The Effect of Self-Directed Learning and TikTok Utilization on Student Learning Engagement through Technological Capabilities in Flipped Learning

Iccafadilah[1], Wulan Oktavia Febriyanti [2], Osly Usman[3]

[1] Office Administration Education, Faculty of Economics and Business, Universitas Negeri Jakarta, Jakarta, Indonesia.
[2] Office Administration Education, Faculty of Economics and Business, Universitas Negeri Jakarta, Jakarta, Indonesia.
[3]Faculty of Economics and Business, Universitas Negeri Jakarta, Jakarta, Indonesia.

Iccafadilah08@gmail.com, wulanoktafia30@gmail.com, oslyusman@unj.ac.id

Abstract. This study aims to determine the influence of Self-Directed Learning (SDL) and the use of TikTok on student learning engagement through technological capabilities in Flipped Learning. The research was conducted using a quantitative approach and the Structural Equation Modeling–Partial Least Squares (SEM-PLS) method, using a sample of 100 students from the Faculty of Economics and Business, State University of Jakarta. The results of the study showed that SDL had a positive and significant effect on learning engagement and technological ability. However, the use of TikTok does not have a significant effect on learning engagement or technological ability. Technological capabilities also do not mediate the relationship between SDL and learning engagement, nor between TikTok utilization and learning engagement. The main conclusion of this study is that student learning engagement in Flipped Learning is more strongly influenced by the ability to learn independently (SDL) than the intensity of social media use such as TikTok. Therefore, a learning strategy is needed that strengthens students' learning independence, especially in the context of digital and flipped learning.

Keywords: self-directed learning, TikTok, learning engagement, technological capabilities, flipped learning

Introduction

The digital transformation in education is a major response to the global challenges outlined in the Sustainable Development Goals (SDGs), particularly Goal 4: Quality Education. The COVID-19 pandemic has accelerated this transformation, with over 1.6 billion students affected by school closures, making digital learning competencies more critical than ever. In the post-pandemic era, the acceleration of digital learning requires not only access to technology but also the development of student-centered approaches that promote independence and active engagement. One such approach that has gained traction is Flipped Learning, where students are expected to study learning materials independently before class and engage in collaborative activities during face-to-face sessions.

Within this context, student engagement becomes a crucial factor. Yet, achieving meaningful engagement in digital or hybrid learning environments remains a challenge especially when learning relies heavily on students' own motivation and initiative. At the same time, social media platforms such as TikTok are increasingly used not only for entertainment but also as informal learning tools. TikTok's short-form video format appeals to digital-native students and has been explored as a potential driver of learning interest and motivation (Aziz & Dali, 2023; Clarissa & Lobo, 2022). However, studies also caution that TikTok can lead to distraction and lacks consistent educational value (Hu et al., 2025).

Despite the growing popularity of digital media, many studies still focus only on the direct impact of media use on learning outcomes. Few have examined how deeper cognitive constructs like Self-Directed Learning (SDL) and technological capabilities influence student engagement especially in flipped learning contexts. SDL refers to the learner's capacity to take initiative, set goals, monitor progress, and evaluate their learning (Garrison, 1997). This ability is critical in flipped models where students are expected to manage their own learning before classroom sessions. Meanwhile, technological capability functions as a key enabler. Without adequate digital literacy, device mastery, and creative information use, students may struggle to

make use of platforms like TikTok in academic ways. Yet, the role of this capability as a mediating factor has rarely been tested empirically.

This study offers a holistic model that integrates Self-Directed Learning, TikTok utilization, and technological capabilities to predict student learning engagement in a flipped learning context. By doing so, it addresses gaps in previous research that treat these variables separately and provides new insights into how internal learner traits and media use interact within modern learning environments. The conceptual model used in this study integrates Self-Directed Learning (SDL) and the use of TikTok as exogenous variables, Technological Capabilities as a mediating variable, and Student Learning Engagement as the endogenous variable. This model illustrates both direct and indirect relationships examined using the SEM-PLS method.

Literature Review

Theoretical framework

Self-Directed Learning

Self-Directed Learning (SDL) is one of the learning approaches that is increasingly relevant in the context of modern education, especially in technology-based learning. SDL emphasizes on students' independence in organizing, managing, and evaluating their own learning process. Some of the definitions from experts regarding Self-Directed Learning can be explained as follows: Doo and Zhu (2024) define Self-Directed Learning as a process in which individuals take the initiative in planning, executing, and evaluating their own learning, with or without assistance from others. Rivera (2021) stated that Self-Directed Learning is a learning process carried out independently by students with personal initiative, ranging from planning to evaluation.

Furthermore, according to Plakhotnik et al. (2021), Self-Directed Learning is a learning strategy that gives students control over their material and how they learn. Sumyadi et al. (2020) explained that independent learning is characterized by students' ability to manage time, learning resources, and reflection on their learning outcomes. Sakniyawati et al. (2024) added that Self-Directed Learning is learning that emphasizes the active role of students in designing their own learning strategies. Students are not only implementers, but also designers of the learning process, so they are more responsible for achieving learning outcomes.

Asim et al. (2024) state that Self-Directed Learning is a learning process that is directed by the students themselves in determining goals and evaluating the results. Self-Directed Learning was analyzed using a theoretical model developed by Garrison (1997). This model consists of three main dimensions, namely self-management, self-monitoring, and motivation. The self-management dimension includes the ability of students to effectively manage resources, time, and learning environments; self-monitoring refers to students' reflective abilities in evaluating understanding and learning progress; While motivation refers to the internal drive that encourages students to stay engaged and responsible for the learning process. These three dimensions form a comprehensive framework in understanding independent learning behavior, especially in the context of technology-based and digital learning.

Utilization of TikTok

TikTok has evolved into a social media platform that can be leveraged for educational purposes. Aziz and Dali (2023) define TikTok as a short video medium used to deliver educational content creatively. The platform offers a new way to present learning materials in an engaging and accessible format for the digital generation. The use of TikTok in the context of education is supported by various educational institutions. Mirawati et al. (2024) explained that this platform is now used by ministries and educational institutions to disseminate learning information. This shows institutional recognition of TikTok's potential as an alternative learning medium.

Furthermore, Clarissa and Lobo (2022) emphasized that TikTok plays a role as an interactive social media that can increase student engagement in online learning. The visual aspect of TikTok is an advantage in the context of education. Liu (2023) describes this platform as a visual education tool that supports learning language, science, and art through storytelling. This visual narrative approach makes it easier for students to understand complex concepts. Ghani et al. (2023) also identified TikTok as a creative tool that supports informal learning and increases students' learning motivation through a concise and engaging content format.

Technology Capabilities

Technology skills are an important competency that students must have in supporting the digital-based learning process. According to Siregar et al. (2022), technological proficiency is defined as students' skills in using technology to support learning, including the use of learning applications and other technological devices. In line with that, Wibowo and Wilujeng (2021) explained that information technology skills include functional skills, creativity, collaboration, communication, and the ability to find and choose relevant information. Sihotang and Ramadhani (2021) emphasized that the ability to use information technology is a student's skill in operating applications and understanding the online learning process, especially those that are growing rapidly during the pandemic.

Learning engagement

Learning involvement in the Indonesian educational literature is defined as the level of active participation, attention, and interest of students in learning activities that affect the success of the teaching-learning process. Fredricks et al. (2004) divide learning engagement into three main dimensions, namely affective, cognitive, and behavioral. The affective dimension includes students' positive reactions to the learning process, such as enthusiasm and desire to learn (Agustini, 2024; Hariyantini, 2025). The cognitive dimension is related to mental exercises and thinking strategies used by students to understand and analyze learning materials (Ridayani, 2025; Sholeha, 2021). Meanwhile, the behavioral dimension refers to the physical participation and real involvement of students in educational activities, such as attendance, discussion, and completion of tasks (Nurfalah, 2025; Agustini, 2024). According to Yuniarti and Muchsini (2024), learning engagement is also a situation where students are active in the learning process through interaction with teachers and peers. This view is reinforced by the results of research by Gadjah Mada University (UGM, 2025), which emphasizes that learning engagement is a dynamic process that involves adaptation, collaboration, and inclusivity, especially in the context of modern education. In this study, learning engagement is analyzed in the context of flipped learning, which is a learning model in which students learn the material independently first—often through digital media—and then deepen their understanding through face-to-face discussions. This model requires students to participate actively, independently, and be ready to be thoroughly involved in the learning process.

Kostelac

Self-Directed Learning on student learning engagement in the context of Flipped Learning

The Self-Directed Learning (SDL) model proposed by Garrison (1997) emphasizes that self-learning is influenced by three main components, namely self-management, self-monitoring, and motivation. In the context of Flipped Learning, these three aspects are very relevant because students are required to study actively before class meetings. Zainuddin et al. (2019) show that LMS such as TES BlendSpace is effective in improving students' SDL, leading to higher learning engagement. Rashid and Asghar (2016) also found that technological readiness and independent learning ability encourage active participation. However, results that are not always consistent are found. Evans Makhubele, Y. (2025) stated that first-year students do not have a sufficient level of SDL, so they experience difficulties in learning engagement. Haris (2024) added that students are not fully ready to learn independently. Dina Merris, Maya Sari (2022) also mentioned that low digital literacy despite high SDL can hinder learning engagement.

TikTok Utilization for student learning engagement in Flipped Learning

TikTok Utilization as a learning medium in the Flipped Learning approach shows significant potential in increasing student learning engagement. Romsi et al. (2023) revealed that the use of TikTok in an educational way can trigger learning motivation and improve students' communication skills, especially in English teaching. Adhani et al. (2023) added that these platforms can spark enthusiasm and active engagement of students, especially when the content presented is interesting and relevant. Romsi et al. also assert that the visual-auditory content characteristics of TikTok can strengthen in-person learning participation.

However, this approach is not without challenges. Hu et al. (2025) highlight that the typical short video format within TikTok can limit the depth of the material presented, thereby reducing long-term learning engagement. Chen et al. (2020) remind that the use of TikTok without a clear pedagogical strategy can interfere with students' focus on learning. Laili (2023) also stated that the presence of non-educational content on these platforms often causes distractions, which has the potential to reduce the quality of student academic

engagement.

The capabilities of technology on student learning engagement in Flipped Learning

Technology capabilities are an important factor in supporting the success of learning engagement in Flipped Learning. Rashid and Asghar (2016) state that technological readiness significantly contributes to active engagement in blended learning environments. Firmansyah (2025) also emphasized that mastery of technology in flipped classrooms is able to increase student collaboration and interactivity. Diningrat and Ngussa (2022) found that students' ability to use technology also strengthens the effectiveness of flipped classroom-based learning.

However, these influences are not always linear. Firmansyah (2025) reminded that the implementation of technology without a mature strategy does not guarantee increased engagement. Chen et al. (2020) also warn that technology can be an obstacle if not used appropriately. Haris (2024) added that limited learning infrastructure and environments such as internet connectivity and unconducive learning spaces can reduce the effectiveness of the use of technology in increasing learning engagement.

Self-Directed Learning on students' technological abilities

According to Garrison (1997), Self-Directed Learning (SDL) includes the dimensions of self-management and self-monitoring that allow students to control their learning processes and resources independently, including mastery of technology. This becomes relevant in Flipped Learning, where the success of learning depends on students' ability to access, understand, and manage digital materials independently. Firmansyah (2025) stated that students with high SDL show a strong tendency to improve their technological abilities. Diningrat and Ngussa (2022) emphasized that SDL encourages active exploration of learning technologies. Rashid and Asghar (2016) also show that SDL is closely related to technological readiness in blended learning.

However, limited access to resources and infrastructure is a barrier. Firmansyah (2025) underlined that even though students have a high SDL, a lack of devices or connectivity can hinder the development of technological capabilities. Dina Merris, Maya Sari (2022) stated that low digital literacy remains an obstacle, and Haris (2024) showed that some students are not ready to face technological challenges despite having the desire to learn independently.

Utilizing TikTok Students' Technology Capabilities

The use of TikTok in learning can be a means of improving students' technological skills. Gao et al. (2023) stated that the use of TikTok encourages students to develop digital skills, such as video editing, algorithm utilization, and educational content management. Romsi et al. (2023) also showed that the use of TikTok for academic purposes has a positive impact on students' mastery of technology. Similar findings were revealed by Gao et al. in another study, which stated that active use of TikTok increases students' familiarity with various features of learning technology.

However, the results of other studies show limitations. Hu et al. (2025) stated that TikTok's short video format is less able to encourage in-depth exploration of the technology. Chen et al. (2020) also noted that the use of TikTok for entertainment has minimal impact on students' technological developments. Laili (2023) added that the high level of distraction from non-educational content can interfere with the technology-based learning process.

The ability of technology to mediate the relationship between Self-Directed Learning and student learning engagement in Flipped Learning

Kara (2021) emphasized that SDL and e-learning readiness mediate the relationship between technology efficacy and student learning engagement, where students with high SDL levels but without technological readiness still face barriers in digital engagement. This is in line with the findings of Zainuddin and Perera (2018) who stated that the use of Learning Management System in the flipped classroom approach can strengthen SDL and increase learning engagement, but its effectiveness is highly dependent on students' technological ability in navigating digital content. Wahyuda et al. (2022) also showed that flipped classrooms are able to encourage self-regulation in learning, but students with low digital literacy still need additional training so that SDL's potential can be realized in the form of active participation.

However, there are also views that reject the role of mediating technological capabilities. Maya Sari (2022) argues that low digital literacy is not an obstacle to learning engagement if students have high SDL, because

learning awareness and self-management are considered more dominant than technical aspects. This is reinforced by Haris (2024) who emphasizes that the cognitive and affective dimensions of SDL, such as intrinsic motivation and self-reflection, have a greater influence on learning engagement than just operational ability in using technology.

The ability of technology mediates the relationship between TikTok utilization and student learning engagement in Flipped Learning

A number of studies show that technological capabilities, especially in the form of digital literacy, mediate the relationship between TikTok utilization and student learning engagement in the context of Flipped Learning. Jimola (2023) emphasized that students who have knowledge and competence in using TikTok as a learning medium tend to show a higher level of learning engagement. In this case, technological capabilities are a bridge that allows the effective use of TikTok to support the learning process. Research by Adhani et al. (2023) also supports these findings, showing that mastery of technological features in the TikTok app contributes to increased student learning engagement. Similarly, Gao et al. (2023) concluded that learning motivation increases when students are able to understand and manage the technological features available on the TikTok platform. On the other hand, some studies have shown that technological capabilities are not always a significant mediator in this relationship. Chen and Wang (2020) found that TikTok use can actually decrease students' focus on learning, and this influence is not fully mediated by the user's digital literacy level. Laili (2023) also revealed that learning engagement is more determined by the quality and relevance of educational content than by the technological capabilities of the user itself. Meanwhile, Hu et al. (2025) stated that technological readiness is not fully able to mediate the relationship between the use of video platforms such as TikTok and student learning engagement.

Conceptual framework

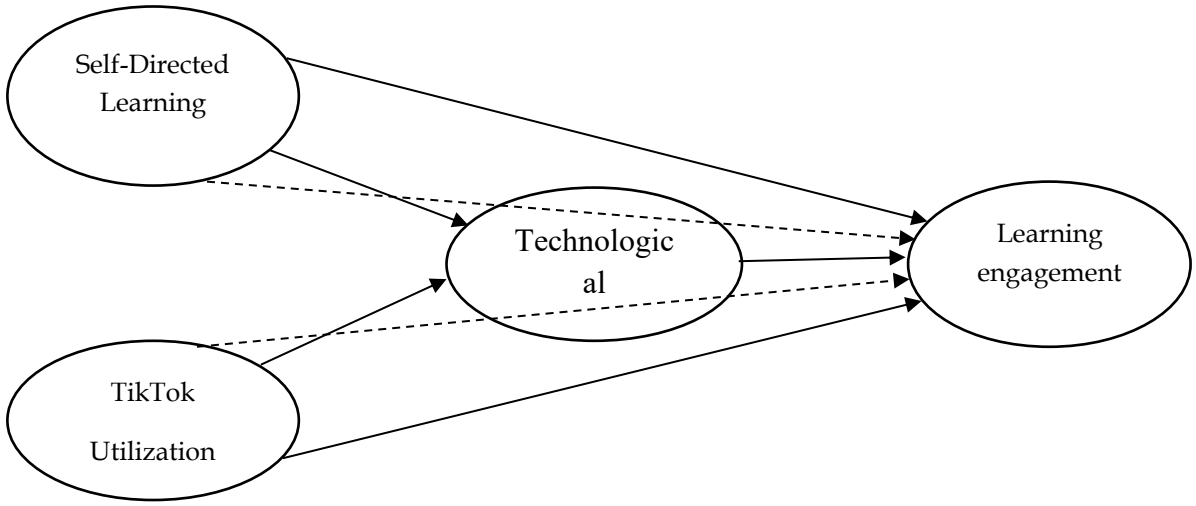

Figure 1. Conceptual Framework of the Effect of Self-Directed Learning and the Use of TikTok on Student Engagement through Technology Capabilities in Flipped Learning

Information:

____ : Direct Influence

------- : Indirect Influence (Mediation)

Methods

This study uses a quantitative approach with an explanatory design. The research sample amounted to 100 active students from the Faculty of Economics and Business, State University of Jakarta who had participated in Flipped Learning and had used TikTok as a learning medium. Sampling was carried out purposively based on certain criteria. The research instrument was in the form of a closed questionnaire with a Likert scale of 1–5, which measured four main constructs: SDL (with motivation, self-monitoring, self-

management indicators), TikTok utilization (access, interaction, creation, learning integration), technological capabilities (digital literacy, device mastery, information management, digital creativity), and learning engagement (cognitive, affective, behavioral, and social dimensions).

The instruments are compiled based on theoretical indicators from four main constructs, namely: Self-Directed Learning (SDL) adapted from Garrison (1997); the use of TikTok which refers to educational indicators of social media (Aziz & Dali, 2023); technological capabilities that include digital literacy, device mastery, information management, and creativity (Siregar et al., 2022); and learning engagements that include cognitive, affective, behavioral, and social dimensions (Fredricks et al., 2004). Data analysis was carried out using Structural Equation Modeling with a Partial Least Squares (SEM-PLS) approach via SmartPLS version 4.0. The analysis process includes testing the outer model for validity and reliability, as well as the inner model to test the causal relationships and mediating effects between variables.

Result and Discussion

This section presents the findings of the study and their interpretations considering theoretical perspectives. Reliability analysis confirmed adequate internal consistency with Cronbach's α values: learning engagement (0.891), technological capabilities (0.953), TikTok utilization (0.867), and self-directed learning (0.876). Discriminant validity was confirmed with all item loadings on respective constructs exceeding cross-loadings (ranging from 0.675 to 0.956). The model explained 36.2% variance in learning engagement (R^2 = 0.362) and 42.5% variance in technological capabilities (R^2 = 0.425). Multicollinearity was not a concern as all VIF values were below 3.0 (ranging from 1.185 to 1.853).

Table 1: Path Coefficient

Variabel	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
KT-KB	0.174	0.177	0.127	1.367	0.172
PT-KB	0.161	0.154	0.123	1.311	0.190
PT-KT	0.073	0.077	0.084	0.868	0.385
SL-KB	0.388	0.400	0.146	2.658	0.008
SL-KT	0.620	0.620	0.075	8.310	0.000

Table 1 presents the path coefficients for direct effects. SDL significantly affects both technological capabilities (β = 0.620, *p* = 0.000) and student engagement (β = 0.388, *p* = 0.008), supporting previous findings by Garrison (1997) and Zainuddin et al. (2019) on the central role of learner autonomy in digital learning environments. However, TikTok utilization did not significantly affect both technological capabilities (β = 0.073, p = 0.385) or engagement (β = 0.161, p = 0.190), suggesting that while TikTok is widely used by students, its educational impact may be limited without guided curation or integration into structured learning. Technological capability also did not significantly predict engagement (β = 0.174, p = 0.172). This finding contrasts with studies such as Diningrat & Ngussa (2022), which found strong links between digital literacy and active participation. The non-significance here may be attributed to students' limited application of their technological skills for academic engagement, potentially using tools for superficial rather than deep learning tasks.

Table:2 Specific Indirect Effects

Variabel	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
PT-KT-KB	0.013	0.014	0.020	0.630	0.528
SL-KT-KB	0.108	0.112	0.084	1.282	0.200

Table 2 shows that the mediating role of technological capabilities was not significant for either SDL or TikTok utilization. The indirect effect of SDL on engagement through technological capabilities yielded β = 0.108 (p = 0.200), while TikTok utilization via technological capabilities resulted in β = 0.013 (p = 0.528).

The study found that self-directed learning significantly influenced both technological capabilities and

learning engagement. This suggests that student autonomy plays a central role in preparing students for active involvement in flipped learning environments. In contrast, TikTok utilization did not significantly affect either technological capabilities or engagement, indicating that the platform may not automatically enhance academic outcomes unless it is intentionally designed and guided for learning purposes.

Furthermore, while students may have technological proficiency, these skills alone did not lead to higher engagement. Technological capabilities also failed to mediate the relationship between SDL or TikTok and learning engagement, underscoring that engagement depends more on students' self-regulation than their technical ability or media consumption. In summary, digital tools can support learning, but do not replace the importance of student-driven motivation and independence. Strengthening SDL appears more critical than increasing access to popular media platforms.

Conclusion

This study concludes that Self-Directed Learning (SDL) significantly influences both student engagement and technological capabilities, underscoring the importance of learner autonomy in flipped learning environments. However, TikTok utilization and technological capabilities do not significantly affect student engagement, nor do technological capabilities mediate the relationship between SDL or TikTok use and engagement. While SDL enhances students' technological readiness, this alone does not guarantee active academic involvement. These findings suggest that although digital tools like TikTok are widely used, their educational effectiveness remains limited without structured integration and targeted learning strategies. This study is limited by its single-institution sample, the use of single-item indicators per variable, and the dynamic nature of TikTok usage, which varies greatly among students.

Future research is encouraged to apply more robust instruments, expand variable scope (e.g., learning motivation, teacher interaction), diversify samples across institutions, and utilize mixed-method approaches. Educational institutions should promote SDL through flexible and autonomous learning models, while educators are encouraged to leverage TikTok creatively within pedagogical frameworks. Students are advised to optimize digital media for academic purposes by developing self-management skills, personal learning strategies, and critical awareness in digital content consumption.

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