Journal Evaluation in Education (JEE)
Vol. 6, No. 4, October 2025, pp. 1365~1373
ISSN: 2716-4160, DOI: 10.37251/jee.v6i4.2237

Microlearning Media Development for Office Management: A TPACK-Based Analysis

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Article Info

Article history:

Received Sep 30, 2025
Revised Oct 10, 2025
Accepted Oct 26, 2025
OnlineFirst Oct 30, 2025

Keywords:

Instructional Technology
Microlearning
Media Development
Office Management Education
TPACK Framework

ABSTRACT

Purpose of the study: This study aims to analyze teachers' proficiency in developing microlearning materials based on Technological Pedagogical Content Knowledge (TPaCK) to enhance students' access to subject matter and improve the effectiveness and efficiency of learning outcomes.

Methodology: This research employed a qualitative approach with a descriptive survey design. The study involved 37 teachers selected through purposive sampling, representing various educational levels and subject areas relevant to the integration of technology in teaching. Data were collected using structured interviews, questionnaires, and document analysis. The questionnaires, distributed via Google Forms, assessed teachers' TPaCK proficiency across the domains of technology, pedagogy, and content knowledge in the design of microlearning materials. Interview data provided deeper insights into teachers' practical experiences, while document analysis validated the quality of microlearning materials produced. Quantitative data from the questionnaires were analyzed using SPSS version 25 to obtain descriptive statistics, and qualitative data from interviews and document reviews were analyzed thematically to triangulate findings.

Main Findings: The results revealed that most teachers demonstrated adequate proficiency in Technological Pedagogical Content Knowledge (TPaCK), particularly in integrating technology into instructional design. However, some teachers demonstrated limited mastery in applying pedagogical principles and in effectively using technology-based tools to develop microlearning materials.

Novelty/Originality of this study: This study provides new insights into the relationship between TPaCK proficiency and the development of microlearning materials in blended learning environments. It underscores how teachers' integrated competence in technology, pedagogy, and content directly influences the quality, accessibility, and effectiveness of digital instructional resources.

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1. INTRODUCTION

Blended learning policy has encouraged teachers to create learning systems that integrate multimedia, so that knowledge transformation can take place without the constraints of space and time. To ensure the success of learning process that makes use of microlearning media, teachers need to be properly prepared to learn the concept of TPaCK, which many teachers have not seemed to understand well. This weak understanding may be linked to the lack of pedagogical competence and ability in using web-based technological device to create

teaching materials [1]. This has resulted in the teachers' having difficulty in developing microlearning approach-based learning media.

This problem can also be attributed to the teachers' lack of creativity in creating interesting learning materials using digital learning media in the form of interactive multimedia [2]. The compatibility of learning materials, methods, and media used is a necessity in creating an interesting, varied, active, interactive, innovative, creative, effective, and fun learning process. Findings of a previous study suggest that online learning needs to be supported by the teacher's readiness in designing learning content that is integrable into e-learning technology [3].

Previous studies have also identified teachers' limited competence in the technological knowledge required to implement the TPaCK framework effectively. Therefore, enhancing teachers' digital technology competence has become a critical necessity. The use of educational technologies that are responsive to changing educational needs can facilitate the implementation of various innovative and context-appropriate learning modes [4]. However, despite these advancements, existing literature still lacks a comprehensive understanding of how teachers particularly those in vocational high schools apply the TPaCK framework in developing microlearning media. Most previous research has focused on higher education settings, leaving a significant gap concerning the application of TPaCK in vocational education, especially within Office Management subjects. This gap underscores the need to investigate the extent to which vocational teachers can effectively integrate technology, pedagogy, and content knowledge in designing microlearning-based instructional materials.

One of the media formats that can be effectively utilized in e-learning is microlearning media [5]. Microlearning offers an innovative approach to designing and organizing learning experiences [6]. In microlearning environments, learning materials often referred to as learning objects are presented in small, concise segments that are easier for students to remember and comprehend [7]–[12]. Such compact and focused learning units have been shown to enhance students' motivation to engage actively at a high level Salleh, Kahirudin, & Ibrahim, while also preventing mental fatigue by allowing flexible learning durations that align with individual capacities [13]. Moreover, microlearning can be applied not only in formal education settings, but also in non-formal and informal learning contexts [8], thereby supporting lifelong learning.

The effective implementation of a microlearning-based learning system requires teachers to possess the ability to design, develop, and utilize learning media that correspond to the complexity and cognitive demands of the learning materials [14]. Consequently, both teachers and students must adopt a mindset shift toward fostering higher-order thinking skills [15], [16]. In this regard, the rationale of this study is to bridge the gap between teachers' theoretical understanding of the TPaCK framework and their practical ability to design and develop microlearning materials. Strengthening teachers' integration of technological, pedagogical, and content knowledge is essential to produce digital learning media that are not only pedagogically sound but also aligned with vocational learning needs and industry relevance. The appropriate development and use of engaging and varied learning media can significantly enhance students' interest and interaction during the learning process. Among the various instructional media, microlearning-based materials are particularly effective in helping students understand and retain content within a relatively short time frame [12].

Based on the gaps identified above, this study addresses the research problem concerning teachers' limited mastery of TPaCK in designing and developing microlearning media suitable for vocational education. Therefore, this research aims to provide empirical evidence regarding the level of teachers' competence, the formats and technologies employed, and the factors that support or hinder the development of microlearning media. The scope of this study is reflected in the following research questions: 1) What is the level of teachers' competence in developing microlearning media based on Technological Pedagogical Content Knowledge (TPaCK) in the Office Management subject in Business and Management Vocational High Schools?; 2) What technologies and media formats are used to develop microlearning media for the Office Management subject in Business and Management Vocational High Schools?; 3) What supporting and constraining factors affect the development of microlearning media for the Office Management subject in Business and Management Vocational High Schools?

The significance of this study lies in its contributions to both theoretical and practical domains. Theoretically, it enriches the growing body of literature on the integration of TPaCK and microlearning within vocational education contexts. Practically, the findings are expected to offer valuable insights for teachers, schools, and policymakers in designing and implementing training programs that enhance teachers' capacity to develop effective, creative, and technology-driven learning media in the digital era.

2. LITERATURE REVIEW

2.1 Function of Learning Media

The main activity in learning is a communication process that takes place reciprocally in a system. Every communication process needs media. Without media, communication cannot take place optimally or will

not even take place. Similarly, the media is also an essential component in learning communication. Learning media has a crucial function in the learning process to achieve learning outcomes [17].

According to experts, learning media serve as a vital means of communication that enables teachers to deliver instructional content effectively to students, while stimulating their thoughts, feelings, actions, attention, and interest in learning [18]–[20]. Beyond their function as a delivery tool, learning media play a strategic role in transforming abstract concepts into concrete understanding an aspect that is particularly essential in vocational education, where practical, hands-on learning is emphasized. By converting complex information into visual, auditory, or interactive formats, media enhances student engagement and promotes deeper comprehension and long-term retention.

Furthermore, learning media perform several strategic roles and functions in the teaching and learning process, including:

1. Enhancing students' learning interest, attention, and active participation.
2. Increasing students' motivation to explore and seek additional information.
3. Overcoming limitations of space, time, and sensory perception in observing real-world phenomena.
4. Recording, storing, and reproducing objects or events for instructional use.
5. Allowing the manipulation or modification of learning objects to facilitate experimentation and analysis.
6. Serving as an effective means of communication for distant or distributed audiences.
7. Making the learning process more interactive and learner-centered.
8. Functioning as a medium for simulation in technical or experimental practice.
9. Supporting teachers in becoming more positive, innovative, and productive in their instructional delivery.

From the above explanation, it can be concluded that learning media has a very significant role in learning process. More than just an aid, media has various strategic functions, such as improving students' interest and attention, increasing students' motivation to learn, overcoming the limitations of space and time, recording events, allowing the manipulation of objects being studied, becoming an effective means of communication, improving interactivity in learning, and serving as a simulator for engine and experiment practice. Hence, learning media has a very crucial role in aiding teachers to deliver learning materials and motivate students to learn enthusiastically.

2.2 Microlearning Media Development

Various online and offline learning approaches can be used at all levels of education. One of them is microlearning. The microlearning strategy offers a practical solution to the problem of learning by using modern information and communication technology [21]. Its application is aimed at improving students' access to learning materials, facilitating them to achieve their learning goals, and improving learning effectiveness and efficiency as a whole.

As electronic-based learning media, microlearning presents learning content in small, practical segments that are easy to understand and remember, accessible anytime and anywhere, and rapidly developing. It is presented in the forms of blogs, infographics, interactive infographics, PDFs, interactive PDFs, eBooks and flipbooks, animated videos, video explainer, whiteboard animation, kinetic text-based animation, explainer videos, interactive video, interactive parallax-based scrolling, webcast/podcasts, expert videos,webinars/recorded webinar, mobile apps, complex branching scenarios, social media, and interactives [20], [22]-[24]. According to Susilana et al., and Mali et al., microlearning has the following characteristics: 1) Contents are presented concisely, with a duration of about 1-3 minutes; 2) Learning atmosphere is relaxed, and learning is more flexible; 3) Contents can be organized in sequence according to needs, hence timelier; 4) It helps create an independent learning environment; 5) It uses an appropriate technology that improves the achievement of the learning outcome [20], [23].

Five characteristics of microlearning media were identified, namely adequacy**,** convenience, efficiency, usability, and recency [23]. Furthermore, Al-Shehri previous researchers were identified the seven dimensions that needs to be considered in using microlearning, namely: time according to the principles of less is more, small content, curriculum containing short modules or brief elements, varied formats applying the principle of adjustment, learning process independent and comprehensive treatment, the use of varied multimedia both during the offline and online sessions, the use of a variety of communicative, interactive, reflective, constructive, discovery, and project-based learning models [21].

Previous studies have predominantly focused on outlining the characteristics and potential benefits of microlearning; however, limited attention has been given to how teachers' Technological Pedagogical Content Knowledge (TPaCK) competence directly influences the quality and effectiveness of the microlearning media they design. This gap highlights the need to integrate both pedagogical and technological perspectives when examining the development and implementation of microlearning, as undertaken in the present study.

From another perspective, microlearning media have also been analyzed within the framework of the Technology Acceptance Model (TAM), emphasizing the dimensions of *perceived ease of use* and *perceived usefulness* [17]. Within this framework, teachers' readiness to adopt and utilize technology emerges as a key determinant of the successful implementation of microlearning strategies. The development of technology-based learning materials must therefore align with teachers' competence in applying appropriate technologies to specific content areas. Such competence is best reflected through their mastery of Technological Pedagogical Content Knowledge (TPaCK) [26], a framework that integrates technology, pedagogy, and subject matter knowledge into a coherent understanding of effective teaching practices [27].

In this study, the TPaCK framework serves as the theoretical foundation for analyzing teachers' abilities to combine content, pedagogy, and technology in the design of microlearning media for vocational education. The findings are expected to contribute to the growing body of empirical evidence on TPaCK application and to inform teacher development programs aimed at enhancing digital pedagogical competence in the era of technology-driven education. There are three main knowledge components that form the basis of TPaCK, namely: Content Knowledge (CK), Pedagogical Knowledge (PK), and Technology Knowledge (TK). Furthermore, empirical findings from previous studies [28], [29] detailed the concept of TPaCk into seven elements as follows:

1. Technology knowledge (TK), which includes knowledge about:
    a. The use of technology, both conventional and digital,
    b. Skills needed to operate certain technology,
    c. The use of information technology to communicate and solve problems.
2. Pedagogical knowledge (PK), which includes:
    a. Knowledge about learning processes and methods,
    b. Understanding of how learners learn, skills to manage class, plan lessons, and use strategies for evaluating results.
3. Content knowledge (CK), i.e., mastery of subject matter knowledge, which includes facts, concepts, theories, and procedures that will be learned and taught.
4. Technology Pedagogical Knowledge (TPK), which includes the teacher's understanding of learning means and processes that result from advances and the use of technology in classroom learning.
5. Technological Content Knowledge (TCK), which includes knowledge about:
    a. The way technology creates new representations for materials that motivates teachers to change the way students understand a concept from lesson content that uses technology;
    b. The ability to choose technology to teach a particular concept or material appropriate to the objective of the lesson.
    c. The effect of technology on learning material and vice versa.
6. Technological Content Knowledge (PCK), which includes knowledge about:
    a. How to use and combine learning materials pedagogically in order to develop an effective and efficient learning process;
    b. The use of learning strategy to teach a different material;
    c. Learning, curriculum, assessment, reporting and their interrelationships:
7. Technological, pedagogical, content knowledge (TPaCK), which include learning strategies that integrate technology appropriately into learning processes.

From the above discussion, it can be concluded that various learning approaches can be used both online and offline, and that microlearning can be an effective approach in meeting the challenges of learning processes that use modern technology. As an electronic-based learning media, microlearning allows learning content to be presented in small, practical and flexible segments using different formats such as blogs, infographics, animated videos, and others. Text also identifies the key characteristics of microlearning, such as having a short duration, relaxed learning atmosphere, content flexibility, and the use of appropriate technology. Furthermore, Text highlights the importance of the teacher's ability to integrate technology into learning, which is reflected in the concept of TPaCK (Technological Pedagogical Content Knowledge) with its three main components: Content Knowledge, Pedagogical Knowledge, Technology Knowledge, and their seven more detailed elements. To sum up, the text explains the importance of technology in modern learning and the requirement that teachers master TPaCk to improve the effectiveness of learning.

3. RESEARCH METHOD

This research used qualitative approach with descriptive survey method. Data were collected with structured interviews and questionnaires distributed through G-Form. Data were processed and analyzed using modus interpreted into three categories, namely: highly competent, fairly competent, and incompetent. Subjects of the research are teachers of Office Management subject at Office Management and Business Service

Vocational High Schools in regencies and municipalities of West Java. The analysis units were 37 teachers. The object of the research is mastery of PTaCk in the development of microlearning media.

Questionnaires were distributed and structured interviews were conducted to 37 teacher subjects of this research. Answers to the questionnaires were processed with descriptive statistics, namely percentage mode, while answers to the interviews were described to answer the research problems. The frequency of data obtained from the questionnaires were tallied and their percentage and mode calculated; the data obtained from the interview were presented descriptively to answer the research problems. The respondent's answer to each question in the questionnaires was given the score from 1 to 7, the interpretations of which are described in Table 1. The results of the data processing are presented in accordance with the research problems and interpretations given in the table.

Table 1. Interpretations of Score Range

Score Range	Interpretation of TPaCK Mastery
1-3	Incompetent
4	Fairly Competent
5-7	Competent

4. RESULTS AND DISCUSSION

Measurement of the subject's level of mastery of TPaCK (Technological Pedagogical Content Knowledge) was made using questionnaires with three indicators, namely: mastery of content knowledge, pedagogical knowledge, and technological knowledge, presented in 22 questions. From the answers given by the respondents, it can be identified that the teacher's level of mastery of TPaCK is on average in the category of competent. The details are presented in Table 2.

Table 2. Level of TPaCK Mastery

No	Indicators	Answer range (%)			Interpretation
		1- 2- 3	4	5- 6- 7	
	Content Knowledge				
1	Teacher's ability to identify the level of difficulty of learning material	5.5	13.5	81.0	Competent
2	Skills to package learning materials into interesting small segments	8.2	16.2	76.6	Competent
3	Ability to implement field of study curriculum in learning	2.8	13.5	83.7	Competent
4	Ability to choose media/technology relevant to the lesson	5.4	13.5	81.1	Competent
5	Ability to formulate lesson objectives and KKTP (learning achievement criteria) relevant to competence requirements	2.7	10.9	86.4	Competent
	Pedagogical Knowledge				
1	Ability to create a learning environment that motivates student to build new knowledge and skills	2.8	2.7	94.5	Competent
2	Teacher's ability to moderate interactions among students in vaarious learning activities	5.5	8.1	86	Competent
3	Teacher's ability to motivate students to learn.	3.7	5.3	91	Competent
4	Teacher's ability to observe student's social development	2.8	2.7	94.5	Competent
5	Teacher's ability to observe student's moral development	2.7	8.2	89.1	Competent
6	Teacher's ability to observe student's spiritual development	2.7	5.5	91.8	Competent
7	Teacher's ability to observe student's motoric development	2.7	10.9	86.4	Competent
8	Teacher's ability to understand student's experiential background	2.7	10.9	86.4	Competent
9	Teacher's ability to understand student's expectation in learning	8.2	5.4	86.4	Competent
10	Teacher's ability to understand student's emotional development that affect the effectiveness of their learning	5.4	5.5	89.1	Competent
11	Teacher's ability to evaluate and measure the achievement of student's learning outcome	5.5	2.7	91.8	Competent
12	Teacher's ability to modify learning techniques/methods based on student's learning outcome	5.5	18.9	75.6	Competent
	Technological Knowledge				
1	Teacher's ability to choose and create technology-based learning media	5.4	13.6	81	Competent

No	Indicators	Answer range (%)			Interpretation
		1- 2- 3	4	5- 6- 7	
2	Teacher's ability to use/operate technology in learning processes	2.7	13.6	83.7	Competent
3	Teacher's ability to use technology to create effective content based on textbooks/learning resources	5.4	10.9	83.7	Competent
4	Teacher's ability to use technology to develop student's knowledge on a particular topic	2.8	13.5	83.7	Competent
5	Teacher's ability to develop student's skills on a particular topic	2.7	10.9	86.4	Competent

Microlearning Technology and Media Format

The technology and media format used to make microlearning media are available in various platforms. In this context, microlearning refers to a learning approach that focuses on delivering information in bite-sized forms that are easy to absorb by students. One of the technologies that is widely used in the making of microlearning media is the Learning Management System (LMS), i,e, a digital platform that enables a teacher to organize, deliver, and manage learning materials online. The formats that are frequently used in the making of microlearning media are videos, audio, infographics, and slides. Video is an effective format to deliver information visually and audio-visually. Based on the observation and evaluation Canva format-based microlearning media produced by teachers of vocational high school, slides (52%), infographics (28%), and videos (20%) are the most produced features.

Supporting Factors in the Development and Use of Microlearning Media

Nearly half of the respondent teachers (46%) claimed that they had never used microlearning media, and the rest (54%) said that they have used them and even made them. The 54% of the teachers who have used and made microlearning media claimed that they have the support of the following factors:

1. The availability of adequate facilities/infrastructure, such as computers (laptops), smartphones, internet network, and sufficient data package quota;
2. The availability of applications that can be used to make microlearning media;
3. Teacher's competence and ability to use technology needed to develop microlearning media correlate with the availability of clear and measurable modules (lesson plans);
4. Teacher's creativity in packaging learning content/materials in micro formats.

These factors increased the teacher's motivation to improve his/her ability and readiness to master the technology, the pedagogical competence, and the subject matter that come under his/her responsibility.

Obstacles in the Development and use of Microlearning Media

In addition to the supporting factors, teachers also still had obstacles in preparing and using microlearning media, which include:

1. Psychological Factors. Some teachers feel comfortable with the conventional mindset about learning processes, so it takes more efforts to adjust themselves to the microlearning model. Similarly, students who are used to receiving complete learning materials from the teacher, now have to adapt to the new mindset of the digital-based learning processes.
2. Physical Factor Not all schools can provide the supporting facilities needed for the applications needed to make microlearning media. Apart from this, frequent power outages, computer breakdowns, speaker malfunction, unreliable internet networks, and editing process difficulties are also problems.
3. Personal Factors. Some of the teachers have not fully understood the concept of *microlearning*. They have difficulties in packaging the learning materials in micro forms and have limited knowledge of the technology and limited access to the information needed. They also have problems in choosing the appropriate designs, colors, fonts, relevant videos and in making and editing brief tutorial videos to make them more motivating and easier for students to understand. This is where professional help is needed to align the presentation with the lesson content.
4. Student Inadequate Resources Sometimes the specifications of the devices that the students use do not support the application so they cannot run in them. Teachers also have difficulties to monitor the overall learning processes that students are engaged in to prevent students from using their devices for fun activities and social media.

Referring to a previous studies it has been found that, there are six prerequisites that enable microlearning media to be used, namely the availability of hardware, software, internet network, data package/Wi-Fi, teachers' ability to package materials in micro-forms, and student's creativity to develop further the content material [6], [30]. Relevant to this, TPaCk-based micro-learning media development must be

supported by the following competencies: (1) mastery of the subject matter being taught, (2) ability to package learning materials, (3) ability to use technology, (4) ability to identify the level of difficulty of learning materials, (5) understanding of the student characteristics, (6) ability to evaluate and measure learning achievement, (7) ability to teach with technology, and (8) ability to formulate learning outcomes following target competence [1].

The results of this study show that most teachers have good mastery of the subject matter content they teach. Most of the teachers also have good mastery of pedagogical content knowledge and technical knowledge. This condition provides a strong basis for the teachers to develop microlearning media appropriate to the levels of difficulty of the learning material. This condition also shows that most respondents have good grasp of TPaCK; however, they still have difficulties in creating microlearning media. Nearly a half of them (46%) have never used microlearning media. Notwithstanding, microlearning media is very helpful in helping students to understand the lesson content in shorter period of time [31]-[36].

According to Regulation of Minister of Education, Culture, Research and Technology of Republic of Indonesia Number 5 of 2022, features of Office Management subjects should be focused on deepening and improving the competence of office administration personnel or other personnel in accordance with the development and needs of the working world. Therefore, Office Management subjects need to be taught with rigor, efficiency and accuracy for operational efficacy. There are ten areas of skills that students need to master, namely: (1) economics and business, (2) general administration management, (3) work place communication, (4) archive management, (5) office technology, (6) meeting/gathering management, (7) simple financial management, (8) human resources management, (9) facility and infrastructure management, and (10) public relations and protocol affairs management.

The choice of learning media and technology have generally been made appropriately in accordance with the learning context. Most teachers chose the slide format when using Canva to create microlearning media. They did so to facilitate access for the students and because the school has the facility for it. In addition to slide, infographics are the next feature that many participants used. Only a few of them used the video. The most serious issues that teachers faced in creating microlearning media are the modification process and making full use of the features offered by applications [37]-[41]. Limited technological competence, limited availability of facilities, technical issues, and unavailability of professional support become the main issues in creating learning material using the video feature. Regardless of the differences in the availability of facilities in different learning contexts, the teachers had strong motivation to learn and improve their TPaCK competence.

5. CONCLUSION

The integration of technology in education has become increasingly essential in modern teaching practices, especially in vocational education. This study has explored the competence of Office Management teachers in utilizing technological tools, specifically the Canva application, to develop microlearning media. By examining the levels of TPaCK competence among these teachers, the study sheds light on their ability to create engaging and effective learning materials. Additionally, it has identified the various factors that support and hinder this process. The following sections present the conclusions drawn from the study, the implications of these findings, and recommendations for future practice. Based on the analysis and discussion above, it can be concluded that the majority of teachers teaching Office Management possess a high level of TPaCK competence, which significantly eases their ability to develop microlearning media. These teachers predominantly utilize three main formats of the Canva application—slides, infographics, and videos—to create their learning materials. Additionally, several factors influence their work, both supportive and constraining, which include psychological, physical, personal, and student resource limitations.

The findings of this study suggest several implications. Firstly, it is essential for the government to provide comprehensive support to teachers, ensuring they can enhance their TPaCK competence standards uniformly and develop microlearning-based learning media effectively in vocational high schools. Secondly, schools should establish standards for the availability of facilities necessary for creating microlearning media. Lastly, schools must facilitate opportunities for teachers to attend training sessions on microlearning media development, enabling them to stay updated with the latest educational technologies and methodologies. In light of these findings, it is recommended that schools offer technical guidance on instructional video production for teachers. This guidance can be organized internally within the school or by engaging external experts. Providing such support will empower teachers to create high-quality instructional videos, thereby enriching the learning experience for their students.

ACKNOWLEDGEMENTS

This study was funded through a Competitive Applied Research (Penelitian Terapan Kompetitif) grant from Universitas Pendidikan Indonesia under the scheme PR-UPI-PT-05: Teaching Innovation Research (Bidang Penelitian Inovasi Pembelajaran). The authors would like to express their deepest gratitude to Universitas

Pendidikan Indonesia for the financial and institutional support provided. Appreciation is also extended to the participating teachers and vocational high schools for their cooperation, insights, and valuable contributions to the successful completion of this research.

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