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ELTs Beliefs and Attitude as Agents of TPACK Integration: Evidence from a PLS-SEM Study

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Abstract

The swift evolution of technology has profoundly influenced educational practices, prompting teachers to incorporate various digital technologies into their instructional environments. This technological shift has not only altered teaching techniques but also reshaped the teachers' pedagogical beliefs. Hence, the current research explored the Technology Pedagogy and Content Knowledge (TPACK) competencies of English language educators within the Pakistani academic context to examine whether their pedagogical beliefs and attitudes influence them. Particularly, this study emphasised on ESL teachers' TPACK practices vis-à-vis their constructivist and transmissive pedagogical beliefs and attitudes. It employed a cross-sectional quantitative design where the participants included Pakistani ESL teachers (N = 80) from several universities in Karachi, Pakistan. The questionnaire contained 51 questions and is categorized into three sections: teachers' beliefs, attitudes, and TPACK practices. It was administered online through Google Forms. To analyse the data, PLS-SEM was utilised. The results revealed the strong multicolinearity between dependent (attitude and beliefs: constructivist and transmissive pedagogical) and independent variables (TPACK). The attitude and constructivist pedagogical beliefs have a significant impact while transmissive pedagogical beliefs has an insignificant and negative impact on TPACK. The study findings suggest that teachers' attitudes and constructivist pedagogical beliefs positively impact (27.7%) TPACK practices but transmissive beliefs negatively impact (-14.7%) teaching methods indicating higher the traditional beliefs lower the TPACK practices. Also, the findings have shown importance for stakeholders who want to improve language teaching methodology, effectiveness of the classroom teaching, and redesign course-related technology integration.

Keywords: language teaching, PLS-SEM, teacher attitude, teacher beliefs, TPACK

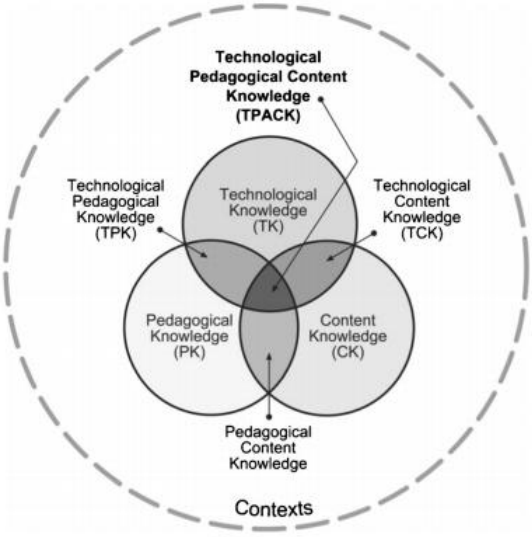
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Introduction

Background of the study

Since the advent of technology, Information Communication Technology (ICT) has progressively permeated virtually every domain of human activity, with education being no exception (Kapur, 2019). Moreover, ICT serves as a primary driver of sweeping transformation, reshaping how people work, retrieve and store knowledge, conduct scientific inquiry, and engage in educational processes. Many researchers have emphasised the meaningful and productive deployment of technological tools within educational settings (Rodrigues et al., 2003; Rogers, 2004). This needs to use ICT became the pathway to the technological, pedagogical, content knowledge framework, what Mishra and Koehler (2006) conceptualised as the TPACK framework, a model integrating technological, pedagogical, and content dimensions of teacher knowledge whose roots can be found in Shulman's (1986) theory of pedagogical content knowledge (PCK). TPACK reflects educators' capacity to synthesise subject-matter expertise with informed selection of pedagogical strategies and appropriate digital tools in service of effective learning. This framework supports the idea that teachers require a foundational knowledge set that encompasses not only their teaching methodologies, content knowledge, and skill set, but also a combination of their pedagogical knowledge with their subject knowledge and the integration of appropriate and effective technology. Simply put, TPACK, at its core, encompasses technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). Rosenberg and Koehler (2015) explain that these three sets of fundamental knowledge merge to comprise pedagogical content knowledge (PCK), technological content knowledge (TCK), and technological pedagogical knowledge (TPK).

Figure 1: *Technological Pedagogical Content Knowledge (Retrieved from http://tpack.org)*



Grasping how ICT functions within instructional contexts requires a clear understanding of the specific ways in which technology mediates teaching and learning processes. Petko (2012) has debated that although computers and ICT are readily available in the education sector, they must be used effectively and are often ignored by teachers. Petko further quotes Cuban's (2001) claim that ICT is overrated by policymakers and underused by teachers and students. Petko (2012) also cautions that this pattern of underutilisation is unlikely to reverse even as personal computing devices become universally accessible to learners. This claim of Cuban is still legitimate since the classroom practices do not involve ICT in its true spirit. However, most teachers use ICT to plan and deliver their lectures and instructional material (Liu, 2011). Liu further explains that ICT would be more effective if technology were used as a mind device for web-based learning tasks and online discussions. Kim and Hannafin (2011) also support the idea that using technology in the education sector is advantageous; however, Liu stated that more research and a deeper, more nuanced understanding of how ICT can be meaningfully embedded in classroom practice remain essential for achieving genuine technological effectiveness. Ertmer et al. (2012) argue that more than providing teachers with access to technology is needed since it entails merging with the paradigm shift in the teachers' pedagogical beliefs.

Problem Statement

Thus, the present research sets out to investigate how ESL educators in Pakistan deploy TPACK in their practice and to determine the extent to which their pedagogical orientations and professional attitudes shape these practices.

Research Objectives

The study aims to:

1) Investigate ESL teachers' TPACK practices concerning their constructivist pedagogical beliefs.
2) Investigate ESL teachers' TPACK practices concerning their transmissive pedagogical beliefs.
3) Investigate ESL teachers' TPACK practices concerning their attitudes.

Research Questions

1) Do Pakistani ESL teachers' Constructivist Pedagogical Beliefs (CPB) influence their TPACK practices?
2) Do Pakistani ESL teachers' Transmissive Pedagogical Beliefs (TPB) influence their TPACK practices?
3) Do Pakistani ESL teachers' Attitudes influence their TPACK practices?

Significance of the Study

Given the extensive examination of attitude–belief–behaviour dynamics in social psychology, teachers' professional practices can be understood as rooted in underlying belief systems that shape their attitudes and instructional decisions (Weekly, 2019). Prior research has examined teachers' pedagogical beliefs (Blume, 2020; Chien et al., 2014; Farjon et al., 2019; Li, 2014; Mihaela & Alina-Oana, 2015; Wu et al., 2022; Wyatt & Dikilitaş, 2021), their attitudes toward technology (Baş et al., 2016; Baturay et al., 2017; Canals & Al-Rawashdeh, 2019; Celik & Yesilyurt, 2013; Kavanoz et al., 2015; Raygan & Moradkhani, 2020; Taghizadeh & Ejtehadi, 2021), and the utilisation of technology in classrooms (Harrison & Lakin, 2018; Joyce et al., 2014;

Liu et al., 2017; Soleimani, 2020); however, limited attention has been given to how these factors collectively influence TPACK practices. Addressing this gap, the present study investigates the association between teachers' pedagogical beliefs and attitudes in shaping their use of technology in language teaching. The findings are expected to inform stakeholders about the role of belief systems in instructional practices and contribute to the development of technology-integrated curricula aligned with teachers' orientations, thereby enhancing the quality of English language teaching across educational levels in Pakistan.

Limitations Study

The study findings have certain limitations. First, with just over 150 teachers, the sample needed to be more significant to adequately reflect Pakistan's ELT community's beliefs and attitudes affecting their TPACK practices, as the socio-economic status in Pakistan varies from city to city. Second, all the respondents were from the metropolitan city of Pakistan, limiting the generalizability of its results.

Literature Review

Teachers' Attitudes and Beliefs

Establishing a coherent and empirically grounded connection among teachers' attitudes, their underlying belief systems, and their observable professional behaviours is of considerable scholarly importance (Pajares, 1992). This set of behavioural patterns leads to the inquiry of teaching practices that can only be fulfilled if teachers' beliefs and attitudes are analysed and examined. Studies have shown that teachers' beliefs are shaped by their self-perceptions as language professionals (Yang, 2019), their understanding of their own capabilities (Wyatt & Dikilitas, 2021), and the broader social and ideological contexts (Zhunussova, 2021) in which they operate. Subsequently, teachers' beliefs concerning their behaviour, control, and norms have been reviewed in the existing literature to comprehend how teachers behave and teach.

Pedagogical Beliefs

Teachers' pedagogical belief systems become visible through their day-to-day classroom conduct, directly influencing how they conceptualise, organise, and implement instructional activities (Mihaela & Alina-Oana, 2015). Wu et al. (2022) highlighted in their study that teachers' pedagogical beliefs were significantly high when designing and planning classroom activities. Consequently, the study by Li (2014) demonstrated that educators held distinct views regarding the pedagogical value of digital tools, and these perceptions powerfully determined which technologies they chose to adopt and how. However, a study by Blume (2020) concluded that teachers prefer to refrain from utilising digital tools for language teaching and learning. As Chien et al. (2014) noted that educators' belief systems regarding their own instructional conduct frequently functioned as an obstacle to the successful adoption of technology. The findings of their research revealed that technology use for assessment was mainly harmful, as assessment through technology was challenging due to the interface, hardware, platform, and system design. Overall, these studies affirmed that teachers' pedagogical beliefs were among the most powerful determinants of lesson planning quality and the ultimate effectiveness of technology adoption in teaching.

Beliefs on the Technology Use in the Classroom

Research shows strong teacher interest in using technology for second language acquisition, though its adoption is shaped by beliefs, experience, and confidence. Koh and Chai (2014) found that younger preservice teachers were generally more confident in using technology than older ones. Liu et al. (2017) and Soleimani (2020) reported a positive relationship between teachers' belief systems and their willingness to integrate technology and promote learner-centred practices such as critical thinking and engagement. However, Harrison and Lakin (2018) emphasized that implicit, experience-based beliefs often unconsciously influence teachers' instructional and technological practices.

Teachers' Language Attitudes Towards Technology

Ajzen's (1991) expectancy-value model explained that teachers' beliefs shape their attitudes, which in turn function as mediators that influence observable behaviour, including

pedagogical decisions and the use of technology in classrooms. In this regard, teachers' attitudes toward technology significantly affected whether and how they integrated it into their instructional practices. Empirical studies grounded in this framework (Baş et al., 2016; Baturay et al., 2017; Canals & Al-Rawashdeh, 2019; Celik & Yesilyurt, 2013; Kavanoz et al., 2015; Raygan & Moradkhani, 2020; Taghizadeh & Ejtehadi, 2021) consistently showed that positive attitudes were associated with greater adoption of educational technologies. For instance, Baturay et al. (2017) reported that teachers generally held favourable views of computer-assisted instruction, while Raygan and Moradkhani (2020) found that receptiveness to digital tools corresponded with positive attitudes toward TPACK, which was also shaped by school climate. These findings aligned with Albirini (2006), who emphasized that positive teacher attitudes combined with TPACK knowledge facilitated effective technology integration, ultimately enabling more practical and technology-enhanced educational environments (Celik & Yesilyurt, 2013).

Technological Pedagogical Content Knowledge (TPACK) and TPACK Practices

Koehler et al. (2011) considered teachers as the designers. They also contend that effective course design demands mastery of all seven constituent dimensions of TPACK to turn the pedagogical process into an effective, results-oriented teaching and learning process. Since the TPACK model considers technological knowledge, it automatically becomes relevant in all domains, making it a well-researched topic. Many quantitative and qualitative research studies investigated TPACK practices (Guo et al., 2019; Koh et al., 2010; Mcgrath et al., 2011). Most of these studies have explored the different components of the TPACK in the teacher's practices, while very few focused on particular subjects; thus, as Bustamante (2020) highlights, empirical research investigations specifically targeting language teaching and learning contexts remain markedly scarce. In addition, in a study designed to map TPACK competencies among language educators, Chai et al. (2013) reported a notable scarcity of inquiry in this domain. Moreover, Cheng (2017) also contested that studies must analyse the association between TPACK practices and language teaching.

To increase TPACK knowledge, language teachers needed to do so significantly (Taghizadeh & Ejtehadi, 2021). Thus, Taghizadeh and Ejtehadi (2021) established that a positive attitude toward technology use was directly associated with enhanced instructional effectiveness

in language learning environments. Also, they accepted that technological issues, inadequate TPACK knowledge, an unsupportive IT department, and learners' affective domain are the challenges that often decrease the effectiveness of the lesson in the language classroom. Thus, teachers' TPACK literacy is highly significant in language learning, and within TPACK, pedagogical knowledge is the foremost one (Kavanoz et al., 2015). Consequently, teacher training is necessary to increase TPACK literacy (Canals & Al-Rawashdeh, 2019). Hence, Farjon et al. (2019) document that structured professional development programmes were instrumental in cultivating more positive attitudes toward technology adoption among teachers. Therefore, TPACK practices could engage language teachers in professional activities (Li, 2014), making technology integration successful in language education (Albirini, 2006).

Hence, following hypotheses are proposed based on the theoretical framework presented in the literature:

H1. Pakistani ESL teachers' Constructivist Pedagogical Beliefs (CPB) impact their TPACK practices.

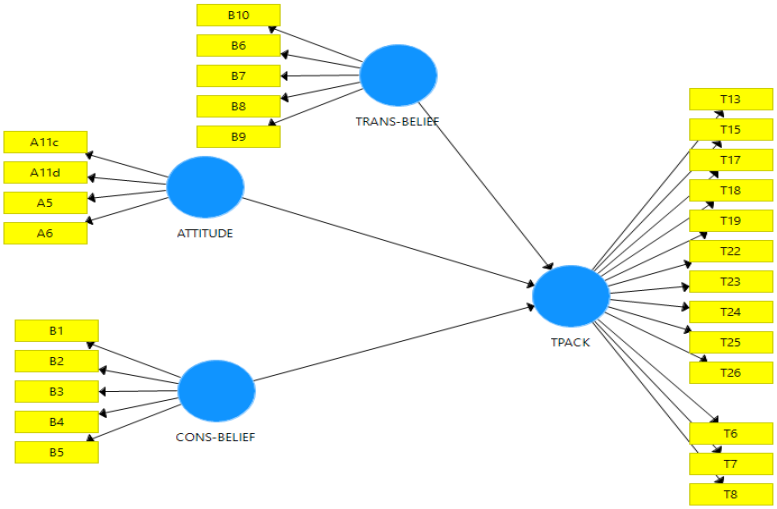
H2. Pakistani ESL teachers' Transmissive Pedagogical Beliefs (TPB) impact their TPACK practices.

H3. Pakistani ESL teachers' Attitudes impact their TPACK practices.

Conceptual Framework

The conceptual framework is depicted in figure 2 below:

Figure 2: *Conceptual Framework*



Research Methodology

Research Design

The study employed a quantitative approach using a correlational survey design to examine the impact of constructivist and transmissive pedagogical beliefs and attitudes on ESL teachers' TPACK practices.

Population and Sample of the Study

Pakistani ESL teachers (N = 150) from numerous schools, colleges, and universities in Karachi, Pakistan, participated in this study. They included 80% female teachers and 20% male teachers. 42.5% of participants indicated they were aged 31-40. 35% of the participants had 6-10 years of experience in teaching language. Quarter of the participants (25%) held a master's degree in Applied Linguistics, while 22.5% had English Linguistics as their major field. Most of the respondents (77.5%) taught in undergraduate degree programs.

Instrumentation

The questionnaire was adapted from Liu et al. (2017), Sifakis & Sougari (2005) and Beri & Sharma (2021) to fit the conditions of the language teachers who participated in this study.

The survey questionnaire encompassed 51 questions and was divided into three sections: teachers' beliefs, attitudes, and TPACK practices. The first six questions reported the participants' demographic information, as mentioned above. Except for the items on attitudes, all the items were posed as statements and rated by the partakers on a five-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree. The items on variables were presented as questions to answer the importance and usability of different attributes related to the English language.

Data Collection

The survey questionnaire was conducted online via Google Forms. Language teachers of English who showed their inclination in the study were consequently sent a Google Form link via email.

Data Analysis

The data were analysed using Partial Least Square Structural Equation Modelling (PLS-SEM). This technique was selected due to its suitability for analysing complex relationships among latent constructs and its robustness with non-normal data. The analysis was conducted using SmartPLS. The evaluation followed a two-step approach; the measurement model assessment for reliability and validity and the structural model assessment using path coefficients and bootstrapping to determine the significance of relationships.

Findings

Measurement Model Assessment

Table 1 indicated that all items had matched with their own variables. The outer loading reflected that the variables had items above 0.7. Attitude had four items (A11C, A11D, A5, A6), Constructivist and Transmissive pedagogical beliefs havd all items (B1-B10), and TPACK had thirteen items (T6, T7, T8, T13, T15, T17, T18, T19, T22, T23, T24, T25, T26).

Table 1: *Outer Loadings*

	ATT	Cons beliefs	Trans beliefs	TPACK
A11c	0.774			
A11d	0.767			
A5	0.74			
A6	0.8			
B1		0.679		
B10			0.733	
B2		0.768		
B3		0.789		
B4		0.866		
B5		0.808		
B6			0.81	
B7			0.844	
B8			0.775	
B9			0.779	
T13				0.722
T15				0.755
T17				0.666
T18				0.689
T19				0.641
T22				0.664
T23				0.762
T24				0.711
T25				0.788
T26				0.791
T6				0.754
T7				0.626
T8				0.664

The construct reliability of all the variables (attitude, beliefs: constructivist and transmissive pedagogical, and TPACK) was above 0.5, as shown in Table 2. Similarly, the discriminant validity of less than 0.85 indicated that all variables were similar and held unique values.

Table 2: *Construct Reliability*

	Composite Reliability	Average Variance Extracted (AVE)	Discriminant validity
Attitude	0.854	0.594	
Cons-Belief	0.888	0.615	0.166
TPACK	0.93	0.507	0.383
Trans-Belief	0.892	0.623	0.186

Structural Model Assessment

The relationship between the dependent (attitude and beliefs: constructivist and transmissive pedagogical) and independent variables (TPACK) was represented by VIF. It had values less than 3.3, indicating strong multicollinearity between variables (See Table 3).

Table 3: *Multicollinearity*

	TPACK
Attitude	1.047
Cons-Belief	1.101
TPACK	
Trans-Belief	1.111

As Table 4 indicated, with p-values falling below the 0.05 threshold, both attitude and constructivist pedagogical beliefs emerged as statistically significant predictors of TPACK practices. However, the p-value of transmissive pedagogical beliefs was more than 0.05, which showed it had an insignificant and negative impact on TPACK.

Table 4: *f-square*

	p-value
Attitude -> TPACK	0.031
Cons-Belief -> TPACK	0.114
Trans-Belief -> TPACK	0.341

Table 5: *r-square*

	Original Sample (O)	P Values
TPACK	0.277	0

Since the p-value was 0 and the r- square value for the TPACK construct was 0.277, indicating that teachers' attitudes and beliefs (constructivist and transmissive pedagogical) had approximately 27.7% impact on TPACK practices. The correlation between TPACK and attitude (0.321) and constructive belief (0.442) suggested strong positive relationships. However, the negative correlation between TPACK and transmissive belief (-0.147) suggested higher the transmissive teaching methods lower the TPACK practices. Moreover, the Q-square value for the TPACK construct was 0.131 which suggested the model's predictive power. This concluded that the model had a a moderate ability to predict TPACK practices based on attitude, constructivist belief and transmissive belief.

Discussions

This research study modified the TPACK model by integrating teachers' pedagogical beliefs (constructivist and transmissive) and attitudes. It employed the revised model to investigate the relationships among Pakistani ESL teachers' pedagogical beliefs and attitudes towards TPACK practices. Generally, the gathered data reinforced the validity of the revised TPACK model, and the majority of the proposed hypotheses were confirmed.

Effect of Constructivist Pedagogical Beliefs and Attitudes on TPACK Practices

RQ1 investigated the impact of ESL teachers' Constructivist Pedagogical Beliefs (CPB) on TPACK practices, and H1 was supported by the data, signifying that the participants' CPB had a positive effect on their TPACK practices. Chai, Chin, Koh, and Tan (2013) highlighted the same effect among Singaporean Chinese language teachers and suggested that their TPACK skills aligned more with constructivist pedagogical beliefs. This implied that Chinese language teachers needed professional development programs focusing on enhancing TPACK. The present findings aligned with the study of Lai and Lin (2018), whose results revealed a significant correlation between CPB and TPACK in Taiwanese teachers. Similarly, the research study results of Wu et

al. (2022) supported the current findings that pedagogical beliefs are important in shaping teachers' TPACK practices for video-based flipped learning.

The results from RQ1 demonstrated the significance of comprehending pedagogical beliefs of teachers, as they are more responsible than others for incorporating TPACK into teaching practices. The study by Chai and Koh (2017) emphasised the importance of the design beliefs of teachers in significantly predicting their TPACK practices. Consequently, the Scaffolded TPACK Lesson Design Model (STDLM) was applied and found that teachers' TPACK efficacy increased by the STDLM and changed their design beliefs, contributing valuable insights into the measurement and development of TPACK practices.

Accordingly, RQ3 examined the effect of ESL teachers' attitudes on TPACK practices, and H3 was backed by the data, signaling that the participants had a positive attitude towards TPACK practices. Azhar and Hashim (2022) establish a meaningful and statistically significant association between the level of TPACK competence and orientations toward technology use among ESL teachers. Also, comparable patterns have been documented in EFL settings across Iran and Turkey (Kozikoğlu & Babacan, 2019; Raygan & Moradkhani, 2020).

Effect of Transmissive Pedagogical Beliefs on TPACK Practices

RQ2 examined the impact of ESL teachers' Transmissive Pedagogical Beliefs (TPB) on TPACK practices, where H2 was not reinforced by the data, demonstrating that TPB did not have a significant adverse effect on TPACK practices of ESL teachers. This observation is aligned with the study by Ertmer et al. (2012), that educators whose professional orientation is predominantly teacher-directed demonstrate considerably lower inclination to integrate technology in pedagogically meaningful ways compared to those with student-centered beliefs, also known as Constructivist Pedagogical Beliefs. However, Tondeur et al. (2017) argue that pedagogical belief systems should be understood as existing along a spectrum rather than as binary categories, with many educators simultaneously drawing on both transmissive and constructivist beliefs. This suggests that more than TPB is needed to strongly predict TPACK practices, as teachers can still integrate technology effectively while holding some traditional beliefs. Language teachers' TPB

tended to apply TPACK more traditionally than their constructivist colleagues. Nevertheless, they were more constructivist than those who did not have TPACK practices at all.

Conclusions

These results focused on ELTs' concept of meaningful and innovative TPACK practices when their pedagogical beliefs and attitudes were studied. The present investigation made a meaningful contribution to the growing body of literature examining how language educators in Pakistan navigated the integration of digital technologies within their professional practice. The findings of the study advocated that the TPACK model could effectively explain language teachers' technology integration in wider and more diverse settings. In Pakistan, the ELTs' pedagogical beliefs were more constructivist or student-centered than transmissive or teacher-centric, indicating that CPB significantly positively affected their TPACK practices and attitudes towards it. Alternatively, their TPB had a negative insignificant effect on TPACK practices, indicating that their traditional beliefs could not influence TPACK practices.

Recommendations

Future research can further investigate whether ELT’s pedagogical beliefs have evolved over time and influence context-sensitive TPACK integration in a diverse Pakistani educational settings.

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