

Assessing Students' Perceptions of Their Professors' Teaching Competence Through the TPACK Framework

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ABSTRACT

The Technological Pedagogical Content Knowledge (TPACK) framework explains effective teaching with technology as the integrated use of technological, pedagogical, and content knowledge. In higher education, students experience this integration directly, yet evidence based on their evaluations of professors remains comparatively limited, particularly in Malaysian teacher education. This cross-sectional survey investigated how 171 undergraduate pre-service teachers at one Malaysian public university perceived their professors' technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), and integrated TPACK. Using an adapted 25-item instrument, the study found high ratings across all domains: CK was highest ($M = 4.45$, $SD = 0.59$), followed by TPACK ($M = 4.33$, $SD = 0.55$), PK ($M = 4.25$, $SD = 0.62$), and TK ($M = 4.12$, $SD = 0.62$). Lower ratings for troubleshooting and using diverse technologies indicate a specific developmental priority. The findings position student perceptions as a valuable, though indirect, source of evidence for institutional professional development and quality assurance. They support capacity building that connects digital tools with content-specific pedagogy and adaptable teaching practice rather than treating technology training as a stand-alone skill.

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1. INTRODUCTION

Digital technology is now integral to higher education, especially in faculties of education that prepare future teachers. The Technological Pedagogical Content Knowledge (TPACK) framework conceptualises technology-enhanced teaching as an integration of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK), rather than as the simple addition of digital tools to established teaching routines (Mishra & Koehler, 2006; Koehler & Mishra, 2009). This integrated perspective is particularly relevant in teacher education, where professors model the practices which students may later adopt in schools.

In Malaysia, the Higher Education Blueprint emphasises graduates and educators who can participate productively in digitally enabled learning environments (Ministry of Education Malaysia, 2015). However, access to technology does not by itself demonstrate pedagogically meaningful use. Recent work on university-teacher TPACK underscores the need to assess technology-related competence in ways that fit higher education rather than relying uncritically on instruments developed for school settings (Nguyen et al., 2024).

Students are the direct recipients of teaching and can therefore provide evidence about how their professors' knowledge is made visible in learning activities, assessment, explanation, support, and technology use. Their perceptions cannot establish a professor actual competence independently of observation or self-report, but they provide a consequential perspective for quality assurance because they reflect learners' experienced teaching. Understanding this perspective is especially important in teacher education: students' experience of their professors can shape what they regard as credible and achievable technology-enhanced pedagogy in their future practice.

This study investigates pre-service teacher education students' perceptions of their professors' TK, PK, CK, and integrated TPACK in a Faculty of Education at one Malaysian public university. It identifies relative strengths and developmental priorities and contributes student-centred evidence to the discussion of TPACK in higher education.

2. LITERATURE REVIEW

2.1 TPACK and Teaching Competence in Higher Education

TPACK extends Shulman's conception of pedagogical content knowledge by foregrounding the relationships among content, pedagogy, and technology (Mishra & Koehler, 2006). The framework is useful because a professor may be knowledgeable about a subject, teaching strategy, or digital tool in isolation without being able to combine them in ways that advance specific learning goals. In higher education, this distinction matters because teaching contexts, disciplinary practices, class sizes, institutional systems, and students' expectations determine how technology can be used. A recent instrument-development study similarly argues that university-teacher TPACK needs contextualised measurement (Nguyen et al., 2024).

Recent conceptual framework also makes context more explicit in the TPACK model, reinforcing the need to interpret survey results in relation to the institutional and disciplinary conditions in which teaching occurs (Petko et al., 2025).

Current higher-education research continues to treat technology integration as a professional-development issue rather than a purely technical one. For example, a 2025 mixed-methods study of lecturers found that targeted professional development can strengthen awareness and skills for TPACK-informed technology integration (Çer, 2025). These findings reinforce the value of examining domain-specific patterns: a high overall score can conceal an actionable weakness in the adaptive, pedagogically purposeful use of technology.

2.2 Why Students' Perception Matter

Students observe enacted teaching across repeated classes, including the clarity of explanations, responsiveness to misconceptions, assessment practices, and the practical contribution of technology to learning. Their ratings therefore complement, rather than replacing the professors' self-reports and observational evidence. This distinction is important because self-reported knowledge may not fully correspond to enact practice; recent work has specifically questioned the extent to which self-reports alone can provide insight into teachers' technological pedagogical knowledge (Krauskopf et al., 2024).

In teacher education, student perceptions provide a second significance. Pre-service teachers learn not only from explicit course content but also from the pedagogical models enacted by their professors. If students consistently perceive technology as peripheral, fragile, or disconnected from content and pedagogy, this may constrain the instructional models available to them as future teachers. Conversely, evidence of perceived strengths and limitations can help faculties target staff development and triangulate student feedback with other quality-assurance evidence.

2.3 Research Gap and Questions

Although TPACK research is extensive, much of it has focused on teachers' or pre-service teachers' self-reports, school contexts, or broad measures of technology use. There is less student-centred evidence about how teacher educators' TPACK is experienced in Malaysian higher education. The present study addresses this gap by examining the four domains visible to students in one faculty by interpreting the resulting profile alongside local and regional evidence. It asks: (1) How do pre-service teacher as education students perceive their professors' TK, PK, CK, and integrated TPACK? (2) Which specific aspects of each domain are rated relatively higher or lower?

3. METHODOLOGY

3.1 Research Design

This study employed a quantitative, cross-sectional survey design to examine pre-service teachers' perceptions of their professors' technological, pedagogical, content-related, and integrated TPACK competencies. A survey was suitable because the study sought a structured summary of students' evaluations at one point in time; it was not designed to establish causal relationships or directly observe teaching practice.

3.2 Context, Participants, and Sampling

The target population comprised of undergraduate pre-service student teachers enrolled in a Faculty of Education from one of Malaysian public university who had recently completed a research methodology course. Participants were selected purposively because they were education students with experience of university teaching and sufficient familiarity with education-related pedagogical concepts to respond to the instrument. This study did not test or quantify their independent mastery of the TPACK framework; accordingly, the findings are interpreted as perceptions of observed teaching rather than as expert judgments of professors' TPACK. Of the distributed questionnaires, 171 valid responses met the inclusion criteria of enrolment in an education-related undergraduate programme and relevant exposure to professors' teaching in the faculty. Table 1 presents the demographic characteristics of the respondents.

Table 1 Demographic characteristics of respondents

Variable	Category	n	%
Sex	Female	136	79.5
	Male	35	20.5
Age	21-23	115	67.3
	24-26	56	32.7
Major	Biology	4	2.3
	Chemistry	24	14.0
	Physics	29	17.0
	Physical Education and Health	28	16.4
	Teaching English as a Second Language	86	50.3
Admission path	SPM	2	1.2
	STPM	21	12.3
	Matriculation	117	68.4
	Diploma	31	18.1

Note. SPM = Malaysian Certificate of Education; STPM = Malaysian Higher School Certificate.

3.3 Instrument

The survey instrument was adapted from Fauzi and Shah (2022) and informed by the TPACK framework (Mishra & Koehler, 2006) and the TPACK assessment instrument developed by Schmidt et al. (2009). It comprised 25 items across TK (6 items), PK (7 items), CK (6 items), and integrated TPACK (6 items). Responses used a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Table 2 presents the original instrument structure.

Table 2 TPACK instrument domains and items

SN	Knowledge Domains	Schmidt et al. (2009)	
		No. of Items	Cronbach's α
1.	TK: Technology Knowledge	7	0.82
2.	CK: Content Knowledge		
	Mathematics	3	0.85
	Social Studies	3	0.84
	Science	3	0.82
	Literacy	3	0.75
3.	PK: Pedagogical Knowledge	7	0.84
4.	PCK: Pedagogical Content Knowledge	4	0.85
5.	TCK: Technological Content Knowledge	4	0.80
6.	TPK: Technological Pedagogical Knowledge	5	0.86
7.	TPACK: Technological Pedagogical Content Knowledge	8	0.92

3.4 Data Collection, Ethics, and Analysis

Questionnaires were administered physically using physical form. Participants were informed of the study purpose, assured that their responses would remain confidential and anonymous, and provided informed consent before participation. Ethical approval was obtained from the Research Ethics Committee, Faculty of Education, Universiti Teknologi MARA.

Data were analysed using IBM SPSS Statistics version 25. Internal consistency was examined using Cronbach's alpha. Descriptive statistics (means and standard deviations) were used to summarise ratings by item and domain. Although the study protocol allowed for inferential analysis, the results reported here address the descriptive research questions; no group-comparison results are presented.

4. RESULTS

4.1 Internal Consistency

All four constructs demonstrated high internal consistency, with Cronbach's alpha values of at least .89 (Table 3). These values support the use of the adapted instrument for describing the response patterns in this sample.

Table 3 Internal consistency of the TPACK constructs

SN	Knowledge domain	No. of items	Cronbach's α	Consistency/reliability
1.	TK (Schmidt et al., 2009 Section 1)	7	0.90	Excellent
2.	CK (Schmidt et al., 2009 Section 2)	6	0.91	Excellent
3.	PK (Schmidt et al., 2009 Section 3)	8	0.91	Excellent
4.	TPACK (Schmidt et al., 2009 Section 7)	6	0.89	Good
5.	Student achievement	6	0.85	Good

4.2 Technological Knowledge

Students rated professors' TK highly overall ($M = 4.12$, $SD = 0.62$; Table 4). Item means ranged from 3.97 ($SD = 0.82$) for troubleshooting technology to 4.20 ($SD = 0.74$) for knowledge of technology. Ratings related to knowledge, currency, ease of use, and technical capacity were comparatively higher than ratings for troubleshooting and using a variety of technologies.

Table 4 Students' perceptions of professors' technological knowledge

SN	TK Items	Mean (SD)	Remarks
1	Professor knows about a lot of different technologies	4.20 (0.74)	High
2	Professor stays update with important new technologies	4.18 (0.74)	High
3	Professor uses technology easily	4.18 (0.72)	High
4	Professor has the technical skills needed to use technology	4.19 (0.70)	High
5	Professor can fix her/his technical problems when facing any compatibility issues (with operating systems, browsers, etc.)	3.97 (0.82)	High
6	Professor uses different technologies	3.98 (0.83)	High
	Overall Mean	4.12 (0.62)	

4.3 Pedagogical knowledge

Students rated PK highly ($M = 4.25$, $SD = 0.62$; Table 5). Item means ranged from 4.05 ($SD = 0.80$) for knowledge of students' learning styles to 4.44 ($SD = 0.60$) for an instructional-capacity item. Ratings for awareness of students' understanding and misconceptions, assessment skills, and instructional capacity were above the domain mean, whereas ratings for a repertoire of strategies, learning styles, and a range of assessment methods were at or below it.

Table 5 Students' perceptions of professors' pedagogical knowledge

SN	PK Items	Mean (SD)	Remarks
1	Professor uses a wide range of teaching approaches	4.25 (0.71)	High
2	Professor adapts suitable teaching styles to different learners	4.05 (0.80)	High
3	Professor adapts his/her teaching based-upon what students understand and do not understand	4.30 (0.72)	High
4	Professor recognizes student's common understanding and misconceptions	4.31 (0.71)	High
5	Professor knows how to assess students' performance	4.44 (0.60)	High
6	Professor assess students learning in multiple ways	4.16 (0.70)	High
7	Professor knows how to organize and maintain learning process	4.28 (0.67)	High
	Overall mean	4.25 (0.57)	

4.4 Content knowledge

CK was the highest-rated domain ($M = 4.45$, $SD = 0.59$; Table 6). All item means were high, ranging from 4.28 ($SD = 0.71$) to 4.70 ($SD = 0.51$). Perceived sufficiency of subject-matter knowledge and readiness to assist students were the highest-rated aspects.

Table 6 Students' perceptions of professors' content knowledge

SN	CK Items	Mean (SD)	Remark
1	Professor has sufficiently knowledge about the subject matter	4.70 (0.51)	High
2	Professor has various ways and strategies of developing student understanding on oral communication	4.37 (0.65)	High
3	Professor uses an analytical way of thinking in his/her teaching	4.28 (0.71)	High
4	Professor helps students to correctly identify the strategies for effective communication, presentations skills and literacy element.	4.64 (0.93)	High
5	Professor guide students to apply appropriate strategies for effective communication, presentations skills and literacy element	4.37 (0.69)	High
6	Professor provides relevant issues in selected case studies for student evaluate critically	4.36 (0.78)	High
	Overall mean	4.45 (0.59)	High

4.5 Integrated TPACK

The integrated TPACK domain was also rated highly ($M = 4.33$, $SD = 0.55$; Table 7). Items relating to integration of knowledge, technology, and pedagogical skills in teaching and student support were above the domain mean, while the remaining items were approximately equal to or below it.

Table 7 Students' perceptions of professors' integrated TPACK

SN	TPACK Items	Mean (SD)	Remarks
1	Professor teach this course where he/she appropriately combines his/ her knowledge on this course, technologies and teaching approaches	4.55 (0.60)	High
2	Professor chooses technologies that enhance the content of oral communication	4.22 (0.70)	High
3	Professor can use the technologies that he/she selects to supports students learning	4.40 (0.66)	High
4	Professor helps the students to coordinate the use of technologies and teaching	4.34 (0.68)	High
5	Professor knows how to evaluate and select new technologies based on their usefulness to specific goals of content	4.22 (0.76)	High
6	Professor appropriately model combining content, technologies and teaching approaches in his/her teaching	4.27 (0.70)	High
	Overall mean	4.33 (0.55)	

5. DISCUSSION

5.1 A Profile of Strengths and Developmental Priorities

Students perceived professors as strong across all four domains, with CK receiving the highest rating and TK the lowest. This profile is broadly consistent with the local and regional studies reported in Table 8, in which CK was highly rated and TK was relatively lower (Fauzi & Shah, 2022; Ningtyas & Degeng, 2023). The finding should not be interpreted as evidence that professors lack technological competence: the TK mean remained high. Instead, the item-level pattern identifies a relative developmental priority in troubleshooting and using diverse technologies.

Table 8 Comparison with local and regional studies

SN	Domain	Our Study	Fauzi & Shah (2022)	Ningtyas & Degeng (2023)
1	TK	4.12 (0.62)	4.17 (0.47)	3.71 (0.91)
2	PK	4.25 (0.57)	4.19 (0.51)	3.94 (0.93)
3	CK	4.45 (0.59)	4.33 (0.55)	4.28 (0.86)
4	TPACK	4.33 (0.55)	4.31 (0.71)	4.10 (0.90)
	Students	Education	EFL	TED: EFL
	Population	171	29	40
	Cronbach α	> 0.80	NA	-

5.2 Interpreting The Content and Pedagogical Strengths

The strong CK and PK ratings are consistent with the central role of subject expertise and pedagogical responsiveness in teaching. In the present study, students particularly valued professors' subject-matter knowledge, readiness to help, assessment skills, and attention to learners' understanding. These ratings suggest that professional development should preserve and build on established strength rather than treating technology integration as a separate deficit-oriented agenda.

However, the results also caution against assuming that high CK and PK automatically produce transformative technology-enhanced learning. TPACK is concerned with the purposeful relationship among domains. The lower relative TK ratings and the item-level PK results for varied strategies and assessment methods indicate that staff development should help professors connect tools to discipline-specific learning problems, learner diversity, and assessment design. This emphasis is consistent with recent higher-education TPACK research that advocates contextualised measurement and targeted professional learning (Nguyen et al., 2024; Çer, 2025).

5.3 What The Positive TPACK Rating Does and Does Not Show

The high integrated TPACK rating ($M = 4.33$) indicates that students generally perceived professors as able to bring technology, pedagogy, and content together in teaching and student support. This is encouraging in a faculty responsible for preparing future teachers. At the same time, the survey records students' perceptions, not direct observation of pedagogical quality or student learning gains. The result therefore supports a quality-assurance conversation rather than a definitive claim about enacted TPACK competence.

Comparisons with self-report studies should also be made cautiously because participants, settings, instruments, and rating perspectives differ. Table 9 is retained as contextual evidence, not as a direct benchmark. The divergence of self- and other-ratings reinforces the value of triangulating student feedback with classroom observation, professor self-reflection, and evidence of course design.

Table 9 Contextual comparison with self-report TPACK studies

SN	Domain	Xiang & Ning (2023)	Schmid et al. (2021)	Altun & Akyildiz (2017)	Nguyen et al. (2024)	
1	TK	3.53 (0.31)	3.40 (0.99)	3.44 (0.74)	3.78 (0.75)	3.73 (0.63)
2	PK	3.28 (0.54)	3.68 (0.66)	3.73 (0.68)	4.21 (0.50)	4.16 (0.55)
3	CK	3.32 (0.62)	4.20 (0.60)	3.32 (0.55)	4.64 (0.47)	4.53 (0.53)
4	TPACK	2.62 (0.54)	3.56 (0.76)	3.50 (0.64)	3.75 (0.99)	3.68 (0.77)
	Participants	TED: Math	TED	TED	Staff: STEM:	Staff: Arts
	Population	106	173	609	36	50
	Cronbach α	0.812–0.920	0.74 – 0.90	-	0.79 – 0.91	0.79 – 0.91

5.4 Implications, Limitations, and Future Research

For institutional practice, the results support professional-development opportunities focused on adaptive technology use, troubleshooting, varied digital tools, and the alignment of technology with content-specific pedagogy and assessment. Student feedback can inform such initiatives, but it should be combined with other evidence before high-stakes decisions are made.

The study has several limitations. It involved a purposive sample from one faculty at one Malaysian public university, used a cross-sectional self-report survey of student perceptions, and did not independently assess respondents' TPACK knowledge. The results therefore cannot be generalised to all Malaysian higher-education professors and do not establish how TPACK is enacted in classrooms. Future research should employ multi-institutional designs and triangulate student ratings with observations, interviews, course artefacts, and professors' self-reports. It could also examine whether TPACK-informed professional development changes students' learning experiences over time.

6. CONCLUSION

This study provides student-centred evidence that professors from one Malaysian Faculty of Education were perceived as highly competent across TK, PK, CK, and integrated TPACK. CK was the most strongly rated domain, while TK was relatively lower, particularly for troubleshooting and use of diverse technologies. The findings support professional learning that builds from established content and pedagogical strengths toward adaptive, content-specific technology integration. Because the evidence is perceptual and institution-specific, it should be used alongside other sources of teaching-quality evidence. In teacher education, this triangulated approach can help ensure that professors model the integrated pedagogies future teachers need to see and practise.

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9. AUTHORS' CONTRIBUTIONS

Johan @ Eddy Luaran: Conceptualisation, methodology, and writing original draft; Desta Berhe Sbhatu: Formal analysis, data curation, and validation; Melissa Malik: Writing review and editing; Ismail Abdulfatai Olohunfunmi: Resources and project administration.

10. CONFLICT OF INTEREST DECLARATION

The authors agree that this research was conducted in the absence of any self benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders. We certify that the article is the Authors' and Co Authors' original work. The article has not received prior publication and is not under consideration for publication elsewhere. This research/manuscript has not been submitted for publication, nor has it been published in whole or in part elsewhere. We testify to the fact that all Authors have contributed significantly to the work, validity and legitimacy of the data and its interpretation for submission to IJELHE.

11. DATA AVAILABILITY/SUPPLEMENTARY MATERIALS

The findings of this study are available from the corresponding author on request.

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