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Microlearning in Teacher Education: Exploring possibilities for Cultural Shifts through Student Teachers' Satisfaction

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ABSTRACT

Teacher education often imposes a heavy content load on student teachers, fostering a culture of overload. One proposed solution is the integration of microlearning courses, which provide short, flexible, and modular learning experiences. The incorporation of microlearning may influence pedagogical practices while also shifting cultural expectations regarding teaching and learning in higher education. This study examines the implementation of a microlearning course in a teacher education college, focusing on student teachers' satisfaction. Using an explanatory sequential mixed-methods approach, the study combined quantitative data from an institutional satisfaction survey and unit-level satisfaction questionnaires. Findings indicated moderately high levels of satisfaction levels of satisfaction across microlearning units and the course as a whole. The technological design and pedagogy aspects were found to contribute more to student teachers' satisfaction compared to the instructor assistance and content aspects. Qualitative analysis of open-ended responses revealed that student teachers highly valued the technology design and autonomy afforded by the microlearning format. However, a small number of student teachers preferred traditional face-to-face interaction with teacher educators. Notably, institutional survey results showed that overall satisfaction with the microlearning course was similar to student teachers' satisfaction with non-microlearning online courses. These findings highlight a cultural tension between guided and autonomous learning within teacher education, emphasizing the importance of addressing the diverse needs of student teachers as teacher education moves toward a technology-enhanced learning culture.

Keywords: Cultural Shift, Microlearning; Online Learning; Teacher Education; Teacher Shortage.

INTRODUCTION

Teacher education plays a significant role in shaping future teachers' motivation to embrace innovation in their classrooms and in promoting both student and teacher agency related to digital competencies (OECD, 2023). However, teacher preparation programs still struggle today to fully address the demands of the digital era and tend to approach digitalization primarily as a technical or pedagogical adjustment rather than as a systemic cultural change that challenges traditional paradigms, norms, roles, and power relations within teacher education (Kohnke et al., 2025). These challenges are often related to the cultural characteristics of teacher education institutions, including heavy workloads, limited autonomy, conflicting orientations toward technological innovation, and generally slow adaptation to change (Biberman-Shalev et al., 2024).

Within such a cultural context, teacher education programs often lack courses that address broader, socially impactful, and relevant issues of the digital era, such as the digital divide, fake news, cyberbullying, and social engineering. This gap is especially problematic given the learning preferences of digital natives, who tend to engage more effectively with brief, accessible, and flexible learning formats (Bucăţa, 2023; Choudhary et al., 2024). In this

regard, the current study presents a curricular-pedagogical experience intended to contribute to cultural change within a teacher education college through the integration of a microlearning course into the college-based programs.

Microlearning is an e-learning approach that prioritizes the delivery of concise, targeted learning units designed to support skill acquisition and provide just-in-time knowledge (Zhang & West, 2020). Accordingly, microlearning courses typically consist of short, focused, and goal-oriented units. Research indicates that microlearning enhances retention and satisfaction through brief, flexible, and personalized learning experiences (Sanal, 2019; Taylor & Hung, 2022). By adopting innovative strategies such as microlearning, teacher education programs can better align with contemporary educational demands, cultivate adaptable and technologically proficient educators, and equip them with essential lifelong learning skills, while also taking into account the heavy workload characteristic of such programs (Biberman-Shalev et al., 2024). At the same time, the relative absence of an instructor and the modular structure of microlearning units may reflect and potentially promote a cultural shift in how college-based courses are traditionally designed (i.e., an instructor teaching a face-to-face frontal design course).

The microlearning course examined in the current study was titled SELECT. It represented a novel learning format within the institution, whose academic culture has traditionally been characterized by face-to-face, teacher-centered courses delivered through frontal lectures lasting approximately 90 minutes. Most college programs are characterized by a set of mandatory courses, and there is almost no possibility of free course selection. In contrast, the SELECT course consisted of short learning units presented on a dedicated website, allowing student teachers to choose what, when, and where to learn, without the continuous presence of a lecturer. The course aimed to enhance innovative learning experiences, introduce extracurricular content, and provide student teachers with greater autonomy in selecting their learning pathways, as well as develop self-regulated learning strategies. The course introduced topics emphasizing the roles of the digital teacher, the digital learner, and the digital citizen (OECD, 2023) and thus included six short units (Completion time was approximately 40–90 minutes, depending on the individual student): (1) How to Convey the Message; (2) Creativity in Education; (3) Beware: Fake News; (4) Social Engineering; (5) A Question of Interpretation; and (6) Digital Explorers (see Figure 1). Student teachers were required to complete four units of their choice out of the six available units. Upon completing each unit, student teachers filled out an anonymous evaluation survey (unit-level survey) related to their extent of satisfaction with learning in that unit.

According to Rof et al. (2024), there is a lack of empirical evidence related to student teachers' satisfaction with microlearning. Thus, the current study focuses on student teachers' levels of satisfaction with each microlearning unit and with the course as a whole. Examining student teachers' satisfaction with microlearning courses is important, as research indicates that high levels of satisfaction positively influence student teachers' motivation to engage in e-learning both during their training and in their future classrooms (Lei & So, 2021; Maqbool et al., 2020). In particular, exploring student teachers' satisfaction with microlearning may contribute to understanding how such learning models can support cultural change in the pedagogical design of teacher education programs, particularly in contexts where shorter training pathways are increasingly considered in response to ongoing teacher shortages in many countries (Donitsa-Schmidt, 2025; Guthery & Bailes, 2023), and post-COVID shifts toward online higher education (Biberman-Shalev et al., 2024).

LITERATURE REVIEW

Microlearning

There is a variety of microlearning definitions, concepts, and designs; however, according to Leong et al. (2020), the common features of microlearning may include microcontent, focusing on a single definable topic, and short learning time. Microlearning provides digitally designed, easily accessible, and learner-driven units. Traditionally developed for industry training and professional development, microlearning has demonstrated potential benefits in higher education by offering concise, tailored content (Sanal, 2019; Taylor & Hung, 2022; Shamir-Inbal & Blau, 2022).

The microlearning model is typically categorized into three types: short lessons lasting 5-10 minutes, just-in-time lessons that are user-driven and task-specific, and flash lessons (Taylor & Hung, 2022). Microlearning units employ diverse instructional strategies, including short readings, short videos, micro-podcasts, gamification, and quizzes (Hug, 2012; Semingson *et al.*, 2015; Taylor & Hung, 2022). Researchers have pointed out the characteristics of microlearning and its pedagogical benefits: Enhanced learning retention, focusing on key concepts in short, targeted sessions (Emerson, & Berge, 2018; Kohnke *et al.*, 2024; Taylor & Hung, 2022); Flexible mobile learning – accommodating different learning preferences, allowing learners to choose where, when, and how to learn (Allela *et al.*, 2020); Personalized learning – enabling learners to create individualized learning paths tailored to their capabilities, interests, and needs (Allela *et al.*, 2020; Emerson & Berge, 2018); Increased engagement and motivation, involving

active learning and boosting engagement through the direct and interactive contents (Kohnke *et al.,* 2024; Semingson *et al*., 2015; Taylor & Hung, 2022); Promoting lifelong skills –promoting competencies necessary for future training, skilling, reskilling, and upskilling in the era of Education 4.0 (Semingson *et al.,* 2015; Shamir-Inbal & Blau, 2022); and Targeted learning focusing on specific learning outcomes, ensuring targeted and goal-oriented learning (Allela *et al.,* 2020; Leong *et al.,* 2020; Taylor & Hung, 2022).

While most studies report high levels of satisfaction from this learning mode (Shamir-Inbal & Blau, 2022; Taylor & Hung, 2022), research has shown that microlearning units presented solely in text mode, without multimedia interaction and gamification, received negative responses from students (Sichani *et al.,* 2018). However, assessments conducted several months later revealed that the students who engaged with small text-based units performed significantly better than those who learned through traditional methods in terms of knowledge retention. This study also highlighted the need for providing support and integrating more traditional learning resources, especially when the transition to microlearning is abrupt and differs from other courses within the institution (Sichani *et al*., 2018). Given that microlearning involves various formats and technologies for varied learning purposes, further research is needed to explore its effectiveness across diverse contexts and interaction types (Taylor & Hung, 2022).

The research on microlearning in teacher education is rather limited, as it is rarely implemented in this context (Javorcik *et al*., 2023). However, there is some empirical evidence that student teachers who experience microlearning evaluate its flexible and stress-free characteristics, allowing them to focus on relevant and immediate tasks and to reflect on digital growth (Kohnke *et al.,* 2024). In a more recent study, Kohnke et al. (2025) found that student teachers in Hong Kong who participated in microlearning gained confidence and autonomy in using AI for lesson planning as well as self-regulated learning strategies such as goal setting. Taken together, these findings may indicate that microlearning is not yet a prevalent pedagogy in teacher education and that its integration into the curriculum may reflect an institutional attempt to promote cultural change in relation to modes of teacher preparation.

Satisfaction and Motivation in Online Courses

In the context of online education, Sun et al. (2012) define satisfaction as "[T]he level of emotional response to needs fulfillment through information technology services" (p. 1198). From an economic perspective, and in alignment with customer-focused business models, increasing competition among higher education institutions has put student satisfaction at the forefront (Parahoo *et al*., 2016). From a pedagogical perspective, student satisfaction in online education has been linked to higher engagement and increased motivation to learn (Maqbool *et al.,* 2020). However, it is worth noting that students who feel more comfortable with technology tend to report higher satisfaction in online courses compared to those who feel less confident in digital learning environments (Rodriguez *et al.,* 2008).

Research consistently highlights the link between satisfaction and behavioral intentions. For instance, McGorry (2003) demonstrated that student satisfaction significantly influences their likelihood of enrolling in future online courses. Similarly, Lei and So (2021) emphasize that students' confidence in their ability to learn effectively in online environments also plays a critical role in their satisfaction. Their study on Chinese faculty and students identified teaching style as the most significant predictor of students' satisfaction in online learning. The findings revealed that students' satisfaction was shaped by their perceived benefits of online learning and their evaluation of teacher performance. Interestingly, students rated the advantages of online learning – such as teacher performance, communication quality, and their future preference for online learning higher than faculty did. In the Canadian higher education context, Conard et al. (2021) found a strong relationship between students' perceived ease of online learning and their satisfaction levels. However, they also noted that students expressed dissatisfaction with the absence of synchronous interactions, valuing opportunities for direct engagement with instructors and peers. In this regard, Wu et al. (2010) emphasized that students and instructors' relationships play a crucial role, as they are strongly linked to fostering a positive online learning climate and shaping performance expectations, ultimately enhancing student satisfaction.

According to Landrum et al. (2020), research on factors influencing student satisfaction in online courses often highlights elements such as interaction, computer self-efficacy, course content, self-regulation, and perceived usefulness. Additionally, research has shown that course design and clarity are positively related to students' satisfaction (Mehta *et al.,* 2017). In their study, Landrum and her colleagues found those "gearing together" students' concerns plays a central role in shaping their satisfaction with online learning. Essentially, students' satisfaction depends on the convergence of students' expectations regarding the time and space of online learning, self-motivation, and the role of peers and instructors. This process aimed to create "the experience that one is the sole student in the class." (p. 4)

Studies have shown that microlearning and its unique characteristics of asynchronous online learning result in higher levels of satisfaction compared to traditional methods (Emerson & Berge, 2018; Leong *et al*., 2020; Shamir-Inbal & Blau, 2022; Taylor & Hung, 2022). This is attributed to students' perceiving microlearning as user-friendly, relevant, and particularly effective when integrated into a comprehensive program with diverse elements, in particular

gamification (Emerson & Berge, 2018). Additionally, research indicates that satisfaction increases due to the personalized nature of microlearning, its convenience, and the ability to access content on mobile devices (Allela *et al.,* 2020; Shamir-Inbal & Blau, 2022). However, some studies suggest that certain factors may undermine satisfaction with microlearning courses, including fragmented experiences, stress, lack of feedback, and insufficient instructions (Shamir-Inbal & Blau, 2022; Taylor & Hung, 2022). Either way, student teachers' satisfaction can be examined not only as an outcome of course design, but also as an indicator of their openness to alternative learning structures that differ from traditional teacher-centered academic models and may reflect a positive factor in promoting cultural change in teacher education.

"SELECT" a Microlearning Course Designed for Student Teachers

The *"SELECT"* course consists of six technology-focused units (Figure 1), with students completing four units of their choice for course credit. Each unit comprises content engagement, knowledge assessment, and learner evaluation. Final grades represent the average of the four unit assessments. The course was designed as a microlearning course without traditional lectures and direct instructor feedback and support. Students had access to a techno-pedagogy team member via email, mainly for technological assistance.

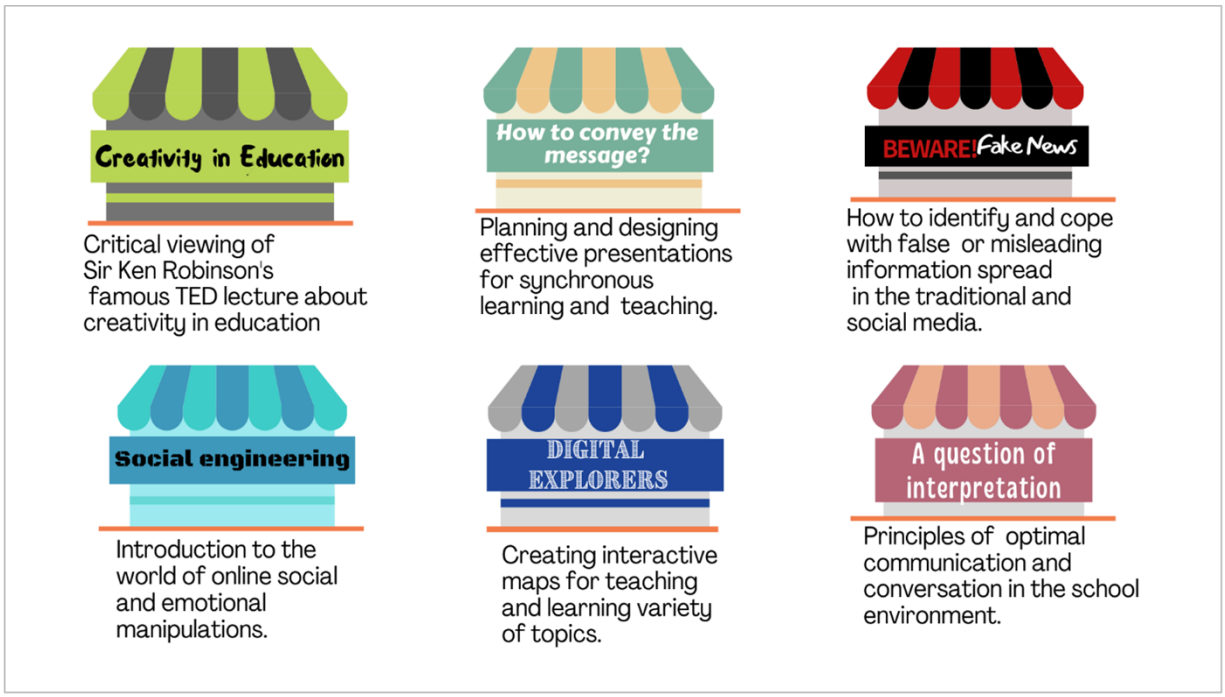

Figure 1. The *"Select"* Course Units

The course content was designed based on the European Framework for the Digital Competence of Educators (Redecker, 2017). Techno-pedagogy experts at the college identified essential digital competencies for future teachers, creating topics crucial for professional development in the digital era. The proposed topics underwent review and received formal approval from the institutional academic council before implementation

Setting Academic Standards

Academic quality was maintained through academic consultants who supervised each unit's development from concept to completion. A pedagogy expert reviewed assessments to ensure varied cognitive levels were addressed. Units were grounded in academic research with full references and suggested readings. To achieve high production quality, an experienced instructional designer with expertise in graphic design, video production, and vocational training collaborated with content experts to ensure excellence in both content presentation and visual design. The "*SELECT*" course launched as a pilot program in 2021 with six initial units.

Unit's Description

Unit 1 - How to Convey the Message

This unit explores effective message presentation based on dual coding and cognitive load theories (Brunyé *et al.,* 2008; Sweller, 2021). Participants learn to design presentations for both synchronous and asynchronous contexts,

with emphasis on clear explanations, engaging visuals, and intuitive navigation. Content is delivered through a narrated avatar with interactive activities reinforcing effective presentation techniques.

Unit 2 – Creativity in Education

This unit highlights the role of creativity in education, drawing inspiration from Sir Ken Robinson's work. Participants explore Robinson's (2006) ideas, watch the TED Talk "Do Schools Kill Creativity?", and engage in activities to analyze its key messages. The unit also addresses the value of incorporating videos into teaching and provides guidelines for effective and meaningful video-based teaching.

Unit 3 - Beware: Fake News

This unit examines fake news with emphasis on scientific misinformation. Beginning with an introductory activity demonstrating the concept, it progresses to an academic analysis of definitions and characteristics. Through practical activities evaluating fake news examples, particularly those related to COVID-19 vaccine misinformation, participants develop critical skills for assessing information source credibility in the digital landscape.

Unit 4 -Social Engineering

In this unit, students are introduced to social engineering, gaining a deeper understanding of common online manipulation tactics, and developing skills to identify and prevent online scams and fraud. The unit includes an introductory activity to explore the phenomenon, in-depth learning through a dedicated MOOC chapter, and practical exercises with a simulation of real-life scenarios in a school environment. This unit aims to empower students and enhance their awareness of digital threats.

Unit 5 - A Question of Interpretation

This unit focuses on building strong teacher-student relationships and effective communication strategies in the school environment. Participants engage in experiential learning activities, including digital simulations with video clips for practicing teacher-student-parent interactions; exercises defining communication needs of different school stakeholders; and scenario-based evaluations where participants analyze responses to realistic situations presented in the simulations.

Unit 6 - Digital Explorers

This unit introduces the capabilities of Google My Maps for creating interactive, collaborative maps. Participants learn to create dynamic maps and explore various ways to integrate Google My Maps into teaching, enhancing engagement and interactivity in educational settings. The unit highlights practical applications for visualizing information, fostering collaboration, and enriching geography, history, and other subjects using engaging animation and interactive activities.

The current study focuses on student teachers' extent of satisfaction with the microlearning course units and the course as a whole, focusing on four core curriculum aspects: content, pedagogy, technology, and instructor support.

Research Question

To what extent were student teachers satisfied with the "SELECT" course overall and with its individual units?

METHODOLOGY

In this study, we examine each unit and the overall course satisfaction as a case study (Schoch, 2020) using an explanatory sequential mixed-methods approach in which the quantitative analysis served as the primary component, followed by qualitative analysis conducted to interpret the quantitative findings (Creswell *et al.,* 2003). This approach leverages the strengths of both methods to provide nuanced insights into the phenomenon under study (Guetterman & Fetters, 2018).

Participants

The study included 269 student teachers who completed satisfaction questionnaires for each microlearning unit, and out of them, 62 participants completed the institutional course satisfaction survey (related to all the course units as a whole). Although unit-level surveys were anonymous, they were mandatory and integrated into each unit, providing a near-complete view of satisfaction. The number of respondents presented in Table 1 varied across the six microlearning units because student teachers could choose four out of the six units to complete; consequently, not all students completed every unit, resulting in different sample sizes per unit. In contrast, the institutional course satisfaction survey was voluntary, completed by 17% of course participants. Because the surveys were anonymous,

it is not possible to determine whether these respondents represent the full cohort or which units they completed. Consequently, the institutional survey may be affected by self-selection bias. Nevertheless, combining both datasets offers complementary insights, capturing both detailed unit-level feedback and overall course satisfaction.

Table 1. Number of student teachers completing each questionnaire

Questionnaire Per Unit	**N**
Creativity in Education	208
Beware: Fake news	188
How to Convey the Message	184
Social engineering	179
A Question of Interpretation	137
Digital Explorers	59
Institutional survey	**62**

Research Tools

Two research instruments were used: (1) a satisfaction questionnaire for each microlearning unit and (2) an institutional survey for the course as a whole. Both instruments included similar closed- and open-ended questions assessing four aspects: (a) learning design, (b) instructor/techno-pedagogical support, (c) pedagogical approach, and (d) content evaluation, on a 1-6 scale. The open-ended questions were: (1) What did you take away from the learning unit/the SELECT course and its learning approach as a learner and as a future teacher? (2) What would you suggest changing in the learning unit? Both satisfaction surveys were developed by the institution's research authority and maintained in an internal questionnaire repository.

Data Collection and Ethics

Data were collected during the 2022–2023 academic year. The unit-level questionnaires were administered at the end of each unit, while the institutional survey was conducted at the end of the semester as part of the institution's course feedback. All data were obtained from the institution's repositories and were fully anonymized. The study was approved by the institution's ethics board.

Data Analysis

The quantitative analysis served as the primary component of the study, assessing student teachers' satisfaction with each microlearning unit and the overall course across four dimensions: technological design, pedagogy, content, and instructor support. All quantitative analyses were conducted using SPSS, version 29. Descriptive statistics summarized participants' responses. Because it was not possible to track which student teacher evaluated which unit, comparisons of satisfaction levels across units were not possible; instead, satisfaction was analyzed separately for each unit as a unique dataset. Corrected item-total correlations were examined to assess the contribution of each item to the total scale score within each unit. These correlations represent the strength of the association between each item and the overall scale score, excluding the item itself to eliminate self-correlation effects.

The qualitative analysis complemented the quantitative findings by providing a deeper understanding of student teachers' satisfaction with microlearning. A deductive thematic analysis was conducted, guided by the four predefined dimensions identified in the quantitative questionnaire. All responses to the open-ended questions were analyzed deductively to illuminate these four satisfaction aspects. Three researchers independently coded the responses, reaching consensus for each segment and its corresponding dimension (Creswell *et al.,* 2003). This deductive approach allowed for a focused examination of responses within the study's framework. Although an inductive analysis might have revealed additional themes, the present approach ensured alignment with the study's objectives and qualitative tools.

RESULTS

The results presented in Table 2 reflect student teachers' preferences across the six course units. The majority of student teachers chose the *"Creativity in Education"* unit (N = 208), followed by "*Beware: Fake News*" (N=188), "***How to Convey the Message***" (N = 184), and "*Social Engineering*" (N = 179). Fewer students selected the units "*A Question of Interpretation*" (N = 137) and the least frequently chosen unit "*Digital Explorers*" (N = 59). This pattern may suggest that student teachers were particularly interested in units whose titles were perceived as relevant to their

profession, as well as contemporary challenges in digital literacy, with the "Fake News" unit generating the highest engagement. The uneven distribution may also reflect diverse interests and learning needs among the cohort, which may influence both perceived relevance and satisfaction with individual units. Moreover, Table 2 reveals a medium-high level of satisfaction across all six units. Satisfaction was highest for the learning design category (range 4.96-5.31), followed by pedagogy (4.77-5.06), instructor support (4.62-5.02), and content (4.66-4.94).

Table 2. Descriptive Statistics for Each Evaluation Statement Across Microlearning Units

	How to Convey the Message N=184		Creativity in Education N=208		Beware: Fake news N=188		Social engineering N=179		A Question of Interpretation N=137		Digital Explorers N=59	
Satisfaction Assertions	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Technological Learning Design												
User: The design of the learning unit (images, graphics, videos) is learner-friendly.	5.3	0.97	5.2	1	5.2	1.1	5.1	1.1	5.1	1.2	5.1	1.3
Clarity: The learning materials within the unit and the instructions for the various activities were presented clearly.	5.3	1.04	5.2	1.1	5.2	1	4.9	1.3	4.9	1.2	4.9	1.4
	5.3		**5.2**		**5.2**		**5**		**5**		**5**	
Pedagogy												
Drill: Exercises throughout the unit contribute to the learning process.	5.1	1.18	5.2	1	5.1	1.1	4.9	1.2	5	1.2	4.8	1.4
Interactive: The learning unit promotes active and interactive learning.	5.2	1.1	5.2	1	5	1.1	5	1.3	5	1.2	4.8	1.4
Efforts: The efforts required to learn the unit are reasonable	4.9	1.28	4.9	1.2	4.9	1.1	4.6	1.4	4.8	1.2	4.8	1.3
Creativity: Learning encourages critical and creative thinking.	4.8	1.43	4.9	1.2	4.8	1.4	4.7	1.4	4.8	1.4	4.7	1.5
	5		**5.1**		**5**		**4.8**		**4.9**		**4.8**	
Contents												
Relevance: The content of the learning unit is relevant and important for teachers in the digital age.	5.3	0.98	5.2	1.1	5.2	1	5.2	1.1	5	1.3	4.9	1.5

Interesting: The learning unit was interesting and enjoyable.	5.1	1.22	5.3	1	5.1	1.1	4.9	1.2	5.1	1.2	4.6	1.6
Knowledge: I learned about an application or concept from the field of technology that I had not encountered before.	4.4	1.6	4.1	1.8	4.4	1.6	4.5	1.5	4	1.7	5.1	1.3
	4.9		**4.8**		**4.9**		**4.9**		**4.7**		**4.9**	**4.9**
Instructor Support												
Assistance: The support from the course facilitator was satisfactory.	**5**	**1.27**	**4.8**	**1.4**	**4.8**	**1.4**	**4.6**	**1.5**	**4.8**	**1.5**	**4.8**	**1.4**
Overall Satisfaction	**5**	**0.93**	**5**	**0.9**	**5**	**0.9**	**4.8**	**0.9**	**4.8**	**1**	**4.8**	**1.2**
Cronbach's α	0.9		0.9		0.9		0.9		0.9		1	
Variance	0.1		0.5		0.1		0.1		0.3		0.1	

Across the six course units, corrected item-total correlations (r) indicate generally high levels of course satisfaction (see Table 3). Items related to *drill exercises* (r= 0.779-0.915), *interesting content* (r= .755-0.895), *clarity* (r = .781-.867), *relevance* (r = .657-.895), *interactive activities* (r = .573-.880), *user experience* (r = .641-.831), *efforts* (r = .603-.818), and *new knowledge* (r = .502–0.813) showed the strongest associations with overall satisfaction.

Other items, including *creativity* (r = .563-.758), and *instructor assistance* (r = .415-.752) contributed moderately to satisfaction, reflecting supplementary aspects of the learning experience. Overall, the pattern demonstrates that while all items are relevant, satisfaction is primarily driven by factors that enhance drill, clarity, and interesting content.

Table 3. Corrected Item-Total Correlations (r)* for each Unit's Satisfaction Scale

	Unit					
	How to Convey the Message N=184	Creativity in Education	Beware: Fake news	Social engineering	A Question of Interpretation	Digital Explorers
		N=208	N=188	N=179	N=137	N=59
Items of the satisfaction scale						
Interactive	0.713	0.747	0.743	0.573	0.743	0.88
Clarity	0.834	0.781	0.822	0.792	0.822	0.867
Interesting	0.799	0.818	0.816	0.755	0.816	0.895
Drill	0.856	0.827	0.847	0.779	0.847	0.915
User	0.648	0.647	0.716	0.641	0.716	0.831
Relevance	0.851	0.766	0.787	0.657	0.787	0.895
Assistance	0.552	0.545	0.415	0.518	0.415	0.752
Efforts	0.603	0.73	0.636	0.615	0.636	0.818
Creativity	0.694	0.704	0.563	0.661	0.563	0.758
Knowledge	0.592	0.684	0.656	0.672	0.656	0.813

* Higher r values reflect stronger correlations with the overall unit satisfaction scale

Data from the institutional survey indicate that overall satisfaction with the microlearning "SELECT" course (M_{total} = 4.73) is similar to the average satisfaction with institutional traditional-online courses (M_{total} = 4.69). Table 4 shows that the course's strongest aspect is its learning design, which student teachers rated highest (M = 5.01). This finding may suggest that satisfaction with the course was closely related to its design, which was also rated highest in the unit-level survey results described earlier, particularly concerning clarity supported by media. Qualitative analysis provided further insight, as open-ended responses highlighted technological design as a key strength, reflecting the high r values for interactive and engaging elements. Students emphasized the quality of online learning tools and the integration of technology in supporting their learning, for example: "*The interactive modules and clear structure made it easy to follow the lessons and stay engaged throughout the unit*."

Following learning design, satisfaction was highest for instructor assistance (M = 4.7), course pedagogy (M = 4.6), and content (M = 4.49). Pedagogy emerged as an important contributor to satisfaction, reflecting the high r values for drill exercises and interactive activities. Student teachers described the activities as engaging and effective: "*The activities with the games and short quizzes enhanced my learning*," and reported applying pedagogical approaches in their own teaching: "*I took* [ideas] *from the activities that were throughout the unit, such as asking questions after watching a short video*." Flexibility and self-paced learning were also appreciated. At the same time, some students noted areas for improvement: "*I would say that the assignments in this unit were not always directly related to what was presented to me beforehand*," and "*The questions in the exam are very confusing and even misleading*."

Course content was generally perceived as interesting and meaningful, consistent with the high r values for relevance and interesting content. One student teacher reflected: "*I realized through the unit the importance of fostering creativity in education*"; another stated: "*I deeply understood the importance of social engineering and my responsibility as a teacher to teach this topic to students who navigate the internet frequently*." However, some student teachers noted variability in content relevance depending on their disciplinary expertise. For example, one early childhood education student teacher felt the "Fake News" unit was less relevant, while others requested additional information or examples.

Regarding instructor support, satisfaction in the institutional survey of online courses was rated the highest (M = 4.93). This is not surprising, as online courses are typically taught by lecturers in the institution, who generally receive high ratings in such surveys. However, it is notable that in the "SELECT" microlearning course, where instructor assistance was limited to technical support via email, satisfaction was still relatively high (see Table 4), despite this dimension being rated lowest in the unit-level survey (see Table 3). This aspect was rarely mentioned in the qualitative responses. The few student teachers who referred to it expressed a preference for face-to-face learning with a lecturer: "*It would have been nicer to have a monthly lecture at the college or a Zoom session on various topics*," and "*I would have preferred it if the course were delivered in person rather than through independent learning*."

Table 4. Institutional survey of the "SELECT" course compared to the average of all online courses in the college (N = 62)

Statement		**"SELECT" course**		**Online courses**	
	Average	**Average**	**Std**	**Average**	**Std**
Technological Learning Design	The course includes sufficient guidance and support.	4.82	1.5	4.55	1.48
	The learning materials on the site are presented clearly.	5.15	1.34	4.7	1.31
	The instructor effectively planned the learning process on the site.	5.06	1.38	4.73	1.31
	The site's structure aids in efficient learning.	5.02	1.38	4.64	1.34
		5.01		**4.66**	
Instructor support	The instructor treats students with respect.	4.95	1.63	5.17	1.03
	I am satisfied with the responsiveness I receive from the instructors for assignments and coursework.	4.61	1.67	4.67	1.38
	The instructor is available to students.	4.53	1.78	4.94	1.2
		4.7		**4.93**	

Pedagogy	The assessment criteria are clear to me.	4.97	1.43	4.73	1.3
	The effort required for the course is reasonable.	4.52	1.73	4.44	1.47
	The assignments contribute to learning in the course.	4.47	1.84	4.58	1.39
	The course is challenging and thought-provoking.	4.42	1.84	4.65	1.42
		4.6		**4.6**	
	The course expands the students' knowledge.	4.58	1.71	4.68	1.39
Contents	The course helps create connections with other knowledge areas or the educational field	4.39	1.93	4.51	1.5
		4.49		**4.56**	
Overall		4.73		4.69	

DISCUSSION

The current study aimed to examine student teachers' satisfaction with the "SELECT" microlearning course, integrated into a teacher education training program. The results indicate that overall, student teachers were satisfied with both individual course units and the course as a whole. This aligns with previous studies on microlearning, which have reported high satisfaction in higher education contexts (Shamir-Inbal & Blau, 2022; Taylor & Hung, 2022).

Examining the four satisfaction dimensions analyzed in this study, course design (especially clarity) and pedagogy (especially drill) appeared to contribute most to student teachers' satisfaction, while course content (especially new knowledge) and instructor assistance contributed less. Notably, the technological design of the learning units emerged as one of the course's strongest aspects, with student teachers appreciating the integration of multimedia and interactive digital tools. This may reflect the potential of microlearning to support a cultural shift in teacher education toward a more digital-oriented, student-centered environment that is clear, interactive, and user-friendly (Sanal, 2019). Moreover, this finding underscores the capacity of microlearning to present content in a clear, well-structured, and interactive manner, fostering student teachers' active engagement, promoting their autonomy in managing the learning process, and supporting sustained attention and meaningful participation throughout each learning unit (Riggs-Zeigen, 2025).

Satisfaction with the pedagogy dimension may similarly indicate support for a shift toward self-directed learning, practical exercises for better understanding the contents, and the promotion of critical thinking. These findings are consistent with Utama et al. (2024), who reported that microlearning significantly improved critical thinking skills among elementary pre-service teachers. Such studies suggest that microlearning fosters skills essential for the 21st century by creating interactive, relevant, and adaptive learning environments. Moreover, technological design and pedagogy were associated with positive attitudes toward integrating technology in future classrooms. For instance, Zakrzewski and Newton (2022) found that student teachers trained with technology were less hesitant to incorporate it into their teaching. However, while feedback on technological design was largely positive, some student teachers preferred face-to-face instruction. This aligns with research showing that the fragmented nature of microlearning can sometimes increase cognitive load, stress, or reduce satisfaction (Sichani *et al.*, 2018), particularly for students who are less comfortable with digital environments (Rodriguez *et al.*, 2008).

Interestingly, content and instructor support contributed least to overall satisfaction. This may reflect a disconnect, as student teachers did not consistently relate all unit content to their future teaching roles. Therefore, integrating microlearning effectively in teacher education requires recognizing the instructor's role not just as a technical support provider, but as a facilitator of practical relevance, bridging theory and practice. Microlearning can assist teacher educators in presenting material interactively and clearly, promoting self-directed learning and critical thinking, while emphasizing the relevance of content to professional teaching. Supporting students in making these connections has long been recognized as a challenge in teacher education (Biberman-Shalev *et al.,* 2024; Korthagen *et al.,* 2001), and the current study suggests that instructor guidance in linking theory and practice remains crucial for satisfaction. Thus, overall, microlearning in teacher education may support a cultural shift toward student-centered practices, offering cognitive benefits such as enhanced critical thinking, interactive learning, clarity, and

scaffolded exercises. However, it must be balanced with deeper learning strategies emphasizing content relevance and modeling to ensure comprehensive understanding (Mostrady *et al.,* 2025).

This study is subject to several limitations. First, its quasi-experimental design may introduce selection bias. Second, as the study focused on a single course in one institution, generalizability is limited. Third, responding to the institutional questionnaire was voluntary, possibly biasing results toward students reporting extreme satisfaction levels. Fourth, it was not possible to track which student evaluated which unit, preventing unit-level comparisons. Finally, qualitative findings were limited to open-ended survey responses, without in-depth interviews or focus groups, which may have constrained insight into student teachers' experiences. Future research should address these limitations by including multiple institutions, detailed interviews, and perspectives of instructors and designers. Future research should also examine in detail the unit that received the highest satisfaction scores to analyze its strengths and contributions. For example, the unit titled Digital Explorers received the highest satisfaction scores, although it was selected by the fewest student teachers. This may also highlight the importance of the perceived relevance of the microlearning unit, which might have resulted in this level of satisfaction (Korthagen, 2011).

The study's findings indicate that microlearning can be integrated successfully into teacher education but requires careful design and support. First, support mechanisms should be available for all student teachers, particularly those facing challenges, to ensure equitable experiences. Second, instructor support should be enhanced via synchronous meetings and AI-based tools to provide immediate responses and facilitate discussion of content relevance and connections across units and courses. In sum, shifting teacher education toward technology-based approaches does not replace traditional and long-established principles; rather, it integrates them with new strategies, such as microlearning, in a way that enhances engagement and supports the well-being of both student teachers and teacher educators, develops technological competencies, and fosters a more student-centered culture.

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