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UTAUT: Analyzing Google Sites Media Reception through Deep Learning on Energy

Wida Widaningsih[1], Dede Trie Kurniawan[2], Yunus Abidin[3]

[1,2,3]Indonesian University of Education, Bandung, Indonesia

*widaningsih2507@upi.edu[1]

Abstract. This study aims to explore the determinants that influence the acceptance of using Google Sites as a digital learning platform, by referring to the Unified Theory of Acceptance and Use of Technology (UTAUT) framework combined with a qualitative approach.*deep learning*. The background of this study is the importance of technology integration in education that is not only functional, but also emotionally relevant and in accordance with the learning context. Using a quantitative approach, this study applies structural model analysis to test the relationship between variables such as*self-efficacy*, *effort expectancy*, teacher attitudes, and habits of using information technology. The findings show that*self-efficacy*, expectations of ease of use, and teacher attitudes have a significant effect on behavioral intentions in using Google Sites, which then encourage the formation of habits in using technology. In addition, teachers' emotional needs have been shown to be a major factor in shaping perceptions of learning effectiveness, in addition to the importance of infrastructure support. Interestingly, the intensity of technology use is not always in line with positive perceptions of the learning process, emphasizing the need for a contextual and affect-based approach. This study confirms that the success of technology integration in learning is greatly influenced by affective factors, accessibility, and a comprehensive learning environment. This model enriches the application of UTAUT in the realm of digital education, especially in designing technology-based learning systems that accommodate the balance between cognitive and emotional aspects of students.

Keywords: *Deep Learning; Digital Learning; Google Sites; UTAUT;*

INTRODUCTION

In the digital era, educational institutions are increasingly using web-based platforms to support student-centered learning. This technology can be utilized in both classroom and out-of-class learning contexts, making it easy for students to access learning materials, communicate with teachers and classmates, and participate in various forms of learning activities. One of the main advantages of learning technology is its accessibility, as it allows students to access materials anytime and anywhere. This helps overcome geographical and time constraints, supporting distance learning, inclusive education, and lifelong learning (Mukhid, M. P.,2023). Based on the 2004 AECT definition, educational technology should be able to facilitate the learning process.

Referring to the 2004 AECT definition, educational technology is understood as the study and ethical practice of facilitating learning and improving performance through the creation, use, and management of appropriate technological processes and resources. Therefore, educational technology does not only support individual learning, but also contributes to

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learning processes in groups and organizations across different levels of education, age groups, learning contexts, places, times, and subject matters. In this regard, educational technology needs to play a greater role in the era of the industrial revolution by adapting to emerging trends, learning needs, and competency standards in both formal and non-formal education (Surani, 2019).

Among various educational technologies, Google Sites offers flexibility, ease of use, and accessibility to design and deliver subject-specific content. Google Sites has proven effective in encouraging collaboration between learners through various features, such as ease of managing content, integration with various other collaborative tools, and the ability to share information directly (real-time). Theoretically, this effectiveness is in line with collaborative learning theories that emphasize the importance of social interaction and collaborative knowledge construction. With its various features such as ease of collaborative editing, integration with various other Google applications, and high levels of accessibility through various types of devices. Google Sites has great potential as a collaborative learning medium in various educational contexts. In general, the use of Google Sites is very flexible and user-friendly, and does not require expensive computer and internet network infrastructure. (Febrian et al., 2024)

In energy education, especially energy saving lessons, students are expected to engage in reflective, critical, and problem-solving activities that require more than just traditional didactic methods. Critical thinking skills refer to an individual's ability to solve problems through the use of arguments that enable them to analyze, assess, and determine decisions related to beliefs or actions taken. In the era of the Industrial Revolution 4.0, which is marked by major changes in various fields of science, 21st century learning emphasizes a number of important skills, such as the ability to communicate, collaborate, think critically, solve problems, and think creatively. These skills are very crucial in facing the challenges that arise in the midst of the development of the industrial revolution 4.0 (Cynthia, R. E., & Sihotang, H., 2023). Through in-depth approach, expectedencourage conceptual understanding and real-world application, in line with digital media platforms. The government has established a policy of implementing deep learning to create meaningful learning experiences and build a learning environment that encourages students' deep understanding. This approach aims to stimulate high-level thinking skills and the ability to apply knowledge in various real situations. In the context of history learning, the use of digital media is a strategic alternative to increase students' interest in learning. Various forms of digital content such as interactive applications, educational videos, and historical simulations are able to present material visually that is more interesting, dynamic,

and interactive. This makes students more interested in learning and understanding the material. For example, visualizing historical events through video or animation can bring historical narratives to life and make it easier for students to understand, thereby increasing their interest in the subject.Fatmawati, I. (2025).

Not much different from learning history, in learning about energy, students are also encouraged to connect the concepts they learn with real-life situations and environmental issues around them. Energy learning should not only focus on memorizing types of energy or sources of electrical energy, but also guide students to understand how energy is produced, used, and conserved in daily life. Through this process, students can develop awareness that the use of electrical energy is closely related to human needs, technological development, and environmental sustainability. Therefore, learning activities can be designed to help students observe energy use at home or school, identify examples of energy waste, and discuss simple actions that can be taken to use energy more wisely.

Furthermore, students are expected to build a deeper understanding of the importance of saving energy as part of responsible environmental behavior. They can be involved in meaningful activities such as creating posters, delivering short messages, or conducting simple campaigns to invite others to save electricity. These activities allow students to apply their knowledge in a practical context and demonstrate their concern for environmental protection. Through such learning experiences, it is hoped that students can apply knowledge about sources of electrical energy, apply in-depth understanding, and strive to save energy and conduct campaigns as proof of their concern for protecting the environment. To support these learning experiences, teachers need appropriate teaching materials and accessible digital media that can facilitate deep learning in energy-saving topics.

The research is intended to evaluate the extent to which school teachers accept the policy on teaching materials designed with a deep learning approach on energy-saving material using Google Sites as an e-learning medium. One of the evaluation approaches that can be used as a solution is the technology acceptance model, considering that the focus of the evaluation lies in the extent to which users accept e-learning. The model considered most appropriate in this context is the Unified Theory of Acceptance and Use of Technology (UTAUT). The UTAUT model is the result of a comprehensive synthesis of various previous theories on technology acceptance. In its development, this model identified four main constructs that influence behavioral intention to accept and use technology, namely performance expectancy, effort expectancy, social influence, and facilitating conditions.

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Previous research has highlighted the role of the UTAUT model in explaining technology acceptance across various educational contexts (Bahri, S. S., et al., 2025.; Sappaile, B. I., et al., 2024).Research byMuhammad, M., Arief, A., & Fuad, A. (2024). confirmed the effectiveness of UTAUT in assessing the use of educational technology. Meanwhile, digital platforms such as Google Classroom and Moodle have been evaluated using UTAUT, but there is limited literature on the use of Google Sites especially in energy saving education with deep learning approach. This gap provides an opportunity for new insights. This study is novel in combining UTAUT analysis with deep learning approach to evaluate the acceptance of Google Sites in energy saving education. Unlike previous studies, this work emphasizes the pedagogical value of platform design that aligns with deep learning principles. Understanding of how students perceive and use Google Sites to learn energy saving concepts is still limited when deep learning strategies are applied. This leads to the formulation of hypotheses, (1)· H1: Performance expectancy significantly influences behavioral intention.(2). H2: Effort expectancy significantly influences behavioral intention.(3). H3: Social influence significantly influences behavioral intention.(4). H4: Facilitating conditions significantly influence actual use. To analyze the acceptance of Google Sites as a digital platform in energy saving education based on UTAUT constructs, within the deep learning framework.

METHODOLOGY

This research uses a quantitative approach with the method*Partial Least Squares Structural Equation Modeling* (PLS-SEM), to test complex theoretical models with multiple latent relationships and relatively moderate sample sizes (Hair et al., 2019). This approach was chosen to analyze the relationship between constructs in the modified UTAUT model and combined with the approach*deep learning* in the context of using Google Sites as a learning medium. The design of this study is explanatory, with the aim of explaining the causal relationship between independent variables (performance expectancy, effort expectancy, social influence, attitude, affective need, facilitating condition) and dependent variables (behavioral intention, ICT usage habit, perceived learning). The research instrument was a questionnaire with a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), which was developed based on indicators in the UTAUT model modified by Venkatesh et al. (2003) and combined with constructs from the deep learning study by Fullan & Langworthy (2014). The population in this study were 87 elementary school teachers in Bandung City. Sampling was carried out using purposive sampling, in accordance with the minimum sample size standards

in PLS-SEM analysis (Hair et al., 2021). Data analysis was carried out using SmartPLS 3.2.9 software through two main stages:

(1). Evaluation of the measurement model (outer model) includes a). Convergent validity is tested through the value*Average Variance Extracted (AVE)* > 0.5; b). The reliability of the indicator is tested through*outer loading* > 0.7 and*Composite Reliability (CR)* > 0.7; and c). Discriminant validity is tested using the Fornell-Larcker and HTMT (Heterotrait-Monotrait Ratio) criteria; (2) Evaluation of the structural model (inner model): Test the path coefficient to see the influence between constructs; a). ValueR^2 to measure the predictive power of endogenous constructs; b). ValueQ^2 (Stone Geisser) to test predictive relevance; c). Significance testing is carried out by*bootstrapping*. Model modifications were made to the classic UTAUT model by adding two additional constructs, namely*affective need* And *perceived learning* developed from literature*deep learning* (Langworthy & Fullan, 2014; Lee & Hannafin, 2016). This addition is intended to capture the emotional and perceptual aspects of using learning technology more comprehensively.

The survey was conducted in the even semester of the 2024-2025 academic year. The main sample of 87 were elementary school teachers in Bandung City. All teachers agreed to participate in this study. The online questionnaire was distributed through the group WhatsApp voluntarily and without repetition. Of the 91 respondents from various age groups, gender, education level, 8 did not fill in the data so that only 87 responses were valid and used for further analysis. A complete summary of demographic information is shown in Table 1.

Table 1 Demographic Information

Item	Demographic	Total	Persentage
Gender	Male	21	24,14 %
	Female	66	75,86 %
Age	18-25	7	8,04 %
	26-35	14	16,09 %
	36-45	30	34,48 %
	> 55	2	2,30 %

Of the total 87 responses used for analysis, 24.14% were male and 24.14% were female. Based on age, 8.04% of respondents were aged 18-25 years, while the remaining

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16.09% were aged 26-35 years. 34.48% of respondents were aged 36-45 and 2.30% of respondents were aged > 55.

RESULTS AND DISCUSSION

Results

This study analyzes the Outer Model with the aim of ensuring that the measurements taken are feasible, valid, and reliable by determining the relationship between latent variables and their indicators.(Baharizqi, S. S. L., et al., 2024)

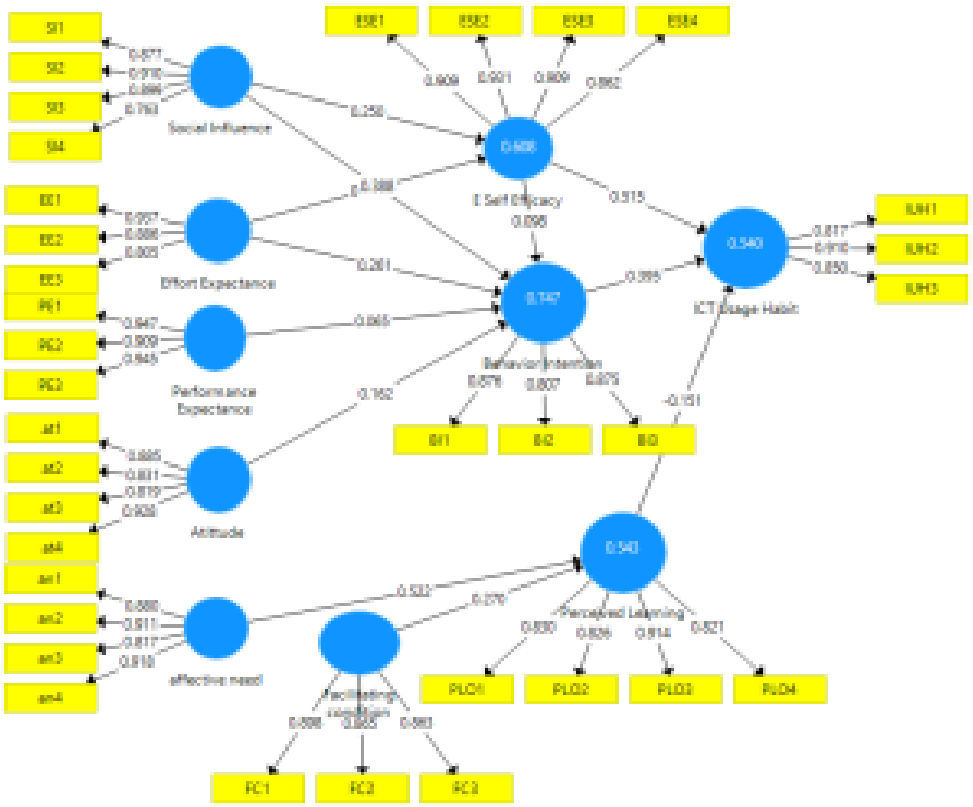

Figure 1. Outer Loading

Sumber : SmartPLS: Ringle, C. M., Wende, S., and Becker, J.-M. 2015. "SmartPLS 3." Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

Structural model based on*Partial Least Squares Structural Equation Modeling* (PLS SEM) visualized in the figure shows the relationship between a number of key constructs in the modified UTAUT model. This analysis aims to evaluate the factors that influence the acceptance of Google Sites technology in supporting deep learning (*deep learning*) on

students. Convergent validity and AVE show that all indicators in the model show*loading factor* high (> 0.7), with an average value ranging from 0.763 (SI4) to 0.947 (PE1), indicating very good indicator validity. Each construct meets the convergent validity criteria, so it can be concluded that the indicators consistently measure the intended construct.

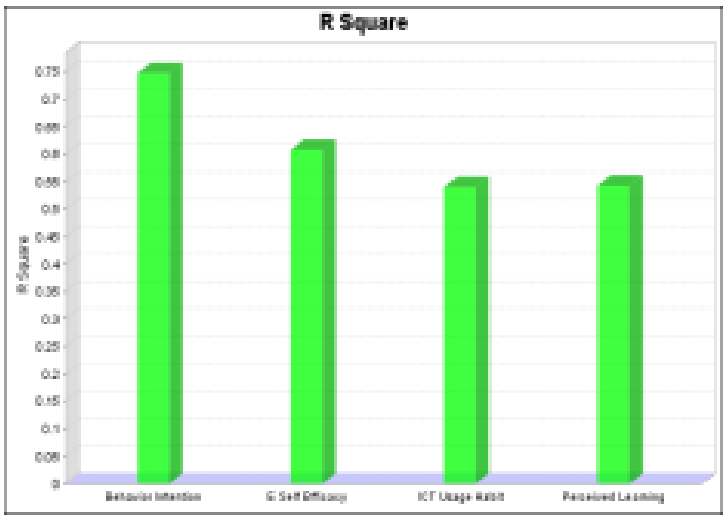

Figure 2. R Square

Sumber : SmartPLS: Ringle, C. M., Wende, S., and Becker, J.-M. 2015. "SmartPLS 3." Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

The R-Square value (Coefficient of Determination) states (1). E-Self Efficacy**:** $R^2 = 0.608$ → Moderate; (2)**.** Behavioral Intention: $R^2 = 0.747$ → Strong; (3**).** ICT Usage Habit: $R^2 = 0.540$ → Moderat; Perceived Learning: $R^2 = 0.543$ → Moderate. These values indicate that this model is able to explain quite strong variability in behavioral intention (74.7%) and is quite adequate in self-efficacy, ICT usage habits, and perceptions of learning. The relationships between constructs include (1). Influence on E-Self Efficacy**(***Social Influence*

→ ESE (β = 0.250) dan *Effort Expectancy* → ESE (β = 0.388). Both showed a positive influence on teacher self-efficacy in using Google Sites, with*effort expectancy* become the biggest contributor. This confirms that the perception of ease of use contributes to forming students' self-confidence in their ability to utilize technology; (2). Predictors of Behavioral Intention (*E-Self Efficacy* → BI (β = 0.098); *Effort Expectancy* → BI (β = 0.261); *Performance Expectancy* → BI (β = 0.065); *Attitude* → BI (β = 0.162). Although *performance expectancy* giving the lowest contribution,*effort expectancy* And *attitude* proven to be more decisive in determining teachers' behavioral intentions. The highest β value still comes from*self-efficacy* although its contribution is not substantially significant. This indicates that self-confidence has

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an influence, but is not dominant when compared to the perception of ease and attitude towards technology; (3). Behavioral Intention→ ICT

Usage Habit with β**=** 0.395. This relationship is quite strong, indicating that behavioral intention significantly influences the formation of habits in using technology. This is in line with the theory of planned behavior, which states that intention is the main predictor of actual habits; (4).

Affective Need dan Facilitating Condition → Perceived Learning **((***Affective Need* → PL (β = 0.522); *Facilitating Condition* → PL (β = 0.270)). Affective factors such as comfort, emotional relevance, and teacher interest have the greatest influence on the perception of learning success. This underlines the importance of emotional involvement in*deep learning*. Meanwhile, support for facilities and technical conditions also contribute, although not as much as the affective aspect. (5). ICT Usage Habit→ Perceived Learning with β = -0.151. Interestingly, a negative relationship was found between ICT usage habits and learning perceptions. This can be interpreted that high frequency or habits in using technology are not necessarily in line with increased learning perceptions.

Figure 3. Bootstrapping

Sumber : SmartPLS: Ringle, C. M., Wende, S., and Becker, J.-M. 2015. "SmartPLS 3." Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

The bootstrapping result image from the SEM-PLS (Structural Equation Modeling–Partial Least Squares) analysis shows that the Unified Theory of Acceptance and Use of Technology

(UTAUT), which was developed with several additional variables, can provide a comprehensive understanding of learning technology adoption behavior, particularly the use of Google Sites in the context of deep learning. The addition of these variables is intended to strengthen the explanatory power of the model, because technology acceptance in education is not only influenced by technical aspects, but also by psychological, social, and learning-related factors. In this context, Google Sites is viewed not merely as a digital platform, but also as an e-learning medium that supports teachers in organizing teaching materials and facilitating meaningful learning experiences.

The influence of exogenous variables on self-efficacy and behavioral intention can be seen from the results of the analysis: Social Influence (SI) → E-Self-Efficacy (ESE) (β = 2.395); Effort Expectancy (EE) → Behavioral Intention (BI) (β = 1.722); Performance Expectancy (PE) → Behavioral Intention (BI) (β = 0.372); Attitude (AT) → Behavioral Intention (BI) (β = 1.220); Affective Need (AN) → Perceived Learning (PL) (β = 4.393); and Facilitating Conditions (FC) → Perceived Learning (PL) (β = 2.164). These results show that social influence has a strong influence on teachers' e-self-efficacy in using technology. This means that support from colleagues, school leaders, and the educational environment can strengthen teachers' confidence in using Google Sites as a learning medium. In addition, effort expectancy, attitude, and performance expectancy also contribute to teachers' behavioral intentions in using Google Sites media in learning. If teachers perceive Google Sites as easy to use, useful for improving learning effectiveness, and relevant to their teaching needs, they are more likely to develop a positive intention to use it. Interestingly, the influence of attitude (β = 1.220) on behavioral intention indicates that teachers' positive perceptions are very important in the use of learning technology platforms.

The mediation path through behavioral intention is shown by E-Self-Efficacy → Behavioral Intention (β = 5.083), Behavioral Intention → ICT Usage Habit (β = 3.292), and ICT Usage Habit → Perceived Learning (β = 1.221). The role of behavioral intention as a mediating variable is confirmed by the strength of the path between e-self-efficacy, ICT usage habit, and perceived learning. This indicates that teachers' confidence in using technology can encourage their intention to use digital media, and this intention may develop into a habit of using ICT in learning activities. When teachers use ICT more consistently, they become more familiar with the features, functions, and benefits of digital learning media. This supports the finding that the intention to actively use technology is a key indicator in encouraging habitual use of educational technology.

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Perceived learning as an endogenous variable has a large contribution from affective need (β = 4.393) and facilitating conditions (β = 2.164). This indicates that emotional needs, such as comfort, interest, and the desire to actively participate, as well as infrastructure support, for example ease of internet access and technical guidance, are the main determinants in the formation of perceptions of learning success using Google Sites media. These findings also suggest that the successful use of Google Sites in deep learning does not only depend on the availability of technology, but also on how users feel supported, motivated, and confident during the learning process. Adequate facilities, clear guidance, and a supportive learning environment can make technology easier to use and more meaningful for both teachers and students. In terms of reliability and validity of the constructs, the outer loading values of all indicators above the threshold of 0.7 indicate good indicator validity, and construct reliability and internal consistency can be assumed to meet the reliability criteria in the SEM-PLS model.

Discussion

The model developed in this study shows that the acceptance of learning technologies such as Google Sites is influenced by a combination of modified UTAUT variables, including self-efficacy, attitude, affective needs, and facilitating conditions. These variables indicate that technology acceptance in learning is not only related to the technical use of the platform, but also to users' confidence, perceptions, emotional needs, and the availability of supporting facilities.

The significant paths to perceived learning illustrate that the application of educational technology does not only depend on technical or cognitive aspects, but also on affective and structural factors. This is in line with the principles of deep learning, which emphasize emotional involvement, learning independence, and students' reflective ability in using technology meaningfully. These findings also support the basic theory of UTAUT, which explains that users' intention and acceptance of technology are influenced by several factors, such as perceived usefulness, ease of use, social support, and facilitating conditions.

Students considered Google Sites as a useful and easy-to-use platform for energy-saving education. The incorporation of immersive learning elements such as reflective assignments, collaborative problem-solving, and real-world projects increased the perceived engagement and relevance of the platform. Compared with previous studies, this study confirms that pedagogical design plays an important role in technology acceptance, especially in environmental education.

This model contributes to the development of UTAUT theory in the context of digital education, particularly by integrating the principles of deep learning. The findings indicate that affective factors and ease of access to technology are more dominant than perceptions of the performance of the technology itself. In the context of Google Sites-based learning, it is important to design activities that are not only technical, but also touch the affective dimensions of students.

Practically, teachers and curriculum developers need to provide adequate infrastructure support and create a fun, interactive, and emotionally relevant learning environment to improve the effectiveness of ICT-based learning. Overall, the results of this study support the hypothesis that the success of technology integration in learning does not only depend on technical aspects, but is also influenced by emotional involvement, ease of access, and holistic support for a supportive learning environment.

CONCLUSION

This study examines various factors that influence the acceptance of using Google Sites as a learning tool, with reference to the framework.*Unified Theory of Acceptance and Use of Technology* (UTAUT) combined with the approach*deep learning*. The findings from the structural model analysis indicate that*self-efficacy*, *effort expectancy*, and the teacher's attitude make an important contribution to the formation of behavioral intentions in using technology, which ultimately encourages the formation of habits in using information technology (ICT Usage Habit). In addition, the results of the study revealed that teachers' emotional needs are a dominant factor in forming their perceptions of learning effectiveness, followed by the availability of supporting facilities. However, the intensity of technology use that high does not always have a direct impact on positive learning perceptions, thus emphasizing the importance of integrating technology with meaningful and contextual learning approaches.

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