Short-Video Learning and Beginner Programming Education: A Netnographic Study of Python Learning on TikTok in Indonesia

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ABSTRACT

This study aims to analyze the engagement of beginner users in learning Python through short-video microlearning on the TikTok platform in Indonesia. The study used a qualitative approach with digital netnography methods to understand learning practices, social interactions, and digital community dynamics within the TikTok ecosystem. The results show that TikTok has developed into a digital pedagogical space that supports flexible, interactive, and community-based programming learning. User engagement is formed through four main dimensions: cognitive engagement, emotional engagement, behavioral engagement, and social engagement. Cognitive engagement is evident in user activities in understanding Python syntax, debugging, and coding logic. Emotional engagement emerges through learning motivation, enthusiasm, and frustration in the coding learning process. Behavioral engagement is evident through self-learning activities such as saving videos, requesting material playlists, and trying out coding practices directly. Meanwhile, social engagement develops through collaborative learning, peer feedback, and community discussions in TikTok's comment section. This study concludes that short-video microlearning on TikTok can lower the entry barrier to programming learning for beginners while simultaneously fostering social learning practices based on digital communities. The research findings contribute to the development of digital microlearning studies, beginner programming education, and social media-based digital pedagogy.

Keywords: TikTok, Short-video learning, Python programming, Beginner programming education, Netnography

INTRODUCTION

The transformation of digital education in the social media era has fundamentally reshaped the ways individuals acquire knowledge, develop skills, and interact within learning processes. The emergence of short-video-based digital platforms such as TikTok has introduced a new form of online learning that is more concise, flexible, and user-participatory. In this context, microlearning has become one of the most relevant approaches, as it enables the delivery of instructional content in small and focused units designed to achieve specific learning objectives (Barus & Bontisesari, 2023; Naser, 2024).

Microlearning is considered effective in reducing cognitive overload through the presentation of brief learning materials that are easy to understand and accessible anytime via mobile devices. Previous studies have demonstrated that the integration of microlearning and short-video learning can enhance users' motivation, engagement, knowledge retention, and overall learning experiences in digital environments (Shatte & Teague, 2020; Alias & Razak, 2023; Mercan et al., 2023).

TikTok, as an algorithm-driven platform, provides an interactive space that enables users not only to consume information but also to engage in discussions, comment exchanges, and collaborative social learning practices.

This phenomenon indicates that social media no longer functions solely as a medium of entertainment but has evolved into a new pedagogical space that shapes the learning culture of the digital generation. Therefore, short-video-based learning on TikTok has become an important issue in contemporary digital education studies, as it represents a paradigm shift from formal learning toward informal learning based on digital communities (Fitri et al., 2025).

In the field of programming education, particularly Python learning for beginners, this digital transformation presents both opportunities and challenges. Programming education has long been recognized as one of the most difficult learning domains for novice learners because it requires logical thinking skills, algorithmic abstraction, and an understanding of complex syntactic structures (Foughali, 2023; Xinogalos et al., 2020). Numerous studies have emphasized that the selection of a first programming language significantly influences the success of early learning experiences, and Python is often considered more beginner-friendly due to its simple and easily understandable syntax compared to other languages such as Java or C++ (Duran et al., 2019; Meier & Lepp, 2023; Fitri et al., 2025).

Nevertheless, although Python is considered beginner-friendly, numerous studies indicate that the primary challenges faced by novice learners are not solely related to the programming language itself, but also to how learning materials are presented, how feedback is provided, and how learning motivation is maintained throughout the educational process (Barbosa Rocha et al., 2022; Leong, 2026). In this context, TikTok introduces a new approach through short-video microlearning, which presents coding concepts in concise and visually engaging formats.

Research on microlearning in digital education has generally demonstrated relatively positive outcomes in enhancing learner engagement and motivation. Several studies have found that mobile-based microlearning can improve knowledge retention and support learning flexibility across various contexts of higher education and professional development (Hilsmann & Dodson, 2025; Riggs-Zeigen, 2025). Other studies have shown that short-video learning can enhance speaking performance in language learning because users are able to access instructional materials quickly and repeatedly (Prasittichok & Smithsarakarn, 2024). In addition, the use of interactive multimedia such as short videos, infographics, and micro-quizzes has been shown to support more engaging learning experiences that are adaptive to the characteristics of the digital generation (Alias & Razak, 2023; ALshammari, 2024).

Nevertheless, most previous studies have primarily focused on instructional effectiveness in general and have not extensively explored the dynamics of user social interaction within social media-based digital learning environments. Existing literature tends to emphasize outcomes such as motivation, retention, or academic performance, while aspects related to social engagement, user communication, collaborative learning, and the construction of collective meaning within digital communities remain relatively underexplored. In fact, on platforms such as TikTok, learning does not occur solely through video consumption, but also through comments, discussions, duets, stitches, and algorithmic interactions that collectively shape a complex social learning ecosystem. Therefore, there is an academic need to understand how beginner user engagement is formed within the context of digital social interactions on TikTok.

From a netnographic perspective, TikTok is viewed as a digital cultural space that facilitates the emergence of community-based social learning practices. Netnography, as a digital research method, provides a methodological framework for understanding how users construct meaning, identity, and learning practices within online communities (Kozinets, 2020; Kozinets et al., 2022). Previous netnographic studies on TikTok have examined various phenomena, including financial literacy, digital religious preaching, political branding, and the construction of cultural identity (Prasetianingsih & Sokarina, 2023; Achfandhy & Chairunnisa, 2022; Taufiq & Daherman, 2024). These findings indicate that TikTok possesses a high degree of interactivity through user-to-system, user-to-user, and user-to-document interactions. Such interactions enable social learning processes through observation, imitation, social feedback, and meaning negotiation among users.

The research gap addressed in this study lies in the limited number of studies integrating three interconnected aspects simultaneously: digital microlearning, beginner programming education, and netnographic social learning on TikTok. Previous microlearning studies have generally focused on instructional design and formal

learning outcomes (Monib et al., 2025; Shatte & Teague, 2020), whereas programming education studies have largely discussed programming language selection, feedback systems, or gamification within formal learning environments (Foughali, 2023; Qian et al., 2026). Meanwhile, TikTok netnography studies have tended to explore cultural, political, or social identity phenomena without deeply examining digital programming learning practices within the platform (Downing, 2025; Kozinets, 2022). Consequently, only a limited number of studies have explained how short-video learning on TikTok shapes the cognitive, emotional, behavioural, and social engagement of beginner users in learning Python programming. In fact, engagement is a key element in the success of digital learning because it is closely related to active participation, intrinsic motivation, persistence, and users' ability to construct knowledge independently. Therefore, this study seeks to fill the existing gap in the literature by examining beginner engagement in Python learning through TikTok using a digital netnographic approach.

In addition to addressing the existing research gap, this study also offers several forms of scientific novelty. First, this research develops the perspective that TikTok should not merely be viewed as a platform for entertainment or the distribution of educational content, but rather as a digital pedagogical space that shapes algorithm-based social learning practices. Second, this study focuses on beginner programming education within the context of short-video microlearning, an area that remains relatively underexplored in digital education studies in Indonesia. Third, this research integrates a multidimensional engagement framework encompassing cognitive engagement, emotional engagement, behavioural engagement, and social engagement in analysing beginner users' interactions with Python-related content on TikTok. Fourth, this study employs a netnographic approach to gain a deeper understanding of informal community-based learning practices through the observation of comments, user interactions, and social discourse on the TikTok platform. This novelty is important because most previous studies have primarily employed quantitative experimental approaches to measure the effectiveness of microlearning, while the dimensions of digital culture and users' social interaction practices have not been extensively explored qualitatively.

Theoretically, this study contributes to the development of digital education studies, computational learning, and social learning theory within the context of short-video-based social media. This research demonstrates that programming education no longer exclusively takes place in formal classrooms or conventional e-learning platforms, but has undergone a transformation toward participatory, flexible, and community-based digital social spaces. TikTok enables users to construct knowledge through video observation, comment discussions, peer feedback, and algorithmic interactions that reinforce collective learning experiences. Thus, the process of learning Python coding is no longer merely an individual cognitive activity, but also a social practice involving communication, collaboration, creativity, and critical thinking simultaneously. Furthermore, this study provides practical contributions for digital educational content creators, educators, and educational institutions in designing microlearning strategies that are more effective, interactive, and aligned with the characteristics of today's digital generation. The findings of this study are expected to serve as a foundation for the development of social media-based digital pedagogy that is more adaptive to the learning culture of younger generations.

Based on the foregoing discussion, this study aims to analyse the forms of beginner user engagement in learning Python through TikTok as a short-video microlearning medium in Indonesia. The focus of the study is directed toward understanding how users develop cognitive, emotional, behavioural, and social engagement in the process of learning Python coding through digital interactions on the TikTok platform. This study also seeks to understand how social learning practices are formed through comments, discussions, and participation within digital communities in a social media-based informal learning ecosystem. Accordingly, the research question addressed in this study is: "What are the forms of beginner user engagement in learning Python through short-video microlearning on the TikTok platform in Indonesia?"

METHOD

This study employed a qualitative approach using digital netnography to understand the forms of beginner user engagement in learning Python through the TikTok platform in Indonesia. A netnographic approach was selected because the study focused on social practices, digital interactions, and the construction of meaning within online communities that develop through comment sections on short-video-based social media platforms.

The research design was descriptive-exploratory in nature, aiming to provide an in-depth description of how beginner users construct cognitive, emotional, behavioural, and social engagement in Python learning through short-video microlearning. In addition, this study adopted an interpretive paradigm to understand users' learning experiences from the perspective of social interaction and digital culture emerging on the TikTok platform. This approach was chosen because digital learning phenomena cannot be fully understood solely through quantitative measurement, but instead require interpretation of communication practices, comments, symbols, and users' social responses within digital communities.

The research participants consisted of TikTok users who interacted with educational Python programming content for beginners during the period of 2024–2026 with the keyword search of "Python coding for beginner" in Indonesian language. Participants were selected through purposive sampling by considering the characteristics of Indonesian creator accounts that actively produced microlearning content related to basic Python, programming syntax, simple debugging, coding tutorials, and Python-based mini projects. The participants included active users who posted comments, asked questions, provided feedback, replied to other users' comments, or demonstrated social engagement in learning discussions.

The unit of analysis in this study specifically focused on user comments related to Python learning practices on TikTok. The research instruments consisted of several main components designed to support the systematic process of digital data collection and analysis. This study utilized scraping tools based on the TikTok API to collect video metadata and user comments on beginner-oriented Python programming content.

The study employed data coding guidelines developed based on engagement dimensions, including cognitive engagement, emotional engagement, behavioural engagement, and social engagement. Cognitive engagement was identified through comments indicating coding logic analysis, problem-solving activities, and reflections on understanding Python concepts. Emotional engagement was analysed through expressions of motivation, enthusiasm, frustration, or anxiety experienced by users during coding learning activities. Behavioural engagement was observed through user activities such as comment frequency, participation in discussions, and involvement in coding practices. Meanwhile, social engagement was analysed through collaborative interactions, peer feedback, community discussions, and mutual support practices among users. In addition, qualitative data analysis software was utilized to support the processes of categorization, thematic coding, and systematic data interpretation.

The data collection procedure was conducted through several stages of digital netnography. The first stage involved a preliminary observation of the Python microlearning content ecosystem on TikTok to identify active Indonesian creator accounts, types of beginner-oriented Python programming content, and patterns of user interaction in coding learning through the comment sections. The metadata of the short videos collected for this study can be seen in Table 1.

Table 1. Short-video Meta data

Id	**Video link**	**Title**
Vid01	@gerhardien/video/7359224621918424326	Learn to code from 0
Vid02	@genius_869/video/7519923911631441208	Looping
Vid03	@genius_869/video/7519563537568517432	Conditional
Vid04	@genius_869/video/7518799232053071160	What is Coding
Vid05	@genius_869/video/7519199664030141752	Python Element for Beginer

The second stage involved the process of scraping video and comment data using the TikTok API during the research period. The third stage consisted of data classification and selection based on relevance to the research objectives. At this stage, comments unrelated to Python learning or containing spam were eliminated from the research data corpus. The fourth stage involved data coding using a thematic coding approach to identify patterns of user engagement based on the dimensions of cognitive, emotional, behavioural, and social engagement. The fifth stage involved digital discourse analysis to understand how users construct meaning, share learning experiences, and engage in collaborative learning within the TikTok community. The final stage

consisted of data triangulation through cross-source comparison, repeated observation, and contextual interpretation of the digital interaction patterns identified throughout the study.

The data analysis method employed in this study combined thematic analysis and interpretive digital discourse analysis. Thematic analysis was used to identify major themes related to the forms of beginner user engagement in learning Python through TikTok. The analytical process was conducted through the stages of open coding, axial coding, and selective coding to identify relationships among engagement categories emerging from user comments and interactions. Meanwhile, digital discourse analysis was utilized to understand how communication practices, language, symbols, and social expressions shape learning experiences within TikTok digital communities. This approach enabled the researchers to interpret not only the content of user comments, but also the social context, digital culture, and interactive relationships formed throughout the online learning process.

The validity of the study was maintained through source triangulation, prolonged digital observation, peer debriefing, and audit trails throughout the analysis process. This study also considered netnographic ethical principles by using only publicly available data, maintaining user anonymity, and ensuring that data interpretation was conducted responsibly in accordance with digital research ethics principles (Kozinets, 2020; Kozinets et al., 2022).

RESULTS

The study found that user interactions within Python microlearning content on TikTok were predominantly characterized by basic technical questions, indicating the high demand among beginner users for programming instruction that is simple and easy to understand. Based on the comment data, most users demonstrated cognitive engagement through questions related to syntax, program logic structures, coding tools, and fundamental Python programming practices. For example, a user identified as “U1” asked, “How can I save it so that the { } symbol appears continuously?”, while another user coded as “U2” asked, “What is the difference between e, f, and g?” These questions illustrate that users utilized the comment section as an additional learning space to obtain clarification regarding coding concepts that were not fully understood through short videos. Another user coded as “U7” asked, “What is if else?” indicating that the basic concept of conditional branching constitutes one of the major difficulties faced by beginners in understanding Python programming logic.

In addition, several users demonstrated deeper curiosity regarding more advanced topics such as functions, looping, and data structures. User “U5” commented, “Please teach looping, if-elif-else, and def functions,” while user “U29” requested, “Please make content about data structures.” These findings indicate that short-video microlearning successfully stimulates curiosity and motivates further exploration among beginner users.

In addition, as shown in table 2 to cognitive engagement, the study also found a high level of emotional engagement manifested through expressions of motivation, social support, and user enthusiasm toward content creators and the coding learning community on TikTok. Several comments reflected forms of emotional support such as “keep up the spirit, bro,” “great job,” “stay motivated,” and “awesome,” which were directed by users toward educational coding content creators. These comments indicate that the relationship between creators and audiences is not merely informational, but also emotional and supportive in nature. Users perceive themselves as part of a collaborative learning community that mutually supports one another throughout the coding learning process.

Table 2 Classification of User Engagement Forms in Learning Python through TikTok

Engagement Dimension	Indicator Findings	Examples of User Interaction
Cognitive Engagement	Syntax analysis, debugging, understanding coding logic	“What is if else?”, “Can elif statements be stacked?”
Emotional Engagement	Learning motivation, enthusiasm, frustration	“Keep up the spirit, bro,” “I really don’t understand”
Behavioral Engagement	Saving videos, requesting playlists, practicing coding independently	“Please make it into a playlist,” “I’ll save this video first”

Social Engagement	Community discussion, peer feedback, collaborative learning	"Come on, let's learn Python coding together"

Furthermore, expressions of emotional relief emerged when users felt that coding materials became easier to understand through the short-video format. User "U32" stated: "Please keep up the good work because your content is easy to understand." This statement demonstrates that the simplification of learning materials through short videos can reduce beginners' fear and anxiety toward programming. However, the study also identified expressions of frustration and confusion among several users who experienced difficulties in understanding certain coding concepts. User "U39" directly commented: "I really don't understand," while user "U52" stated: "I gave up at variables, I'm so confused." These comments indicate that although TikTok is effective in attracting users' attention, the limited duration of short videos remains a challenge in explaining more complex programming concepts.

The findings also revealed strong behavioural engagement through users' self-directed learning behaviours and active participation in Python microlearning content. Behavioural engagement was reflected in the large number of users requesting learning playlists, presentation files, and information regarding the coding applications used by content creators. User "U13" commented: "Please make it into a playlist," while users "U59" and "U61" requested learning presentation files with comments such as "I want the PowerPoint file." These activities indicate that users were not merely passively watching videos but were actively attempting to organize their own learning processes through the collection of additional learning materials.

Furthermore, many users demonstrated interest in the coding tools and software utilized by creators through questions such as "What application is that?", "What app are you using?", and "Which Python application is good to use?" These questions suggest that users were attempting to develop independent coding learning practices through the devices available to them, including the use of smartphones as programming learning tools. User "U20" even asked: "Can beginners learn coding using only a smartphone?" indicating the emergence of mobile learning tendencies within TikTok-based coding education.

The dimension of social engagement appeared to be highly dominant in this study through practices of collaborative learning and peer interaction among users. The comment section evolved into a collective discussion space in which users helped one another understand coding concepts. For instance, user "U19" commented: "Come on, let's learn Python coding together, I'm still learning the basics too." This comment reflects the emergence of a collective identity among novice learners studying together within a digital community. In addition, several users contributed supplementary technical explanations regarding the material presented by creators. User "U34" explained the relevance of looping in network engineering, while user "U35" mentioned that while-loop concepts are also applied in other software such as LabVIEW. These forms of contribution demonstrate that users were not only passively receiving information but were also participating in the collective production of knowledge through comment interactions.

Peer-to-peer interaction was also evident in discussions related to syntax and coding logic. User "U50" attempted to explain their understanding of if-else statements in JavaScript and compare them with Python. This practice illustrates that TikTok creates a social learning environment that enables users to construct collective understanding through informal dialogue.

The study also found that TikTok encourages the development of self-directed learning among beginner users. Many comments indicated that users utilized TikTok content as an initial gateway for independently learning coding without the direct involvement of formal educational institutions. User "U15" wrote: "I want to learn, but I'm confused about where to start," while user "U60" asked: "If I'm completely new to programming, should I learn HTML first or something else?" These questions demonstrate that TikTok functions as an initial orientation space for beginners in understanding programming learning pathways. In addition, users frequently requested recommendations regarding laptops, software, and coding learning roadmaps from creators and the community. This phenomenon indicates that short-video microlearning not only delivers technical material but also forms an informal learning ecosystem that helps users determine their own learning directions independently. Consequently, TikTok has evolved into a community-based digital learning platform that

connects information, motivation, and social interaction within the process of learning Python coding for beginners in Indonesia.

Table 3. Patterns of User Interaction in TikTok Python Microlearning Content

Type of Interaction	Main Characteristics	Learning Implications
Technical Questions	Questions related to syntax, tools, and debugging	Indicates the need for conceptual understanding
Social Support	Motivation and appreciation directed toward creators	Enhances emotional engagement
Peer Learning	Users assisting other users	Collaborative learning is established
Material Requests	Requesting playlists, PowerPoint files, and advanced materials	Indicates high behavioral engagement
Coding Practice Discussions	Sharing coding experiences and software usage	Forms a digital learning community

The findings presented in the table 3 demonstrate that user interaction patterns within TikTok-based Python microlearning content are characterized by multidimensional learning engagement. Technical questions related to syntax, coding tools, and debugging indicate that beginner users actively seek conceptual understanding and clarification regarding programming concepts. At the same time, social support interactions, such as expressions of motivation and appreciation directed toward content creators, contribute to strengthening users' emotional engagement throughout the learning process. The emergence of peer learning practices, in which users assist one another through explanations and feedback, further illustrates the development of collaborative learning within the digital community. In addition, requests for playlists, presentation files, and advanced learning materials reflect high behavioural engagement, as users attempt to organize and continue their learning independently beyond short-video content. Discussions regarding coding practices and software usage also reveal that TikTok functions not only as a content-sharing platform, but as a digital learning community that facilitates knowledge exchange, social interaction, and collective learning experiences among beginner Python learners.

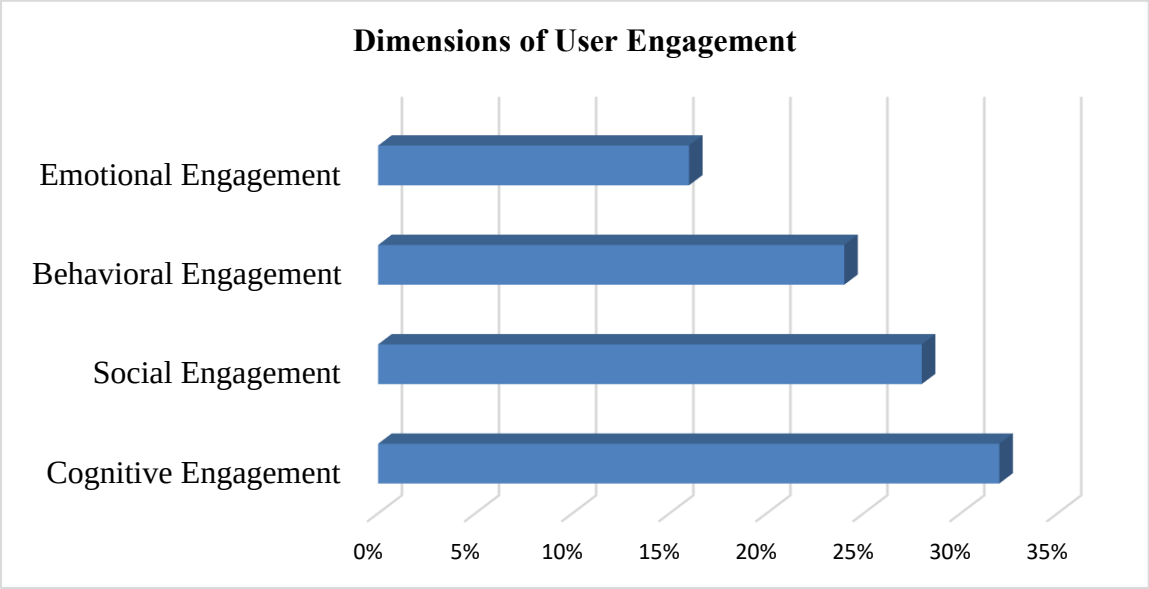

Figure 1. Distribution of User Engagement Dimensions

The dominance of user engagement forms in learning Python through TikTok based on the results of netnographic observations is show in figure 1. The graph indicates that cognitive engagement represents the most dominant form of engagement, as most users actively asked questions related to Python syntax, debugging, and coding logic. Social engagement also demonstrated a high proportion because the comment section evolved into a collaborative learning space where users interacted and supported one another throughout the learning process.

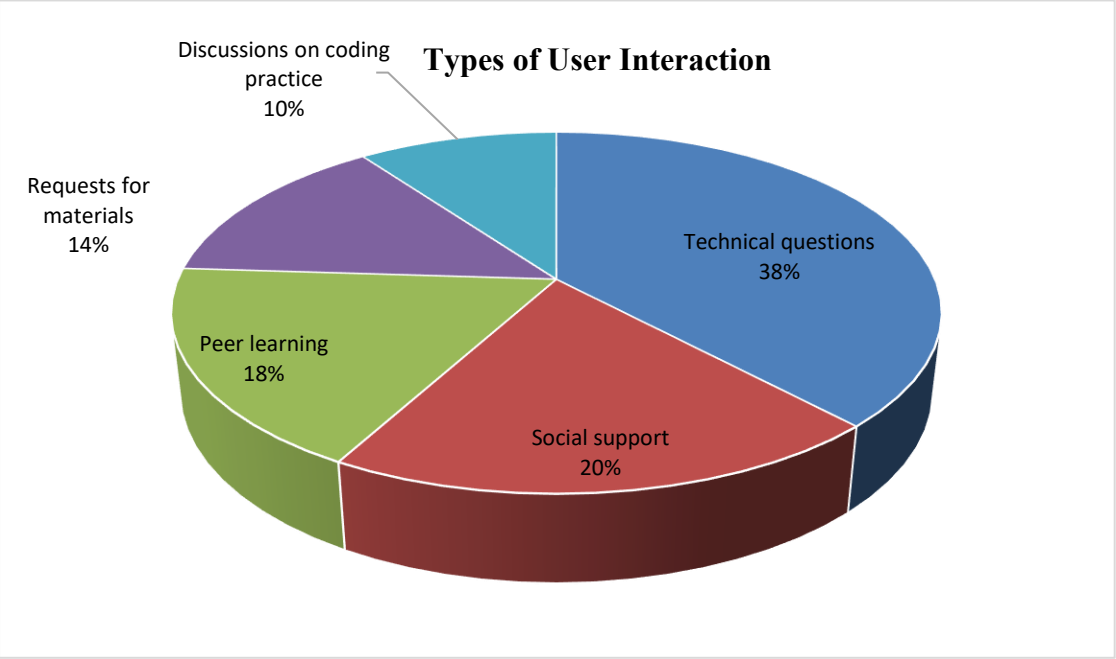

Figure 2. Type of user interaction

The interpretation of the Figure 2 indicates that:

- Technical questions (38%) represent the most dominant form of interaction, indicating that TikTok is utilized as a coding learning consultation space for beginners.
- Social support (20%) demonstrates the strong emotional engagement between users and content creators.
- Peer learning (18%) indicates the emergence of collaborative learning within the digital community.
- Material requests (14%) suggest a high level of behavioural engagement toward continued learning.

DISCUSSION

The findings of this study indicate that TikTok has evolved into a short-video microlearning-based digital learning space that enables beginner users to learn Python in a more flexible, interactive, and participatory manner. These findings reinforce the argument that digital microlearning represents a relevant learning approach in the social media era because it can simplify complex materials into concise learning units that are easier for users to understand (Barus & Bontisesari, 2023; Naser, 2024). In the context of this study, users demonstrated high levels of engagement with Python learning content because the materials were presented visually, practically, and directly focused on specific coding concepts. This condition is consistent with previous studies suggesting that short-video learning can enhance motivation, knowledge retention, and perceived usefulness in digital learning when designed with clear instructional objectives and controlled cognitive load (Alias & Razak, 2023; Alshammari, 2024). TikTok enables users to access coding materials quickly through mobile devices, making the learning process more flexible and aligned with the characteristics of the digital generation, which is accustomed to consuming concise and visual information. Furthermore, TikTok-based microlearning also demonstrates a paradigm shift from teacher-centred learning toward learner-centered learning, as users actively regulate their own learning pace, content selection, and forms of interaction. Therefore, the findings of this study strengthen the view that short-video microlearning is not merely a medium for distributing educational content but has evolved into a new form of digital pedagogy that connects technological flexibility with the learning needs of the digital generation.

This study found that cognitive engagement constitutes one of the primary dimensions of learning Python through TikTok. Users actively utilized the comment sections to understand syntax logic, program debugging, and fundamental programming concepts such as looping, branching, and variables. These findings indicate that coding education on TikTok is not merely passive through video consumption but also involves users' critical thinking processes and conceptual reflection.

These findings support previous studies suggesting that microlearning can enhance analytical thinking and task performance when instructional materials are designed in small units with clearly defined learning objectives (Utama et al., 2024; Sankaranarayanan & Mithun, 2024; Naser, 2024). Furthermore, the use of short-video formats enables users to break down complex coding concepts into smaller and more manageable components, thereby helping to reduce cognitive overload, as explained in digital microlearning theory (Mercan et al., 2023; ALIAS & Razak, 2023). Nevertheless, this study also found that some users experienced confusion when materials were delivered too rapidly or without sufficient in-depth explanation. These findings are consistent with the arguments of Chen (2025) and Naser (2024), who emphasized that microlearning has limitations in explaining topics that require sustained attention and complex problem-solving. In the context of programming education, concepts such as variable manipulation, nested loops, and conditional logic require more extensive conceptual elaboration than can typically be accommodated within the duration limits of TikTok short videos. Therefore, this study demonstrates that the effectiveness of short-video learning is strongly influenced by the quality of instructional design, material structure, and the availability of additional interactions that support users' understanding.

In addition to cognitive engagement, this study demonstrates that emotional engagement plays an important role in maintaining beginner learners' motivation in TikTok-based coding education. Many users expressed enthusiasm, motivation, and self-confidence after following Python tutorial content presented in a simple and non-intimidating manner. These findings reinforce previous research indicating that microlearning can increase learner motivation, perceived enjoyment, and engagement because the learning format feels lighter and more accessible compared to traditional formal learning environments (Shatte & Teague, 2020; Riggs-Zeigen, 2025). In this study, users perceived learning coding through TikTok as less intimidating because creators delivered the material using simple language, attractive visuals, and informal approaches closely aligned with the digital culture of younger generations. This condition supports the argument that the affective dimension in digital learning significantly influences users' persistence and self-efficacy in self-directed learning processes (Prasittichok & Smithsarakarn, 2024). However, this study also identified emotional frustration when users were unable to understand certain concepts solely through short videos. Comments such as "I really don't understand" or "I gave up at variables" indicate that the limited duration of videos may generate frustration when users do not receive additional explanations or adequate feedback. These findings suggest that emotional engagement in microlearning is dynamic in nature because it is influenced by the complexity level of the material, users' self-regulation abilities, and the social support available within digital communities.

The dimension of behavioral engagement in this study demonstrates that TikTok users actively develop self-directed learning strategies in learning Python. Users not only watched videos, but also saved content, requested learning playlists, searched for coding software, and independently practiced coding through mobile devices or personal laptops. These findings support the studies of Mercan et al. (2023), Nitiasih et al. (2024), and Barus & Bontisesari (2023), which argue that mobile microlearning increases accessibility flexibility and enables users to learn across various contexts of time and place. TikTok allows users to access coding materials anytime through smartphones, thereby making the learning process no longer dependent on formal classroom settings. In addition, users' requests for advanced materials and learning roadmaps indicate that microlearning is capable of fostering continuity of learning even when materials are delivered in small units. These findings suggest that short-video learning does not necessarily result in fragmented learning, as often criticized in discussions of microlearning, but can instead serve as an entry point for broader learning exploration when users possess strong intrinsic motivation. In the context of Python education, TikTok functions as a gateway learning platform that introduces basic coding concepts and encourages users to continue learning independently through other resources. Therefore, this study demonstrates that behavioral engagement in microlearning is determined not only by content quality, but also by the platform's ability to facilitate users' learning autonomy.

One of the most significant findings of this study is the emergence of social engagement through collaborative learning practices within TikTok comment sections. Users helped one another explain syntax, provide debugging solutions, share learning experiences, and motivate fellow novice learners throughout the process of learning Python coding. These findings strengthen the arguments of TikTok netnography studies suggesting that digital interactions on short-video platforms form participation-based learning ecosystems grounded in community interaction and peer engagement (Achfandhy & Chairunnisa, 2022; Downing, 2025). In this study,

comments did not merely function as responses to videos, but evolved into collective discussion spaces that enabled users to construct shared knowledge through social learning practices. The user-to-user interactions identified in this study support the concept of triadic interaction within TikTok learning ecology, consisting of user-to-system, user-to-user, and user-to-document interactions, as described in previous social media netnography studies (Achfandhy & Chairunnisa, 2022). Furthermore, users demonstrated collaborative problem-solving practices when jointly discussing coding errors or comparing programming logic across different coding languages. This phenomenon indicates that coding education through TikTok is social and participatory rather than merely individual and consumptive. Therefore, this study demonstrates that social interaction is a crucial factor strengthening the effectiveness of microlearning because users obtain emotional support, technical assistance, and social validation from digital communities.

From the perspective of beginner programming education, this study demonstrates that TikTok functions as an initial orientation space for novice learners seeking to understand the world of programming. Many users asked fundamental questions regarding coding applications, learning roadmaps, and beginner-friendly programming languages. These findings support the studies of Foughali (2023), Xinogalos et al. (2020), and Duran et al. (2019), which emphasize that the early stages of programming education are strongly influenced by language accessibility, learning environments, and the quality of feedback received by beginners. In this study, Python emerged as a relatively accessible language for users because of its simple syntax and its widespread use among digital educational creators on TikTok. However, this study also demonstrates that success in programming education depends not only on the programming language itself, but also on how instructional materials are presented in engaging and accessible ways. TikTok enables creators to simplify coding concepts through visual demonstrations and informal language closely connected to the digital culture of younger generations. This condition supports the argument that instructional design and motivational environments play substantial roles in the success of beginner programming education (Renzella et al., 2018; Zambach, 2024). Therefore, this study demonstrates that short-video microlearning can serve as an effective strategy for reducing entry barriers to coding education for beginners.

CONCLUSION

This study demonstrates that TikTok has evolved into a short-video microlearning-based digital learning space capable of supporting the process of learning Python for beginners in Indonesia. The platform no longer functions solely as a medium of entertainment but has also become a digital pedagogical space that enables users to acquire programming knowledge in a flexible, rapid, and socially interactive manner. The findings reveal that user engagement in learning Python through TikTok is formed through four primary dimensions: cognitive engagement, emotional engagement, behavioural engagement, and social engagement. Cognitive engagement is reflected through users' activities in understanding syntax, coding logic, debugging, and technical discussions related to Python programming. Emotional engagement emerges through users' learning motivation, self-confidence, enthusiasm, and frustration when encountering difficulties in understanding coding materials. Behaioural engagement is demonstrated through self-directed learning activities such as saving videos, requesting learning playlists, practicing coding directly, and searching for additional learning resources. Meanwhile, social engagement develops through collaborative learning practices within comment sections, enabling users to assist one another, provide feedback, and collectively share coding learning experiences.

The findings of this study indicate that the short-video microlearning format on TikTok has the potential to reduce the entry barriers to programming education for beginners. The concise, visual, and practical presentation of materials makes basic coding concepts more accessible compared to formal learning environments, which are often perceived as complex and highly theoretical.

Nevertheless, this study has several limitations because it focuses exclusively on the TikTok platform and employs a netnographic approach based on the observation of public comments. Therefore, future studies are recommended to combine netnographic approaches with in-depth interviews, learning analytics, or learning experiments to measure more specifically the influence of short-video microlearning on users' coding skill development.

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