to students' needs, making it a powerful tool for improving motivation and educational outcomes.

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