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# Student-Rated Teacher TPACK and Perceptions of Technology-Enhanced English Language Learning as Predictors of Perceived Learning Outcomes: Evidence from the University of Sargodha, Pakistan

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**ABSTRACT**

Technology-enhanced English language learning (TEELL) is spreading across university classrooms, yet its benefits depend on how teachers combine technology with pedagogy and content. This cross-sectional survey examined how students' ratings of their teachers' Technological Pedagogical Content Knowledge (TPACK) and students' perceptions of TEELL relate to perceived English language learning outcomes. Data came from 303 undergraduates at the University of Sargodha, who completed a questionnaire built on a five-point Likert scale. The TPACK (24 items, α = .937), TEELL (13 items, α = .912) and learning-outcome (10 items, α = .881) scales showed good internal consistency. Pearson correlation and multiple linear regression were used for analysis. All three variables correlated positively and significantly ($r$ = .536 to .774, $p < .001$). In the final model, TEELL perceptions (β = .642, $p < .001$) and TPACK (β = .246, $p < .001$) both predicted perceived outcomes and together explained 64.2% of the variance ($R^2 = .642$, $F(2, 300) = 268.899$, $p < .001$). TEELL perceptions alone explained 59.9%, and adding TPACK raised this by 4.3% ($\Delta R^2 = .043$). Teachers' knowledge matters, but students' perceived outcomes track their own experience of technology in class more closely. Because every measure was self-reported by the same students at one time point, the findings describe associations and not effects. The results bear on teacher education and institutional support in resource-limited universities.

## 1. Introduction

Digital technologies are now routine in university teaching, and the shift to online and blended delivery during the COVID-19 outbreak raised expectations of teachers' digital competence and of institutional readiness (Bozkurt et al., 2020). Access to technology does not guarantee effective learning, though. What counts is what teachers do with it: how they tie it to sound teaching strategies and to the outcomes students are meant to reach (Voogt et al., 2013).

Language learning makes the point sharply. It depends on communication, interaction and practice in listening, speaking, reading and writing. Used with a clear pedagogical purpose, technology can supply authentic input, support collaboration, give timely feedback and open flexible learning spaces. Technology-enhanced English language learning (TEELL) refers to the use

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of digital tools such as learning management systems, multimedia resources and online platforms to support the learning of English. Tseng et al. (2020), reviewing 51 studies of language teachers' TPACK, found that technology was often used within traditional, teacher-centered teaching. The teacher's approach, in other words, decides what TEELL looks like in practice.

The Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) describes the knowledge teachers need for this task. It extends Shulman's (1986) pedagogical content knowledge by adding technology, and it treats the relationships among technology, pedagogy and content as a distinct kind of professional knowledge. A review of 74 TPACK papers reported positive results in strengthening teachers' capacity to integrate ICT (Chai et al., 2013), and interviews with 30 EFL teachers showed that many had strong pedagogical or content knowledge but struggled to integrate technology (Sahnan et al., 2025). Most TPACK instruments, however, rely on teachers' self-report (Schmidt et al., 2009), which can be colored by social desirability and by teachers' view of their own competence.

Students, by contrast, see the technology in use. They can tell whether a teacher uses digital tools to build communication and language skills or only to present content in the old way. What teachers say they do and what students observe may differ, so students' ratings offer a view of TPACK in practice that does not depend on teacher self-report; Tseng (2014) took this route in studying EFL teachers' TPACK. Collecting students' perceptions of TEELL alongside their ratings of teachers' TPACK also makes it possible to ask how the two relate to what students believe they have learned.

Infrastructure and institutional support shape how far technology can be used in Pakistani higher education. Sultana and Imran (2024) listed insufficient technological infrastructure, limited professional development and inadequate administrative support among the barriers facing English teachers in Pakistan. The University of Sargodha is a public university with several undergraduate English language programs and a developing educational technology infrastructure, which makes it a suitable setting for asking how teacher knowledge and student experience relate to learning outcomes. To the author's knowledge, studies that examine teachers' TPACK, students' perceptions of TEELL and perceived English language learning outcomes together remain scarce.

English matters in Pakistan for academic achievement, employment and communication beyond the country (Ahmad, 2020). Institutional conditions can limit how far teachers use new methods: Mansoor et al. (2025), studying differentiated instruction among Pakistani ESL teachers, reported large classes, heavy workloads, limited time and high administrative expectations as obstacles. In such settings it is unclear whether the gains students report from technology-enhanced classes owe more to teachers' knowledge, to the quality of the learning experience, or to both. The answer matters for planning teacher professional development and investment in educational technology.

The research question is therefore this: to what extent do teachers' TPACK, as rated by students, and students' perceptions of TEELL predict students' perceived English language learning outcomes? The study makes three contributions. First, it measures teachers' TPACK through students' perceptions instead of teachers' self-reports. Second, it places teacher knowledge and student experience in the same regression model, so their relative contributions can be compared. Third, it supplies evidence from a public university in Pakistan. The design is cross-sectional, so "predict" and "influence" are used in a statistical sense and do not imply causation.

## 2. Literature Review

### 2.1. TPACK in English Language Teaching

The TPACK framework grows out of Shulman's (1986) argument that making subject matter comprehensible to learners is a distinct kind of professional knowledge. Mishra and Koehler (2006) extended that argument by adding technological knowledge as a third domain and by proposing that technology integration depends on how well technology, content and pedagogy are aligned. The framework has seven related domains: content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK) and integrated TPACK. In English language teaching, CK covers grammar, vocabulary, linguistics and the language skills; PK covers approaches such as communicative language teaching and task-based learning; and TK covers tools such as learning management systems and multimedia. Schmidt et al. (2009) turned the seven domains into a self-report instrument that measures each one separately.

Work on language teaching has followed the same path. Bostancıoğlu and Handley (2018) developed and validated a TPACK questionnaire for teachers of English as a foreign language (EFL), an instrument built for language teaching and not for technology use in general. Tseng et al. (2020) reviewed 51 studies of language teachers' TPACK published between 2011 and 2019. Teachers' technology use was often dominated by traditional, teacher-centered teaching, and respondents had difficulty telling the seven sub-domains apart even when survey items were contextualized. Hubbard (2008) argued that training in computer-assisted language learning belongs in language teacher education.

TPACK research has also been used to identify teachers' strengths and weaknesses. A recurring pattern is that teachers' content and pedagogical knowledge exceed their technological knowledge and integrated TPACK. Abubakir and Alshaboul (2023), for instance, surveyed 182 EFL teachers in Qatar and found content knowledge to be the strongest domain and integrated TPACK the weakest; teachers who had received professional development scored higher. Sahnan et al. (2025) reported a similar imbalance in their interviews. A student-based measure of TPACK can show whether the same imbalance appears in students' perceptions and whether it is related to their reported learning outcomes.

### 2.2. Teacher TPACK and Learning with Technology

Teachers' integrated knowledge sits at the center of the research on successful technology use. Voogt et al. (2013), in a review of 55 peer-reviewed articles, described TPACK as resting on a careful alignment of content, pedagogy and the potential of technology. They also found that teachers' knowledge and beliefs about pedagogy and technology are intertwined, and that both shape whether a teacher decides to teach with technology. Chai et al. (2013) presented TPACK as a corrective to teacher education programs that treat technology apart from subject matter and pedagogy. Tondeur et al. (2017), reviewing qualitative studies, reached a related conclusion about the link between teachers' pedagogical beliefs and their technology use.

In English language teaching the same point holds: technology helps most when it serves a definite learning purpose. When digital tools merely deliver content as a traditional lesson would, the teacher stays at the center of the class, which is the pattern Tseng et al. (2020) found to be dominant in the studies they reviewed. The teacher's pedagogical orientation therefore shapes how students experience technology in the classroom.

Findings from English language settings add several challenges. Abubakir and Alshaboul (2023) found that EFL teachers in Qatar rated their content knowledge highest and integrated TPACK lowest. Saeed and Rasul (2023) surveyed 48 faculty members at four universities in Lahore, Pakistan, and recommended professional development and stronger infrastructure, since teachers who knew their subject well often lacked the pedagogical and technological skills to use ICT effectively. Mansoor et al. (2025) described large classes, limited time, heavy workloads and high administrative expectations as constraints on Pakistani ESL teachers' use of differentiated instruction, and Sultana and Imran (2024) reported that outdated materials, limited professional development, inadequate administrative support and insufficient technological infrastructure impede English teaching in Pakistan.

Two limits of this literature matter here. First, many TPACK scales are teacher self-reports (Schmidt et al., 2009), which capture perceived competence and not what happens in class. Second, attention falls on teachers' technological competence, while students, who experience technology-enhanced teaching directly, are seldom asked. Tseng (2014) took a different route by asking students to rate EFL teachers' TPACK, and the present study follows that route.

A third limit is contextual. Reports from Pakistan describe insufficient technological infrastructure and limited institutional support (Saeed & Rasul, 2023; Sultana & Imran, 2024), so teacher knowledge may reach students unevenly. Teacher competence matters, but it cannot by itself overcome systemic constraints. TPACK should therefore be examined alongside students' own experience of technology-enhanced learning in specific institutional settings.

### 2.3. Students' Perceptions and Perceived Learning Outcomes

Teacher knowledge describes what teachers bring to the classroom; it does not directly describe how students experience technology-enhanced teaching. A learner-centered account is offered by the Technology Acceptance Model (TAM; Davis, 1989), which holds that perceived usefulness and perceived ease of use shape technology acceptance. Tafazoli et al. (2018) compared the attitudes of English language students toward computer-assisted language learning across cultures, and Maican and Cocoradă (2021) studied university students' behaviors, emotions and perceptions in online foreign language learning during the COVID-19 pandemic and discussed what their results mean for the teacher-student relationship online.

Evidence on outcomes is generally positive. Yunita (2023) meta-analyzed eight studies and concluded that online learning had a positive effect on English language education during the COVID-19 pandemic. Perceptions are conditional, however. Mahyoob (2020), surveying 184 EFL learners in Saudi Arabia, found that technical, academic and communication challenges affected online learning and that most learners were dissatisfied with continuing it. These findings suggest that the classroom experience of technology matters for students' perceptions of outcomes, and that this experience depends on teachers' practice and on classroom conditions.

Learner-side work also suggests that perceptions concern more than the technology itself. Students' engagement and emotional investment plausibly depend on whether technology is seen as helping them reach communicative goals or as getting in the way (Maican & Cocoradă, 2021; Tafazoli et al., 2018). That distinction is built into the outcome measure used here. Perceived outcomes cover perceived gains in language skills, confidence and participation, and overall improvement, all of which are likely to be tied to how useful and manageable students find technology-supported activities.

### 2.4. The Present Study

The literature offers two explanations of perceived learning outcomes: a teacher-side explanation (TPACK) and a learner-side explanation (students' perceptions of TEELL). The two are probably linked, since teachers' purposeful choice of tools and activities shapes the learning experiences that students later evaluate. One way to picture the link treats TPACK as an antecedent and the classroom TEELL experience as its product. This study does not test mediation. It examines the joint and relative contributions of the two predictors. Both were expected to relate positively to perceived outcomes. Which would predict more was left as an empirical question, because students tend to judge instruction by what they experience.

## 3. Methodology

### 3.1. Research Design

The study used a quantitative, deductive design within a positivist orientation. A cross-sectional survey captured students' perceptions of teachers' TPACK, their perceptions of TEELL and their perceived learning outcomes at a single point in time (Creswell & Creswell, 2023; Setia, 2016; Wang & Cheng, 2020). No intervention was introduced, no variable was manipulated and participants were not randomly assigned to groups, so the study examines relationships as they occur in the natural educational setting.

A quantitative design suited the study because it concerns predefined constructs and the statistical relationships among them, not participants' subjective experiences as such (Creswell & Creswell, 2023). The deductive logic began with relationships expected from the TPACK model and earlier studies, which were then tested against survey data. Every participant answered the same questionnaire, which supports comparability across the sample (Wang & Cheng, 2020). Each participant was surveyed once. The study therefore cannot say whether students' perceptions or teachers' TPACK change over time, and a longitudinal design was not used.

### 3.2. Participants and Sampling

The target population was undergraduate students at the University of Sargodha who had first-hand experience of learning English with technology. Purposive sampling was used so that participants would have direct experience of TEELL (Campbell et al., 2020). Four hundred (400) responses were received. After screening for completeness and consistency, 303 valid responses were retained for analysis, none with missing data. Participants came from 10 academic programs: BS English (31.7%), Human Dietetics and Nutrition (16.8%), BS Linguistics (10.9%), Software Engineering, BSCS, Mass Communication, Food Science, Islamic Studies, BS IT and BBA. To be included, students had to be current undergraduates who had taken English language courses in which technology was used. Participation was voluntary, and all eligible students who volunteered took part. Table 1 shows the distribution of gender and year of study.

Purposive sampling suits studies in which participants are chosen for the information they can provide and not as a statistical sample of a larger population (Campbell et al., 2020). It fit the aim here, which concerns students' first-hand experience of technology in English classes. The questionnaire was administered in class during English language lessons, which ensured that respondents had that experience. Including a range of programs was meant to capture a variety of learning experiences within one institution.

**Table 1: Gender and Year of Study of Participants (N = 303)**

| Characteristic | Category | n | % |
|---|---|---|---|
| Gender | Female | 232 | 76.6 |
| | Male | 71 | 23.4 |
| Year of study | Second year | 250 | 82.5 |
| | First year | 53 | 17.5 |

Second-year students formed the majority of the sample (82.5%). Because they had been exposed to technology-supported English learning for longer, they may be better placed to judge their learning experience, their teachers' TPACK and their perceived outcomes. The results may therefore reflect second-year views more than first-year views.

### 3.3. Instrument

A structured questionnaire was developed by the researcher from earlier TPACK and TEELL studies, the TPACK model (Mishra & Koehler, 2006) and the student-perception approach of Tseng (2014). Items were rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), a format widely used in educational research to measure attitudes and perceptions

(Joshi et al., 2015). The research supervisor reviewed the draft questionnaire for content validity and clarity, and revisions were made before the final version was used (Taherdoost, 2016). Internal consistency was assessed with Cronbach's alpha for each scale (Table 2).

Three scales entered the analysis. The first measured students' perceptions of their teachers' TPACK across the seven TPACK domains (24 items). The second measured students' perceptions of TEELL (13 items) in two subscales: interaction, collaboration and engagement (6 items), and skill practice, comprehension, flexibility and learner autonomy (7 items). An example item is "Using digital tools makes me more motivated to learn English." The third scale measured perceived English language learning outcomes (10 items) in three dimensions: language skills development (4 items), confidence and participation (3 items) and overall perceived improvement (3 items). An example is "Digital feedback has helped me to develop my skills in English writing." The questionnaire also contained demographic items and items on institutional support, which are not analyzed in this article.

Teachers' TPACK was scored from students' ratings, because the aim was to capture teaching practice as students observe it and not teachers' own assessment of their competence. The TPACK scale contained items for each domain: technological knowledge (four items), content knowledge (three), pedagogical knowledge (three), technological content knowledge (three), technological pedagogical knowledge (three), pedagogical content knowledge (three) and integrated TPACK (five). Integrated TPACK items asked, for instance, whether technology helped achieve the goals of the lesson and whether it supported meaningful learning tasks instead of simply delivering content. The TEELL and outcome scales were built to separate how students felt about the learning experience (interaction, collaboration, engagement, skill practice, flexibility and autonomy) from how they felt about their own language skills, confidence and overall improvement.

**Table 2: Internal Consistency of the Scales Used in the Analysis**

| Scale | Number of items | Cronbach's α |
|---|---|---|
| Teachers' TPACK (seven domains) | 24 | .937 |
| Students' perceptions of TEELL | 13 | .912 |
| Perceived English language learning outcomes | 10 | .881 |

### 3.4. Data Collection Procedure

Permission was obtained from the relevant academic departments and course instructors before the questionnaire was administered. It was delivered through Google Forms during a scheduled English language class, which helped keep missing answers to a minimum, and it took about 15 minutes to complete. Responses were downloaded into Microsoft Excel, imported into IBM SPSS Statistics and checked against the original file before analysis.

No study variable had missing values, so imputation was not needed. Participation was voluntary.

### 3.5. Data Analysis

Analyses were run in IBM SPSS Statistics. Scale scores were computed as mean item scores on the original 1-5 metric for teachers' TPACK, TEELL perceptions and perceived learning outcomes. Pearson product-moment correlations described the direction and strength of the relationships among the three variables (Schober et al., 2018). Simple linear regression then tested whether TEELL perceptions predicted perceived outcomes, and multiple linear regression assessed the separate and combined contributions of TPACK and TEELL perceptions. Models were interpreted through $R^2$, adjusted $R^2$, the F statistic and standardized coefficients (β) (Mweshi & Muhyila, 2024). Statistical significance was set at $p < .05$, and $p < .001$ is reported where it applies.

Simple regression came first, to establish how well TEELL perceptions predict perceived outcomes. Multiple regression then tested whether TPACK made a significant contribution once TEELL perceptions were controlled, and which predictor carried more weight. With the models entered sequentially, the increase in explained variance ($\Delta R^2$) shows the incremental contribution of teachers' TPACK. Multicollinearity was checked from the correlation between the two predictors ($r = .536$), which gives a tolerance of .71 and a variance inflation factor of 1.40, well within conventional limits (Tabachnick & Fidell, 2019).

## 4. Results

### 4.1. Descriptive Context

Table 3 reports the mean rating of each dimension of the three scales, as context for the inferential results. Students rated teachers' TPACK as moderate overall ($M$ = 3.31, $SD$ = 0.89), and perceived improvement in learning was rated positively ($M$ = 3.65, $SD$ = 0.89). Among the seven TPACK domains, content knowledge was rated highest ($M$ = 3.53) and technological knowledge lowest ($M$ = 3.07). Both TEELL dimensions ($M$ = 3.55 and 3.66) and all three outcome dimensions ($M$ = 3.53 to 3.65) fell in the moderate-to-positive range.

**Table 3: Mean Ratings for the Dimensions of the Three Scales (N = 303)**

| Scale | Dimension | M | SD |
|---|---|---|---|
| Teachers' TPACK | Content knowledge (CK) | 3.53 | 0.95 |
| | Pedagogical knowledge (PK) | 3.41 | 0.91 |
| | Technological knowledge (TK) | 3.07 | 0.99 |
| | Technological pedagogical knowledge (TPK) | 3.32 | 0.96 |
| | Technological content knowledge (TCK) | 3.30 | 0.94 |
| | Pedagogical content knowledge (PCK) | 3.41 | 0.91 |
| | Integrated TPACK | 3.39 | 0.93 |
| TEELL perceptions | Interaction, collaboration, and engagement | 3.55 | 0.88 |
| | Skill practice, comprehension, flexibility, and learner autonomy | 3.66 | 0.85 |
| Perceived outcomes | Language skills development | 3.54 | 0.92 |
| | Confidence and participation | 3.53 | 0.90 |
| | Overall perceived improvement | 3.65 | 0.89 |

*Note.* Means and standard deviations are those reported for each dimension on the five-point scale. The regression analyses used scale scores for TPACK, TEELL perceptions, and perceived outcomes.

### 4.2. Correlations among TPACK, TEELL Perceptions, and Perceived Outcomes

Table 4 presents the Pearson correlations. All three were positive and statistically significant ($p$ < .001). Teachers' TPACK correlated moderately to strongly with perceived outcomes ($r$ = .590), sharing 34.8% of their variance ($r^2$ = .348). TPACK also correlated positively with TEELL perceptions ($r$ = .536, $r^2$ = .287): students who rated their teachers' TPACK highly also perceived TEELL more positively. The strongest correlation was between TEELL perceptions and perceived outcomes ($r$ = .774, $r^2$ = .599), so students who perceived TEELL positively also reported greater learning gains.

**Table 4: Pearson Correlations among Teachers' TPACK, TEELL Perceptions, and Perceived Learning Outcomes (N = 303)**

| Variable | 1 | 2 | 3 |
|---|---|---|---|
| 1. Teachers' TPACK | — | | |
| 2. TEELL perceptions | .536 | — | |
| 3. Perceived outcomes | .590 | .774 | — |

*Note.* p < .001 (two-tailed).

### 4.3. Regression Analyses

Two regression models were estimated with perceived learning outcomes as the dependent variable. Model 1 contained TEELL perceptions only, and Model 2 added teachers' TPACK. Tables 5, 6 and 7 give the model summaries, the analyses of variance and the coefficients. **Model 1: TEELL perceptions.** The model was statistically significant, $F(1, 301) = 449.185$, $p$ < .001, and explained 59.9% of the variance in perceived outcomes ($R^2$ = .599, adjusted $R^2$ = .597). TEELL perceptions were a significant

predictor ($B$ = .806, $SE$ = .038, β = .774, $t$ = 21.194, $p$ < .001). The near-identical $R^2$ and adjusted $R^2$ indicate that the estimate is stable.

**Table 5: Model Summaries for the Regression of Perceived Learning Outcomes (N = 303)**

| Model | Predictors | R | $R^2$ | Adj. $R^2$ | SE | F (df) | p |
|---|---|---|---|---|---|---|---|
| 1 | TEELL perceptions | .774 | .599 | .597 | .39980 | 449.185 (1, 301) | < .001 |
| 2 | TEELL perceptions, Teachers' TPACK | .801 | .642 | .640 | .37832 | 268.899 (2, 300) | < .001 |

*Note.* Dependent variable: perceived learning outcomes. SE = standard error of the estimate. $\Delta R^2$ from Model 1 to Model 2 = .043.

**Model 2: TEELL perceptions and TPACK.** Adding teachers' TPACK produced a significant model, $F(2, 300) = 268.899$, $p$ < .001. The two predictors together accounted for 64.2% of the variance in perceived outcomes ($R$ = .801, $R^2$ = .642, adjusted $R^2$ = .640). Explained variance rose by 4.3% ($\Delta R^2$ = .043, $\Delta F(1, 300) = 36.16$, $p$ < .001; Cohen's $f^2$ = .12, a small-to-medium effect by the benchmarks in Cohen, 1988), and the standard error of the estimate fell from .39980 to .37832. Table 6 gives the analysis of variance for both models. In Model 1, the total variance in perceived outcomes (SS = 119.912) divided into explained variance (regression SS = 71.799) and unexplained variance (residual SS = 48.113). In Model 2, the explained part rose to 76.973 and the residual fell to 42.938. The lower residual mean square in Model 2 (.143, against .160 in Model 1) shows that it fitted the data better.

**Table 6: Analysis of Variance for the Regression Models (N = 303)**

| Model | Source | SS | df | MS | F | p |
|---|---|---|---|---|---|---|
| 1 | Regression | 71.799 | 1 | 71.799 | 449.185 | < .001 |
| | Residual | 48.113 | 301 | .160 | | |
| | Total | 119.912 | 302 | | | |
| 2 | Regression | 76.973 | 2 | 38.487 | 268.899 | < .001 |
| | Residual | 42.938 | 300 | .143 | | |
| | Total | 119.912 | 302 | | | |

*Note.* Dependent variable: perceived learning outcomes. Model 1 predictor: TEELL perceptions. Model 2 predictors: TEELL perceptions and teachers' TPACK.

**Table 7: Regression Coefficients for Predicting Perceived Learning Outcomes (N = 303)**

| Model | Variable | B | SE | β | t | p |
|---|---|---|---|---|---|---|
| 1 | (Constant) | .664 | .139 | — | 4.771 | < .001 |
| | TEELL perceptions | .806 | .038 | .774 | 21.194 | < .001 |
| 2 | (Constant) | .302 | .145 | — | 2.087 | .038 |
| | TEELL perceptions | .669 | .043 | .642 | 15.693 | < .001 |
| | Teachers' TPACK | .257 | .043 | .246 | 6.013 | < .001 |

*Note.* Dependent variable: perceived learning outcomes.

Both predictors were significant in Model 2, so each contributed uniquely. TEELL perceptions (β = .642, $t$ = 15.693, $p$ < .001) were the stronger predictor; their standardized coefficient was about 2.6 times that of TPACK (β = .246, $t$ = 6.013, $p$ < .001). With TPACK held constant, a one-unit increase in TEELL perceptions went with a .669-unit increase in perceived outcomes. With TEELL perceptions held constant, a one-unit increase in TPACK went with a .257-unit increase. The unstandardized coefficient for TEELL perceptions fell from .806 in Model 1 to .669 in Model 2, which shows that the two predictors share variance. The intercept ($B$ = .302, $SE$ = .145, $t$ = 2.087, $p$ = .038) is statistically significant but has no practical meaning, since a score of zero lies outside the range of the scale.

The correlations allow the unique and shared contributions to be separated. TEELL perceptions alone accounted for .294 of the variance in perceived outcomes beyond TPACK ($R^2$ of .642 minus $r^2$ of .348), TPACK alone accounted for .043, and the remaining .305 was shared by the two predictors.

The final regression equation is:

**Outcome = 0.302 + 0.669 (TEELL) + 0.257 (TPACK)**

The equation shows what the coefficients mean in practice. In Model 1, a student with a TEELL score of 3.5 would be predicted to have an outcome score of 3.485 (0.664 + 0.806 × 3.5). In Model 2, a student with a TEELL score of 3.5 and a TPACK score of 3.2 would be predicted to have an outcome score of 3.466 (0.302 + 0.669 × 3.5 + 0.257 × 3.2). Predicted outcomes rise with TEELL perceptions and, to a lesser extent, with TPACK. In sum, teachers' TPACK and students' perceptions of TEELL both contributed to the variance in students' perceived outcomes; TEELL perceptions were the stronger predictor, and TPACK added a smaller but significant amount.

## 5. Discussion

This study asked how far teachers' TPACK, rated by students, and students' perceptions of TEELL predict undergraduates' perceptions of their English language learning outcomes. Both matter, but not equally. Together they explained 64.2% of the variance in perceived outcomes, a substantial share for a model with two predictors. TEELL perceptions were the stronger predictor (β = .642), and teachers' TPACK added a smaller but significant contribution (β = .246).

### 5.1. Why TEELL Perceptions Predicted Outcomes Most Strongly

Two readings of the stronger effect of TEELL perceptions are possible, and they support each other. The classroom is where students form their view of their learning, and students judge that learning mainly by what they experience there. The TEELL scale captures those experiences: more interesting lessons, higher motivation, better collaboration, opportunities to speak and write, access to authentic materials and flexible, self-paced study. They are where technology integration becomes real for learners. The reading fits the Technology Acceptance Model (Davis, 1989), which gives perceived usefulness a central place in acceptance, and it is compatible with the attention that Tafazoli et al. (2018) paid to students' attitudes toward technology in English classes and that Maican and Cocoradă (2021) paid to their emotions in online language learning. It also accords with Tseng's (2014) decision to use students' perceptions as the source of data on teachers' TPACK.

The size of the coefficient calls for caution. The correlation of $r$ = .774 comes from two scales completed by the same students at the same time, and both ask students to rate the benefits that technology brings to their English classes. Part of the association may reflect a shared evaluative orientation, a general tendency to answer positively or negatively, and part a genuine link between experience and outcome. The coefficient shows how closely perceived experience tracks perceived gains; it does not measure how much of the gain the experience caused.

### 5.2. Independent Contribution of Teachers' TPACK

TPACK remained a significant predictor after TEELL perceptions were accounted for, and it raised explained variance by 4.3%. The result accords with the central claim of the TPACK framework (Mishra & Koehler, 2006), that effective technology use rests on the relationships among technology, pedagogy and content. It also fits Voogt et al.'s (2013) finding that teachers' knowledge and beliefs about pedagogy and technology together shape whether they teach with technology, and Tondeur et al.'s (2017) review linking pedagogical beliefs with technology use. In English teaching, Abubakir and Alshaboul (2023) found that EFL teachers who had received professional development scored higher on TPACK, which suggests one route by which knowledge could reach classroom practice.

The unique contribution of TPACK beyond TEELL perceptions supports the argument that technology integration depends on combined knowledge and not on tools alone. A composite measure of integrated knowledge would be expected to affect outcomes through the quality of the learning activities teachers design, and the coefficient here (β = .246) is in line with that expectation. The present data cannot show which domains matter most, because the seven TPACK domains were combined in one score. Tseng et al. (2020) reported that respondents often struggle to tell the sub-domains apart, so a composite score is a reasonable choice for this design, but it cannot be used diagnostically.

The contribution of TPACK is modest next to that of TEELL perceptions, for two reasons. First, the two predictors are moderately correlated ($r$ = .536), and most of what TPACK explains is shared with TEELL perceptions: TPACK alone accounts for .348 of the variance in perceived outcomes, but only .043 of that is unique to it. The pattern is consistent with the view that part of teachers' influence reaches students through the learning experiences teachers create, although the cross-sectional design cannot test that pathway. Second, TPACK was measured through students' perceptions. Students may see more of the classroom effect of teachers' knowledge than of the knowledge itself, so the specific contribution of TPACK may be underestimated.

The outcome measure also shapes the interpretation. Perceived outcomes record what students think they have achieved, which probably reflects what they experienced in class as much as what their teachers know. That favors experience-based predictors. Whether teachers' TPACK is related to objective language achievement is an empirical question that this design cannot address.

### 5.3. The Pakistani University Context

The descriptive pattern gives some context. Students rated their teachers' technological knowledge ($M$ = 3.07, $SD$ = 0.99) lower than their content knowledge ($M$ = 3.53, $SD$ = 0.95) and pedagogical knowledge ($M$ = 3.41, $SD$ = 0.91), which matches the imbalance reported elsewhere (Abubakir & Alshaboul, 2023; Sahnan et al., 2025). Even so, perceived learning outcomes were positive ($M$ = 3.65, $SD$ = 0.89). One possible explanation is that purposeful use of the technology available can offset some limits in infrastructure and in teachers' technical skill, in line with the TPACK emphasis on aligning technology with pedagogy and content (Voogt et al., 2013). The explanation is tentative: infrastructure and institutional support were not included in the regression models, and later studies should test them directly.

A second reading concerns context. If students' experience of technology-supported learning is the strongest correlate of perceived outcomes, efforts to strengthen teachers' TPACK pay off to the extent that they improve that experience, meaning engagement, interaction, practice and autonomy in class. Studies from Pakistan point to working conditions, including infrastructure and administrative support, as the factors that decide whether teachers can turn knowledge into learning opportunities (Saeed & Rasul, 2023; Sultana & Imran, 2024). Mahyoob (2020) found that technical and communication problems accompanied dissatisfaction with online learning among EFL students in Saudi Arabia, so students' attitudes toward TEELL may reflect their teachers' working environment as well as their teachers' knowledge.

### 5.4. Theoretical Contribution

The findings show the value of combining a teacher-side view (TPACK) with a learner-side view (perceptions of technology) when explaining learning outcomes in technology-enhanced classrooms. TPACK describes what teachers bring to technology integration, and students' perceptions describe how that integration is received. Using students as informants on teachers' TPACK also responds to the concern that self-reported TPACK may not match classroom practice (Tseng, 2014), and it extends this line of work to a public university in a developing country.

The study also makes a methodological point. Collecting students' ratings of TPACK and students' own perceptions of TEELL in the same survey allows teacher-centered constructs to be studied with student data. The two predictors have strong but distinct effects, which suggests that they measure different but related aspects of teaching and learning English with technology, and that either one alone would give only a partial account.

## 6. Implications

- **For teachers.** Effective TEELL does not depend on sophisticated technology. It depends on purposeful pedagogical planning. The areas students rated highest (interaction, skill practice and learner autonomy) can be supported with tools teachers already have, such as smartphones, free applications and authentic online materials. Teachers should also prepare fallback options for times when the internet connection fails.
- **For universities.** Professional development should help teachers build integrated TPACK and should not treat technology use as an end in itself; it should give particular attention to technological knowledge, which students rated lowest of the domains. Universities should also direct teachers to the digital resources already available to them, encourage pedagogically sound use of those resources and monitor TEELL regularly.

Because TEELL experience explained more of the variance in perceived outcomes, universities should also track students' experience of technology in English classes through short, regular surveys and not rely only on indicators of technology provision. Such feedback can show where technology helps students most and where it helps least, and it can guide professional development and resource allocation.

- **For policy and curriculum design.** Sustained professional development and technology investment should be treated as conditions for implementing TEELL, and approaches suited to local conditions should be preferred to uniform requirements. English language programs should integrate technology deliberately, and evaluation of that integration should look at the pedagogical value of the technology and not at how much of it is used.
- **For research.** Students' perceptions of teachers' TPACK offer a practical complement to teacher self-report, especially where classroom observation is hard to arrange. Future studies could combine both sources and compare them.

## 7. Limitations and Future Research

Several limits apply. The cross-sectional design rules out causal inference; the results describe associations, and the study did not test whether TEELL experience mediates the link between TPACK and outcomes. Learning outcomes were measured through students' perceptions, not through proficiency tests or achievement scores. All three measures came from the same participants at the same time, which may have inflated the relationships, particularly between TEELL perceptions and outcomes. Students rated teachers' TPACK, and students may not observe all of the knowledge their teachers hold. The sample was purposive and drawn from one public university, and most participants were second-year students (82.5%) and women (76.6%), which limits generalization. Teacher attributes such as experience, professional development and subject specialization were not examined. The factor structure of the three scales is not reported here, and checks of regression assumptions other than multicollinearity (normality of residuals, homoscedasticity and influential cases) are not reported either; both should be included in later work.

Mixed-methods designs (interviews or classroom observation alongside surveys) and longitudinal designs that follow changes in students' perceptions and teachers' TPACK would add depth. Studies should also include objective measures of English proficiency, so that perceived and measured outcomes can be compared. Models that add teacher-level and institutional conditions, such as infrastructure, internet access and administrative support, would address the contextual factors raised in this paper. Structural equation modeling could test whether TEELL experience mediates the effect of TPACK, and comparisons between public and private universities or across regions of Pakistan would strengthen generalizability. Subgroup analyses by gender, discipline, year of study and digital literacy could show for whom, and under what conditions, TEELL works.

Because of the strong correlation between TEELL perceptions and perceived outcomes, future work should also separate the two sources of data more sharply, for example by collecting outcome data from a different source or at a different time. Replication at other universities would show whether the relative size of the TPACK and TEELL coefficients found here is specific to this setting or holds more widely.

## 8. Conclusion

This study examined how teachers' TPACK, as rated by 303 undergraduates at the University of Sargodha, and students' perceptions of TEELL relate to perceived English language learning outcomes. Both were significant positive predictors, and together they explained 64.2% of the variance. TEELL perceptions were the stronger predictor ($\beta = .642$), and TPACK added an independent and significant contribution ($\beta = .246$; 4.3% of explained variance). Teacher knowledge matters, but students' sense of what they learned follows their experience of technology-supported learning more closely. Universities that want to improve English language learning with technology therefore need to develop teachers' TPACK and to improve the learning experiences that this knowledge is meant to produce.

The study adds evidence from a public university in Pakistan, where research combining teacher knowledge, learner experience and perceived outcomes has been limited. Its main message is that the quality of students' technology-supported learning experience tracks their ratings of learning outcomes very closely, and that teachers' TPACK adds to the prediction beyond that experience. The results rest on students' perceptions at one university and must be read within the limits set out above, but they offer a clear empirical starting point for work on the pathways that link teacher knowledge, classroom experience and learning outcomes.

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