PERCEIVED COMPETENCIES AND PRACTICE AMONG LANGUAGE TEACHERS IN EGYPT: THE RELATIONSHIP BETWEEN TPACK AND TECHNOLOGY ADOPTION LEVEL

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Abstract: The study aimed to investigate the relationship and the predictive ability of the perceptions of competencies EFL teachers held about their technological, pedagogical, and content knowledge (TPACK) and their technology practices level. A convenient sample (N = 60) from private schools in Egypt was approached. Two theories propelled current study, i.e. the TPACK framework posited by Mishra and Koehler (2006) and the diffusion of innovation theory advanced by Rogers (2003). Correlation and regression analyses were applied. A strong positive correlation (r = .75, n 60, p < .001) was revealed. Content knowledge (CK), TPACK (the domain), and the pedagogical, content knowledge (PCK) manifested the greatest degree of association. TPACK (the domain) and CK made the main contributors to explaining the dependent variable (technology adoption level). The findings are contributions to the understanding of the factors that influence technology integration. The study can be a basis for any strategy for a curriculum and/or professional development programme by targeting the main factors that influence technology integration in instruction. The measurability of the TPACK may limit the findings.

Keywords: perceived competencies, EFL TPACK, diffusion theory, correlation, technology adoption level

INTRODUCTION

In the literature, the concept of teachers' beliefs has a common core as the phrase refers to unique, subjectively valid, value-laden mental constructions that are the comparatively stable outcomes of key social experiences that significantly influence how teacher interprets and contributes to classroom activities (Skott, 2013). Teachers possess beliefs on a variety of issues, which exist in a multidimensional system, with some beliefs being more essential than others, and they may be sometimes contradictory (Buehl & Beck, 2015). As a result, elements of a teacher's personal belief system might either help or hinder the implementation of beliefs in practice. There is a reciprocal, although complicated, relationship between instructors' beliefs and actions (Basturkmen, 2012; Mansour, 2009). In other words, beliefs and practices impact one another (Richardson, 1996; Thompson, 1992), and the intensity of this interaction varies between persons, settings, and the types of beliefs and practices under consideration, and in terms of the degree of the relationship between instructors' beliefs and practices, it is worth noting that there was never a perfect match between beliefs and practices, nor was there ever a total absence of relationship (Buehl & Beck, 2015).There have been approximately 60 years of study on teachers' beliefs, including over 700 empirical investigations. Despite this extensive body of work, further studies are needed to better understand the relationship between teachers' pedagogical views and their use of digital tools, particularly those that assist 21st-century teaching and learning (Fives & Buehl, 2012). Teachers' self-efficacy beliefs may explain some of the discrepancies between teachers' beliefs and practices (Ogan-Bekiroglu & Akkoç, 2009; Tang et al., 2012), as teachers are more likely to act on their beliefs about content and various aspects of instruction when they believe in their own capability. This inconsistency, Buehl and Beck suggest, is no reason to dismiss the strength of beliefs as it is important to comprehend the potential relationship between beliefs and practices, as well as the internal and environmental elements that may help or impede this interaction. Buehl and Beck (2015) define "practice" as any action that occurs during the teaching process, including planning, decision-making, instructional strategies or approaches, assessment, reflection, family work, and relationship development.

PURPOSE OF STUDY

The purpose of this study was to ascertain whether the perceived competencies EFL teachers had about their TPACK were related to their technology adoption level in their teaching. The study proceeded further to investigate whether these perceived competencies on TPACK can serve as predicative factors of teachers' adoption level of technology in the classroom. The study was achieved in order to answer the following two questions:

1. Is there a relationship between EFL in-service teachers' perceived competencies on their TPACK and their technology adoption level in instruction?
2. Could the TPACK perceived competencies of the EFL in-service teachers predict their technology adoption level in instruction?

Hypotheses

The two subtypes of correlational questions, i.e. the relationship/explanatory question and the predictive question were employed.

For examining the first relationship question, the study formed the following hypothesis:

H_0: There is no a statistically significant correlation between EFL in-service teachers' perceived competencies of their TPACK and their technology adoption level in instruction.

H_A: There is a statistically significant, positive correlation between EFL teachers' perceived competencies of their TPACK and their technology adoption level.

For investigating the second predictive question, the study formed the following hypothesis.

H_0: EFL in-service teachers' perceived competencies of their TPACK are not statistically significant predictors of their technology adoption level in instruction.

H_A: EFL in-service teachers' perceived competencies of their TPACK are statistically significant predictors of their technology adoption level in instruction.

The study hypothesised that in-service EFL teachers' perceived competencies in terms of the TPACK had a significant correlation with their technology adoption level. The seven constructs of the TPACK framework, i.e., content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK), pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK), and technological pedagogical content knowledge (TPACK) were the independent variables. The dependent variable was teachers' technology adoption level, which was based on the types of technology adopters categories according to the diffusion of innovation theory by Rogers (2003).

LITERATURE REVIEW

Richards (2017) argues that using technology in the classroom is no longer a choice, but rather a must in today's schools, and teachers are expected to be digitally literate, just as excellent schools are required to make good use of the resources made accessible by technology. Likewise, Ertmer and Ottenbreit-Leftwich (2010) argue that instructors' low-level use of technology is no longer suitable to satisfy the demands of 21st-century learners. Simply supporting lecture-based education with technology falls well short of recommended best practices. For teachers and schools in developing countries, however, technology remains "an option." For example, in Egypt, textbooks, workbooks, and rote memorization are heavily – and nearly entirely – used in the classroom (McIlwraith & Fortune, 2016; Sobhy, 2012). Egypt's instructional technology lags behind the times, posing a dilemma for students of all ages (Morgan & Lee, 2017; Sadik, 2008). Egypt is an example of a local setting in which English is not a native language but is nonetheless regarded as an important communication tool (Lewko, 2012). The Egyptian educational system is the largest in the Middle East and North Africa (MENA) region and is one of the largest in the world in terms of the number of the students (Baradei & Amin, 2010). Interest in the instructional technology in the developing countries has irresistible lure as it is thought of as instrumental in not only enhancing education but also contributing to modernity of community (UNESCO, 2018). Bakr (2011) studied the differences of attitudes of Egyptian public schools teachers on computers in terms of teaching experience and gender. Findings indicate that the teachers had positive attitudes and there were no differences in terms of gender or teaching experience. The researcher recommended further research of teachers' attitudes towards computers in terms of other variables such as subject matters, self-efficacy, and in-service training programs. Latif (2018) found that the majority of studies conducted in Egypt between 2006 and 2015 focused on improving language skills and integrating technology into the classroom, while learning practices, which include issues of identity, autonomy, anxiety, and perceptions, were near the bottom of the research agenda. Badran et al., (2021) investigated secondary school teachers' perceptions on the information and communication technology (ICT) component of the 2017 education reform. The majority of participants expressed positive viewpoints on the relative advantage of ICT

integration, average attitudes on its complexity, and negative perspectives on its compatibility with Egypt's education goals and core aims. The findings also emphasised the presence of several barriers that may influence teachers' decisions to accept or reject the ICT reform, such as human and technological infrastructures, as well as communication. As available studies that target language teachers in Egypt are few and mostly achieved in Higher Education institutions, current study explores a new context of ICT in Egypt education.

Theoretical Framework

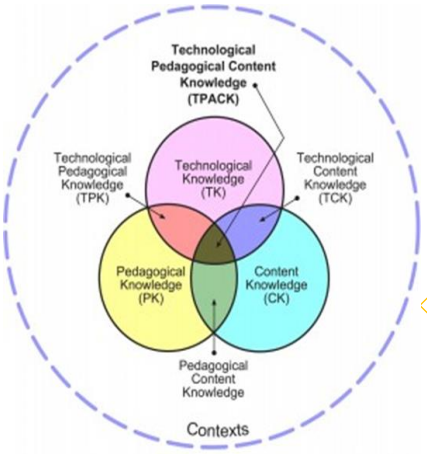
Technological Pedagogical Content Knowledge (TPACK)

Mishra and Koehler (2006) developed TPACK, which is employed to guide or evaluate the use of technology in the classroom. The model relies on Shulman's pedagogical content knowledge (PCK) (1987). Mishra and Koehler's model necessitates three types of basic knowledge, i. e. content, pedagogy, and technology, as well as the interactions between and among them. As a result, the TPACK comprises seven domains, namely content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK), pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPCK) (TPACK).

Diffusion of Innovation Theory (DOI)

Rogers (2003) stated that people adopt innovations due to certain innovation attributes and at different rates. He grouped people into five categories according to how quickly they adopt the innovation from the earliest adopters to the latest adopters: innovators, early adopters, early majority, late majority, and laggards. Adopters in each category are similar with regard to their innovativeness, which is " the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system''(Rogers, 2003, p. 22).

Figure 1 *Theoretical Framework of the Study*

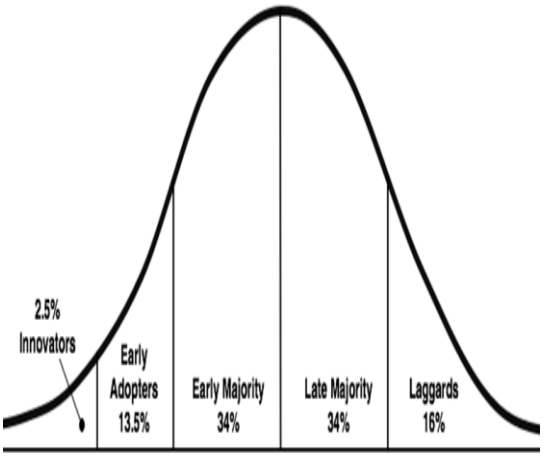


Independent variables (TPACK Constructs): TK, PK, CK, PCK, TCK, TPK, TPACK
Dependent Variable: Technology Adoption Level (innovativeness)

METHODOLOGY

Research Design

Current study is a component of a PhD research. In the original research, a sequential mixed methods approach was employed, as quantitative data were gathered and analysed in the first phase, then qualitative data was collected and analysed in the second phase, and eventually both methods were integrated in the interpretation phase of the research (Creswell & Creswell, 2017). The current component of the study displays quantitative findings obtained through investigating the relationship between EFL teachers' perceptions of competencies about their TPACK and their technology adoption level.



Sampling Procedures and Samples

In correctional research a sample is selected by employing a suitable sampling technique (Gay et al., 2011).The researchers used one's experience and knowledge of the group to be approached to select a sample (*N*=60), which was believed to represent the given population. The pool of participants included EFL in-service teachers from preparatory private education schools. The sample included female and male teachers (53.3% and 46.7% respectively), and 95% of the respondents were either BA or B.ED qualified. The majority of the teachers (70%) was between 26 and 35 years old. While 45 % of the respondents had below a 5 year teaching experience, 26.7 % had been teachers between 6 and 10 years.

Context of the study

Private schools are reported to be more interested in delivering high-quality education services, including using technology in instruction, than their public school counterparts, and in most cases, available resources are used (El-Fiki, 2012). Because of its geographical location, diverse makeup, and convenience for the researchers, the sample for this study was chosen from Fayoum, Egypt. Six different private K-12 schools were asked to complete the survey. That included private ordinary schools (71.6%), private language schools (16.7%), and private Azhar schools (11.7%).

Research Instrument

The study adapted the tool created by Bostancioglu and Handley (2018) to test the TPACK of EFL teachers after receiving the authors' approval. Teachers' responses were graded on a five-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. The instrument consists of 35 items in total, with 5 items per subscale for measuring TPACK's seven domains. A scale to measure teachers' innovativeness according to Rogers (2003) theory of innovation was developed after reviewing literature of tools which assess individuals' orientations towards changes, such as the tool developed by Hurt et al. (1977) which was also based on Rogers' theory. A 5-item tool developed by Lavadia (2017), modelled on Rogers' five categories, to measure tertiary science faculty technology adoption level was a direct reference for current study tool as well. Current tool consists of 10 items. Establishing the I-CVI and S-CVI, as well as more than 10% negatively phrased items, were all part of the validity processes of the scales. Internal consistency was achieved for each of the subscales as well as the overall TPACK scale and scale of measuring teachers' innovativeness (see Table 1).

Table 1
Cronbach's Alpha Values of the Scales

Scale	Cronbach's Alpha	Number of Items
CK	.844	5
TK	.687	5
PK	.750	5
PCK	.759	5
TCK	.681	5
TPK	.807	5
TPACK	.900	5
Adopt Level	.851	10

Data Analyzing Instruments

To investigate the strength and direction (positive or negative) of a relationship between teachers' TPACK and their adoption level of technology, a simple bivariate correlational analysis was performed. The relationship between teachers' perceptions of competencies, as measured by the technological, pedagogical, and content knowledge scales, and technology adoption level, as measured by technology adoption level scale, was investigated using Pearson correlation coefficient. Pearson product-moment correlation analysis is used to describe the strength and direction of the linear relationship between two variables (Pallant, 2013). It is utilized for continuous variables or continuous variables and a categorical one, and the values of correlation coefficients (r) can range from -1 to +1, and regardless of the sign, this value demonstrates the strength of the relationship.

To investigate the predictive capability of the model, multiple regression analysis was utilized. Multiple linear regression is based on correlation analysis but allows a more sophisticated exploration of the interrelationship among a set of variables. Multiple regression provides information about the model as a whole (all subscales) and the relative contribution of each of the variables that make up the model (Tabachnick et al., 2007). In present study the relationship was between one 'effect' variable, called the dependent or the outcome variable, i.e. the technology adoption level, and the predictors, also called independent variables, or explanatory variables i.e., TK, CK, PK, PCK, TCK, TPK, and TPACK. All the independent variables were entered into the equation simultaneously, thus each independent was evaluated in terms of its predictive power, over and above that offered by all the other independent variables. To ensure no violation of normality, linearity and homoscedasticity (Tabachnick et al., 2007) required to perform correlation and regression analysis, preliminary analyses were performed.

FINDINGS AND DISCUSSION

Correlational Analysis

Table 2 depicts the correlation coefficients of the relationship between TPACK domains, namely TK, CK, PK, TPK, TCK, PCK, TPACK, and technology adoption level variables.

Table 2
Pearson Product-Moment Correlations among Variables

	Total Adopt	Total TK	Total CK	Total PK	Total PCK	Total TCK	Total TPK
Total TK	.344**						
Total CK	.653**	.589**					
Total PK	.596**	.562**	.906**				
Total PCK	.649**	.427**	.703**	.717**			
Total TCK	.507**	.281*	.529**	.589**	.768**		
Total TPK	.516**	.321*	.659**	.780**	.701**	.724**	
Total TPACK	.649**	.405**	.654**	.722**	.831**	.855**	.862**

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Scales revealed significant correlations (*r* ranged from .344 to .649 , p < .01) for the Total Adoption Level and the domains of TPACK. For instance, Total TK was correlated with Adopt level (*r* .344 , *p* < .01). Total CK ,The Total TPACK and Total PCK domains of the TPACK manifested the greatest degree of association with the level of technology adoption (*r* = .653, .649, .649; *p* < .01).

In the light of the statistically significant finding for the first question, the Null (H_0) Hypothesis was rejected. The Alternative Hypothesis (H_a) was, however, retained.

Regression Analysis

The correlation Table 2 displays the relationships among the different variables (TK, CK, PK, PCK, TCK, TPK, and TPACK), in addition to the relationship between the dependent variable, adoption level, using the Pearson correlation coefficient (*r*). According to the guidelines set by Gay et al. (2011), the relationship between the TPACK domains and the technology adoption level was found to be strong positive relationship at *r* = .75, *n* 60, *p* < .001 (see Table 3).

Table 3
Model Summary of Variance in the Dependent Variable

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.752a	.565	.507	4.82213

a. Predictors: (Constant), TotalTPACK, TotalTK, TotalCK, TotalPCK, TotalTCK, TotalTPK, TotalPK
b. Dependent Variable: TotalAdopt

The above model summary of variance shows an R square value of .565. When expressed as a percentage, the model explains 56.5 % of the variance in adoption levels. R Square may be overestimated, due to small sample size. The Adjusted R square value, .507, provides a better estimate of the true value for the said population (Pallant, 2013). The Adjusted R Square value when expressed as a percentage indicates that the TPACK model explains 50.7% of the variance in technology adoption levels.

The ANOVA measurement (see Table 4) which assessed the statistical significance for independent variables indicated *p* < .001. The proposed model supported that the seven scales of TPACK ((TK, CK, PK, PCK, TCK, TPK, and TPACK) explained the variance in adoption levels.

Table 4

ANOVA for Technology Adoption Level as Dependent Variable

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1571.032	7	224.433	9.652	.000[b]
	Residual	1209.152	52	23.253		
	Total	2780.183	59			

a. Dependent Variable: TotalAdopt

b. Predictors: (Constant), TotalTPACK, TotalTK, TotalCK, TotalPCK, TotalTCK, TotalTPK, TotalPK

Table 5 below shows which of the seven independent variables contributed to the prediction of the dependent variable.

Table 5
Coefficients for Total Scores of TPACK Scales

	Standardized Coefficients			Collinearity Statistics		
	Beta	t	Sig.	Part	Tolerance	VIF
(Constant)		3.474	0.001			
Total TK	-0.126	-1.060	0.294	-0.097	0.590	1.694
Total CK	0.547	2.367	0.022	0.216	0.156	6.398
Total PK	-0.108	-0.399	0.691	-0.037	0.114	8.758
Total PCK	0.172	0.923	0.360	0.084	0.241	4.157
Total TCK	-0.211	-1.146	0.257	-0.105	0.247	4.052
Total TPK	-0.319	-1.447	0.154	-0.132	0.172	5.803
TotalTPACK	0.732	2.673	0.010	0.244	0.111	8.976

The presence of any statistically significant contribution of each of the seven independent variables is seen in a *p* value that is less than .05. For instance, in comparing the contribution of each independent variable, the largest Beta coefficient, .732 belonged to Total TPACK. This means that TPACK made the strongest contribution to explaining the dependent variable when the other variables are controlled. The next highest Beta coefficient was, .547, which means that Total CK contributes to a lesser extent to the dependent variable. Further exploration regarding CK and TPACK and their predictive values to adoption level can be seen in the part correlation coefficients. Total TPACK's correlation coefficient, .244, when squared, results in (.05), implies a 5% contribution to the explanation of variance in the dependent variable.

According to the findings of the regression analysis, the Null Hypothesis: EFL in-service teachers' perceived competencies of their TPACK are not statistically significant predictors of their technology adoption level in instruction, was rejected and the Alternative Hypothesis has been retained.

Research Implications

The findings of this study speak to practitioners concerned about educator development, such as administrators, and professional developers, as well as teachers and other professionals who are keening on combining technology into the process of teaching and learning. To consider a change initiative such as the integration of modern technologies within pedagogy and content at the school level, it is necessary to regard the culture or the body of beliefs, values, and traditions that are part of the society (Smith, 2000; Weick, 1976).

Given that a statistically significant relationship exists between perceptions and enacted technology integration practices, explicitly targeting these perceptions is a valuable investment of time. This implies that directing professional development to improve these specific perceptions would benefit technology integration efforts. As a statistical predictor, teachers' perceptions of their competencies as measured by the TPACK survey instrument could provide an indication of the level of technology integration into teaching and learning. In looking at the individual TPACK domains, the CK and the TPACK areas were individually statistically predictors. The findings that perceived knowledge in multiple TPACK domains is positive suggests that efforts to improve teacher

knowledge in the TPACK domains may result in increased self-efficacy beliefs. These findings are consistent with Bandura (1997) on describing how knowledge and self-efficacy function and prior findings regarding TPACK and vocational self-efficacy beliefs (Sahin et al., 2009).

Prior research suggests that perceived competency beliefs influence how likely a teacher is to use technology in the classroom (Bull, 2009; Kellenberger, 2014; Marcinkiewicz, 2014; Wang et al., 2004). It is essential when developing specific strategies for supporting meaningful learning about technology in the classroom during a teacher preparation program and, ultimately, successful technology integration in the future, to understand how these beliefs are influenced by perceived knowledge of pedagogy, content, and technology.

The present study is a correctional study, and a limitation of correlational research is that it cannot identify cause and effect. A positive correlation between TPACK and technology adoption level could mean that (a) TPACK influences technology adoption, (b) technology adoption level influences TPACK, (c) technology adoption level and TPACK influence each other, or (d) TPACK and technology adoption level are influenced by other variables. To determine cause and effect, an experimental study is necessary.

Limitations

There are some factors that may impact the findings of this study. First, the measurability of TPACK as a framework is unsettled as the boundaries between and among its constructs are not clear (Baser et al., 2015; Schmidt et al., 2009). Second, the current study relied on participants' self-reporting their responses in the form of a questionnaire survey as the main means of gathering data. Therefore, the researchers relied on the participants' sincerity and openness when they made their responses. Self-reporting data lends itself to biased results, and many of the TPACK surveys and questionnaires have been developed for self-description. Lastly, the participants were from private education schools, and it is not reasonable to apply findings to other types of schools.

Recommendations for Future Research

Due to some of the limitations discussed above, further research should be conducted in future studies to transcend current limitations. The context of this study was private preparatory education schools. It would be valuable to replicate this study at other similar private or /and state schools, and with different school subjects for corroboration of the findings. Furthermore, current study relied upon in-service EFL teachers' self-assessment and self-reporting. Beliefs can be idealistic and desirable, and may not inform practice (Albion & Ertmer, 2002). Observations would provide a richer understanding of enacted beliefs. Therefore, it would be valuable to include observations of teachers at work in the classroom, actually integrating technology into their practices, as current participants might have provided favourable answers. Moreover, PCK is different for various content areas, and blend to develop better teaching practices in a discipline (Prosser & Trigwell, 2013; Schmidt et al., 2009). Addressing the belief systems and practices of lecturers at colleges and universities can provide valuable information about integration of technology to transfer learning at higher institutions. Future research could be conducted by implementing a plan of action of an in-service program to enhance EFL teachers' digital literacy and to model the integration of online project-based instruction into English education. Furthermore, the scarcity of investigating the perceptions of students about their teachers' self-efficacy beliefs on technology in instruction in EFL classroom, using the TPACK as a framework is noticeable in the literature.

CONCLUSION

To conclude, the current study aimed to investigate any link between EFL teachers' perceptions of competencies on their TPACK and their technology integration level. Findings showed a relationship between teachers' beliefs about their competencies on their TPACK and their practices of technology in their instruction. The study also indicated the predictive ability of teachers' TPACK of their technology integration. To effectively integrate technology in student-centred learning, content delivery that juxtaposes belief system change and involvement of teachers, educators' leaders and site administrators in the visionary process is required (Ertmer & Ottenbreit-Leftwich, 2010; Senge et al., 2012).

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