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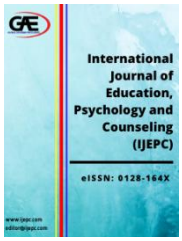

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PERCEPTION LEVEL OF TIKTOK APPLICATION AMONG IPGKTI STEM TRAINEE TEACHERS IN TEACHING AND LEARNING

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Abstract:

Innovative teaching methods in STEM education are essential for fostering engagement, creativity, and problem-solving. Despite the popularity of TikTok as a short-form video platform, little research has examined its educational potential within teacher training, particularly in STEM contexts. This study investigates the perception level of the TikTok application among STEM trainee teachers at Temenggong Ibrahim Teacher Training Campus (IPGKTI), focusing on its implications for teaching and learning. Guided by the Technology Acceptance Model (TAM), the survey instrument comprised 13 items across five sub-constructs ease of use, educational value, engagement potential, content quality and relevance, and social influence adapted from the Standards for Educational and Psychological Testing (AERA, APA, & NCME, 2014). Data were collected through purposive sampling of 88 STEM trainee teachers. The instrument demonstrated strong internal consistency (Cronbach's alpha = 0.89; sub-constructs = 0.78–0.86). Rasch Measurement Model confirmed scale robustness (person reliability = 0.84; item reliability = 0.90). Inferential analysis using independent samples t-tests and ANOVA revealed no significant differences in perception across gender, field of study, or years of study ($p > .05$; $\eta^2 < 0.01$). Item I5 (TikTok promotes creativity in STEM teaching) recorded the lowest agreement (mean logit = –0.42), while Item I2 (using TikTok to expand social networks) had the highest (mean logit = +0.61). These findings indicate that TikTok is widely perceived as a social networking tool but remains underutilised as a medium for creative STEM instruction. The results highlight a gap in digital pedagogical competence, suggesting the need for teacher training programs to embed TikTok-based microlearning and instructional design strategies. Such targeted training could transform TikTok

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from a networking platform into a pedagogically meaningful tool for innovative STEM education.

Keywords:

STEM Teacher Trainees, STEM education, TikTok Application

Introduction

Perceptions of STEM teachers towards TikTok in teaching and learning As educators increasingly adopt TikTok as a teaching tool, it is imperative to address the potential drawbacks associated with its use in educational settings. While the platform can indeed enhance engagement and creativity, concerns about content quality and appropriateness persist; not all user-generated videos align with academic standards or provide accurate information (Tan et al.,2022). A comprehensive understanding of teachers' perceptions is paramount to effectively harnessing the affordances of TikTok, addressing potential challenges, and strategically optimising its integration to foster enhanced pedagogical practices and improved learning outcomes in STEM education. Investigating the nuanced perspectives of STEM teachers regarding TikTok is essential to inform effective implementation strategies and maximise its potential as a supplementary educational resource (Caballero et al., 2023). STEM teachers' attitudes toward TikTok are shaped by a complex interplay of factors, including their assessment of its usability, relevance to educational objectives, capacity to stimulate student interest through engaging content, and the overall standard and reliability of the information it offers (Rininggayuh et al., 2024).

Moreover, the fleeting nature of TikTok's short-form content may lead to superficial understanding rather than deep learning, raising questions about how effectively complex STEM concepts can be conveyed within such constraints. Educators must therefore navigate these challenges by developing clear guidelines for content creation and evaluation, ensuring that students not only engage with the material but also cultivate the critical thinking skills necessary for discerning credible sources amidst the vast array of digital content available (Syah et al., 2020). Ultimately, fostering an environment where TikTok serves as a complementary resource rather than a standalone solution can help maximise its benefits while mitigating risks associated with its integration into the classroom (Shahin & Amin, 2023). TikTok's creativity and engagement make it a promising tool for STEM teachers to use in dynamic, interactive classrooms (Vizcaíno-Verdú & Abidin, 2022). It's short, visual content aligns with how students learn today, potentially enhancing their understanding and retention of complex STEM concepts (Mohottala et al., 2023). The platform can also help develop crucial digital literacy and critical thinking skills (Mohottala et al., 2023).

Furthermore, TikTok's global reach, user-friendliness, and ability to sustain student interest make it an appealing tool for STEM teachers to promote learning both in and out of the classroom (Roberd & Roslan, 2022). The platform's short, visually engaging content has the potential to improve students' understanding and retention of complex STEM concepts. Additionally, TikTok presents a unique opportunity to foster creative exploration and dynamic interaction, providing educators with a platform to revolutionise traditional pedagogical approaches and encourage students to engage actively in their educational experiences. Therefore, this study was conducted to identify the perception level of IPGKTI STEM Trainee Teachers regarding the TikTok Application for teaching and learning, based on gender, field

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of study, and year of study. This study was also conducted to determine significant differences in the perception level of IPGKTI STEM Trainee Teachers regarding the TikTok Application for teaching and learning, for gender, field of study, and year of study.

Methodology

Research Design

This study employed a quantitative survey research design, supported by statistical analysis, to investigate STEM trainee teachers' perceptions of TikTok as a tool for teaching and learning. Quantitative methodology was chosen as it enables measurable and generalisable insights into student engagement and learning outcomes when TikTok is integrated into STEM education.
A pilot study was conducted with 19 science education teacher trainees to refine the survey instrument and assess its clarity, reliability, and validity before implementation. Minor adjustments were made based on pilot feedback to improve item wording and ensure construct alignment.

Sampling Procedure

The study utilised purposive sampling, targeting 88 STEM trainee teachers from the Temenggong Ibrahim Teacher Training Campus (IPGKTI). This sampling strategy was deemed appropriate as the research focused specifically on trainee teachers from STEM disciplines (Science, Mathematics, and RBT) who are directly relevant to the study's objectives. The sample included participants across different academic years, from PPISMP to Year 4 of PISMP, allowing for comparison across cohorts.

Instrumentation

The primary data collection instrument was a structured survey comprising 13 items distributed across five sub-constructs:

1. Ease of Use
2. Educational Value
3. Engagement Potential
4. Content Quality and Relevance
5. Social Influence

Each item was rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), enabling measurement of agreement levels. The instrument was developed with reference to the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014), ensuring adherence to established guidelines for educational assessment tools.

Validity and Reliability

Content validity was established through expert review by three senior lecturers in educational technology and STEM education, who evaluated the relevance, clarity, and alignment of the items with the study constructs. Construct validity was examined during the pilot study through exploratory analysis. Reliability analysis indicated that the overall survey demonstrated strong internal consistency, with a Cronbach's alpha of 0.89. Sub-construct reliabilities ranged from 0.78 to 0.86, exceeding the recommended threshold of 0.70 (Hair et al., 2019). This confirmed that the instrument was both valid and reliable for measuring trainee teachers' perceptions of TikTok in teaching and learning.

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Data Collection and Analysis

The survey was administered via Google Forms, facilitating efficient distribution and collection of responses. Data analysis was conducted using two complementary approaches:

- Rasch Measurement Analysis: To evaluate item fit, person reliability, and item reliability, ensuring the psychometric soundness of the instrument.
- SPSS (Version 26): For descriptive statistics (mean, standard deviation) and inferential analysis (independent samples t-tests and ANOVA) to identify potential differences based on gender, field of study, and years of study.

Table 1: Sub-constructs and items in Section B

Sub Constructs	Item No.	Total Item
Ease of Use	1,2,3	3
Educational Value	4,5	2
Engagement Potential	6,7,8	3
Content Quality and Relevance	9,10	2
Social Influence	11,12,13	3

Table 2 shows the distribution of items according to the sub-constructs measured in this survey.

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Table 2: Level of TikTok Application among IPGKTI STEM Trainee Teachers in Teaching and Learning Survey Item Distributions

Sub Constructs	Items
Ease of Use	Item 1: I always watch TikTok video content to gain the information needed. Item 2: I follow other TikTok user accounts to expand my social network. Item 3: I can easily navigate through the different features of TikTok.
Engagement Potential	Item 4: I found that TikTok's most interactive features, such as duets and comments, could engage students in STEM learning. Item 5: I view that TikTok could promote creativity in teaching STEM-related topics.
Content Quality and Relevance	Item 6: I assume that interactive content on TikTok could enhance students' learning in STEM. Item 7: I always share most of the educational content of TikTok videos I watch with others. Item 8: I expect TikTok could encourage interactive discussions around STEM topics.
Educational Value	Item 9: I often come across high-quality STEM-related content on TikTok. Item 10: I found that most STEM content on TikTok is relevant to educational needs.
Social Influence	Item 11: I am motivated to use TikTok because other trainee teachers use it effectively. Item 12: I ensure that the TikTok application for teaching STEM is well-accepted among trainee teachers. Item 13: Based on its popularity and societal trends, I am inspired to use TikTok for teaching STEM.

The psychometric characteristics that comprise the validity and reliability of these questionnaires were analysed using the Rasch measurement Model. In the aspect of validity, item polarity analysis, item Fit, Principal Component Analysis (PCA), and item-respondent map (Wright map) were used. In terms of reliability, item and respondent reliability analyses, including the determination of Cronbach's Alpha value and the separation index, are used. To determine the level of perception of STEM trainee teachers based on gender, field of study, and year of study, descriptive statistical analysis was employed. To determine the relationship between the level of perception of STEM trainee teachers on the use of the TikTok application in teaching and learning based on gender, field of study, and year of study, inferential statistical analysis was used. Both descriptive and inferential analyses were conducted using Statistical Package for the Social Sciences (SPSS) version 26.0. Before performing inferential analysis, a data normality test is conducted to determine whether the test is parametric or non-parametric, as this informs the choice of inferential analysis. Table 3 shows the types of analysis used to answer the research questions.

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Table 3: Types of Analysis

Research Questions	Types of analysis
1. What is the perception level of STEM trainee teachers? 2. Is there a significant difference between the level of perception of STEM teachers with: a. Gender b. Field of study c. Year of Study	Descriptive Analysis: Rasch Measurement Model Inferential Analysis: 1. Independent t-test 2. One-way ANOVA

Results And Discussion

Based on Rasch measurement Model analysis, the polarity items for all 13 items showed a positive value of Point Measure Correlation (PTMEA CORR.), indicating that all items can measure the construct of perception Level of TikTok Application (Bambang & Wahyu, 2015). All items showed item polarity, with a PTMEA Corr value ranging from 0.55 to 0.78. Item fit for all items shows the Mean Square MNSQ value from 0.58 to 1.78. Most of the items have an outfit Mean Square MNSQ value in the range of 0.50 to 1.50; however, only two items, I1 and I2, have outfit MNSQ values outside this range. This means that the value of the MNSQ of eleven items follows the measurement requirements (Bond & Fox, 2015). Items I1 and I2 may be ambiguous or multidimensional, which measure different traits from the sub-constructs.

However, the Rasch model required a minimum value of 40% for Raw variance explained by measures and 60% for excellent one-dimensionality. The unexplained variance in the 1st contrast value should not exceed 15% for ideal measurement. Principal Component Analysis (PCA) for this survey yielded values exceeding 40%, with a raw variance explained by measures of 51.8%. The unexplained variance in the 1st contrast, at 9.1%, meets the criteria of the Rasch model requirement. This indicates that the survey has good one-dimensionality (Bond & Fox, 2015). The person reliability for this inventory was 0.88, while item reliability was 0.91. Both person and item reliability exceed 0.70, indicating high reliability and being widely accepted (Bond & Fox, 2015). Internal consistency of Cronbach's Alpha was considered excellent within the range from 0.80 to 0.90. Table 4 shows reliability and separation index values based on the construct of Perception Level of TikTok Application for this survey.

Table 4: Perception Level of TikTok Application

	Separation Index	Reliability
Person	2.71	Cronbach's Alpha: 0.92 Person Reliability: 0.88
Item	3.20	0.91

Table 5 presents the item statistics for the construct *Perception Level of TikTok Application*. The mean value of 0.00 and standard deviation of 0.67 indicate that the distribution of person responses is centered and falls within an acceptable spread, suggesting that the measurement model is well-targeted to the sample. The person logit values ranged from a maximum of 5.57 to a minimum of -3.22, demonstrating a wide spread of participants' perceptions across the

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construct. This indicates that the instrument is capable of distinguishing between individuals with high and low levels of perception regarding TikTok application usage.

Similarly, the item logit values ranged from 1.30 (maximum) to -0.96 (minimum), showing that the difficulty levels of the items are adequately distributed along the perception continuum. This spread ensures that the items can effectively capture varying degrees of perception, from more easily endorsed to more challenging statements. According to Bond and Fox (2015), a good distribution of item logit values strengthens the evidence for construct validity, as it shows that the inventory is able to assess the full range of the latent trait under investigation. In summary, Table 6 demonstrates that the *Perception Level of TikTok Application* inventory not only possesses strong reliability (as shown in Table 5) but also exhibits robust measurement characteristics through the adequate spread of person and item logits. This supports the validity of the instrument in assessing perceptions toward the TikTok application in an educational context.

Table 5: Perception Level of TikTok Application

Item statistics	Perception Level of TikTok Application
Mean	0.00
Standard Deviation	0.67
Person Logit Maximum	5.57
Person Logit Minimum	-3.22
Item Logit Maximum	1.30
Item Logit Minimum	-0.96

Based on Figure 1, item 2, which measures the perception level in expanding social networks using TikTok user accounts, has the highest agreement, and item 7, which measures sharing educational content of TikTok videos with others, has a high level of agreement among IPGKTI STEM teachers' trainees. Next, Items 9, which measures the perception level of searching for high-quality STEM-related content on TikTok, Item 11, which measures motivation for TikTok usage, and Item 3, which measures the perception level of navigating different TikTok features easily, all show a moderate to high level of agreement.

Subsequently, item 10 measures their perception level of the relevant STEM content on TikTok about their educational needs. Item 13 measures the usage of TikTok based on popularity and societal trends for teaching STEM; item 12 measures their acceptance of the TikTok application for teaching STEM, and item 4 measures the perception level of students' engagement in STEM learning from interactive features, with a moderate to low level of agreement.

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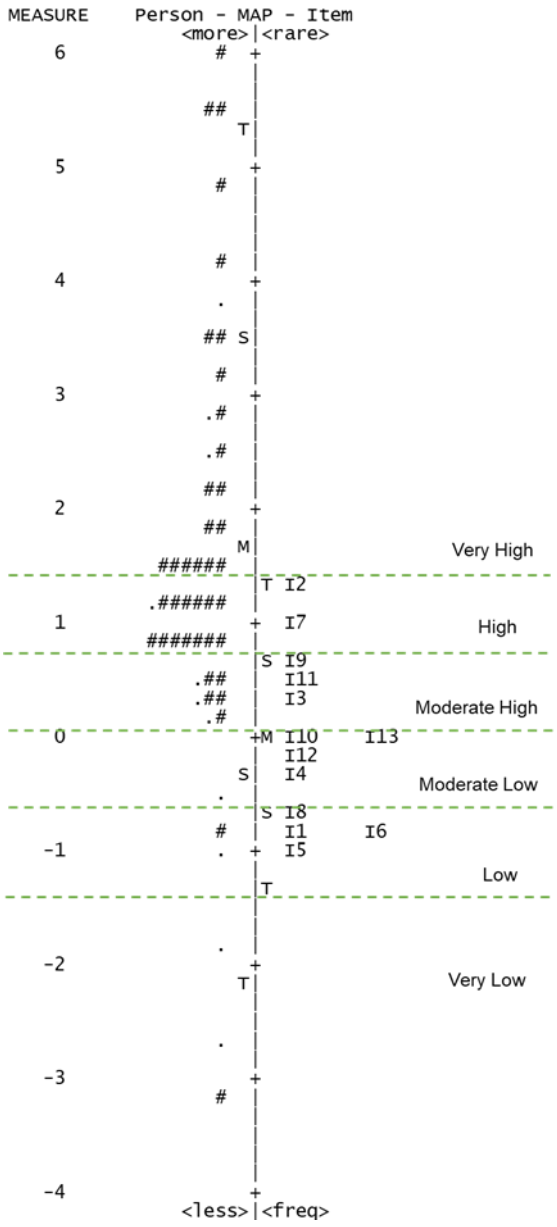

Figure 1: Perception Levels of TikTok Application for STEM Teaching

Moreover, item 5, which measures their perception of TikTok's level of promoting creativity in teaching STEM-related topics, has the lowest level of agreement. Then, item 1 which measures their perception level of TikTok video content to gain the information needed, item 6 which measures their perception level by assuming that interactive content on TikTok could enhance students' learning in STEM and item 8 which measures their perception level by expecting TikTok could encourage interactive discussions around STEM topics on a low level of agreement. Table 6 demonstrates the perception level based on the threshold range from the Wright Map.

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Table 6: Threshold Range of Perception Levels on TikTok Application Based on the Wright Map

Level	Threshold Range	Threshold Range of Perception Level
Very Low	≤ -2 SD	≤ -1.34
Low	-2 SD ≤ L ≤ -1 SD	-1.34 ≤ L ≤ -0.67
Moderate Low	-1 SD ≤ ML ≤ Mean	-0.67 ≤ ML ≤ Mean
Moderate High	Mean ≤ MH ≤ 1 SD	Mean ≤ MH ≤ 0.67
High	1 SD ≤ H ≤ 2 SD	0.67 ≤ H ≤ 1.34
Very High	≥ 2 SD	≥ 1.34

Based on inferential analysis, no significant difference was found in the perception level of the TikTok application among STEM teacher trainees of different genders. According to the analysis, the perception level among female trainee teachers (N = 63, M = 1.60, SD = 1.92) was higher compared to that of male trainee teachers (N = 27, M = 1.59, SD = 1.79). The mean difference in perception level of the TikTok application between male and female trainee teachers was 0.01. An independent sample t-test showed that the difference was not significant, $p = 0.978$, where $p > 0.05$. Therefore, the null hypothesis is accepted.

Based on the findings from the one-way ANOVA analysis, there was no significant difference between the perception level of the TikTok application among the three groups of fields of study: Primary Science Education, Primary Mathematics Education, and Design and Technology. The Bonferroni test showed a p-value of 0.813, where $p > 0.05$. Therefore, the null hypothesis is accepted. In addition, there was no significant difference among the five groups of study duration from PPISMP, 1-year PISMP, 2-year PISMP, 3-year PISMP, and 4-year PISMP. The Bonferroni test showed a p-value of 0.577, where $p > 0.05$. The Tukey post hoc test also indicated no significant difference among the four groups of years of study. Therefore, the null hypothesis is accepted.

Discussion

This study investigated STEM trainee teachers' perceptions of TikTok as a teaching and learning tool, with analysis across gender, field of study, and year of study. Overall, TikTok was perceived positively as a social and networking platform, but scepticism emerged regarding its potential to foster creativity and enhance engagement in STEM education.

The finding that TikTok was valued for networking and resource-sharing aligns with previous studies. Shahin and Amin (2023) similarly reported that educators appreciated TikTok's simplicity for video creation and professional networking but remained unconvinced of its academic credibility. The current study reflects this duality: TikTok is seen as a connector but not yet as a creative or pedagogical enhancer. This suggests that teachers differentiate between TikTok's technological ease of use and its instructional depth, treating it more as a supplementary tool than a core medium for STEM teaching.

One of the most notable findings was the low agreement with TikTok's ability to promote creativity in teaching STEM topics. Several factors may explain this. Pedagogically, many STEM trainee teachers may lack formal training in digital instructional design, which limits their ability to harness TikTok for creative and interactive purposes. Liu (2023) stressed that bridging functional digital skills with instructional design competencies is critical if teachers

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are to transform simple video tools into meaningful learning experiences. Without this scaffolding, TikTok risks being used only for passive content consumption rather than active, creative pedagogy.

From a technological perspective, the short-form video format may constrain the teaching of complex STEM concepts, which often require extended explanations, scaffolding, and problem-solving demonstrations. While Mohottala et al. (2023) and Sajonia (2024) demonstrated that TikTok can translate abstract concepts into visual learning, their findings emphasised the importance of educator expertise in segmenting content effectively. This suggests that the limitations observed in this study are less about TikTok as a platform and more about the capacity of teachers to adapt complex material into microlearning formats.

The relatively low scores on engagement potential (e.g., promoting interactive discussions or enhancing deep learning) also diverge from findings by Escamilla-Fajardo et al. (2021), who found that engagement was higher when TikTok was integrated with collaborative or project-based assignments. This contrast highlights a cultural and pedagogical gap: while international contexts may experiment with integrating TikTok into active learning designs, trainee teachers in this study appear to use it primarily for individual exploration or passive exposure, rather than structured classroom interaction.

Concerns about content quality and academic relevance further explain the scepticism. Moderate agreement levels in this study mirror findings from Rininggayuh et al. (2024) and Syah et al. (2020), who cautioned that unregulated TikTok content lacks academic rigour. Teachers' reluctance, therefore, may be rooted in a legitimate worry that without curated, quality-controlled content, TikTok risks trivialising STEM subjects. Zulkifli et al. (2022) similarly argued that without pedagogical training, educators cannot effectively contextualise TikTok content for classroom use. This reflects a broader issue: TikTok democratises content creation, but without peer-review mechanisms, its educational credibility remains fragile (Roberd & Roslan, 2022). Interestingly, peer influence and societal trends showed moderate to high agreement, suggesting that adoption of TikTok is often driven by social motivation rather than pedagogical rationale. Caballero et al. (2023) noted that teachers may adopt new educational technologies because of peer adoption pressure rather than a clear instructional purpose. This finding has implications: while social acceptance of TikTok is high, it does not necessarily translate into effective or innovative instructional use.

Finally, the absence of significant differences across gender, field of study, and year of study suggests that TikTok perceptions are uniformly distributed across demographics. This reflects the platform's ubiquity and mainstream adoption across user groups, as digital fluency has become a shared cultural norm. However, this homogeneity also suggests that the barriers identified (e.g., limited creativity, concerns about content rigour) are systemic rather than group-specific, pointing to structural gaps in digital pedagogy training within teacher education programs.

In summary, while TikTok is embraced for its ease of use and networking functions, its potential to support creativity, engagement, and academic rigour remains underdeveloped. This gap highlights the need for targeted digital pedagogy training that equips trainee teachers to

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leverage TikTok not only as a social tool but also as a structured, creative, and reliable medium for STEM instruction.

Conclusion

In conclusion, while TikTok is widely accepted as a social and networking tool among STEM trainee teachers, its potential for enhancing creativity in STEM teaching remains underutilised. This highlights a gap in digital pedagogical skills that needs to be addressed to promote the effective integration of innovative teaching tools in future classrooms. Teacher training programs should prioritise providing educators with the knowledge, skills, and support necessary to effectively leverage TikTok for STEM education. This includes training on designing engaging and interactive TikTok content, aligning TikTok content with specific learning objectives, and addressing concerns about content quality and appropriateness. Further research is needed to explore effective strategies for integrating TikTok into STEM education, aiming to foster creativity, enhance student engagement, and promote deeper learning.

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