Asesorías y Tutorías para la Investigación Científica en la Educación Puig-Salabarría S.C.
José María Pino Suárez 400-2 esq a Lerdo de Tejada. Toluca, Estado de México. 7223893475
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TÍTULO: La integración de la facultad; la disponibilidad generalizada de la tecnología en la universidad y la escuela afectan los niveles de competencia TPACK de la integración de la tecnología de los docentes en servicio previo.

AUTOR:

1. Yousef A Aljemely.

RESUMEN: El objetivo de este estudio fue investigar la competencia de los maestros de pre-servicio y su capacidad para integrar su conocimiento de la educación con el conocimiento del contenido académico; utilizando herramientas tecnológicas, describió el marco de conocimiento del contenido tecnológico educativo Tepak (TPACK). Para lograr el objetivo del estudio, se preparó un cuestionario de dos partes. La primera parte se centró en los datos personales, mientras que la segunda se basó en preguntas sobre las siete partes de las competencias según TPACK. 120 encuestados completaron el cuestionario. Los resultados del estudio mostraron que no hay diferencia en la percepción de los maestros de pre-servicio de TPACK y la percepción de los maestros de posgrado sobre TPACK.

PALABRAS CLAVES: Tecnología, integración defectuosa, Educación, TPACK.

TITLE: Faculty's integration, pervasive availability of Technology at university and school affect TPACK competency levels of Pre-service Teachers Technology Integration.

AUTHOR:

1. Yousef A Aljemely.

ABSTRACT: The aim of this study was to investigate the competency of pre-service teachers and their ability to integrate their knowledge of education with knowledge of the academic content using technological tools, outlined the framework of knowledge of educational technological content Tepak (TPACK). To achieve the objective of the study, a two-part questionnaire was prepared. The first part focused on personal data while the second was based on questions about the seven parts of competencies according to TPACK. 120 respondents filled the questionnaire. The findings of the study showed that there is no difference in the perception of pre-service teachers of TPACK and the perception of the postgraduate teachers about TPACK.

KEY WORDS: Technology, faulty integration, Education, TPACK.

INTRODUCTION.

Advancement in technology and its integration in almost every aspect of life has arose the need to integrate new technology in education as well. Today, students use technology to simplify their everyday tasks, thus the need for technology in the classroom cannot be ignored.

To successfully integrate technology in education, there is a need for teachers to be conversant with new technology and ways of integrating it. This has led to the introduction of the TPACK concept, which helps teachers integrate technology with the curriculum. TPACK creates a model and framework through which technology can be incorporated in the curriculum to boost learning in the classroom.

DEVELOPMENT.

What is TPACK?

Technological Pedagogical Content Knowledge (TPACK) is a theoretical framework for understanding teacher knowledge required in order to effectively integrate technology in educational

research (Mishra & Koehler, 2006). It introduces the relationship and complexities between different components of knowledge which include; technology, pedagogy and content.

TPACK was previously referred to as TPCK but was renamed as a way of making it easier to remember and to also integrate technology, pedagogy and content in a better manner (Thompson & Mishra, 2008). The TPACK framework builds on Shulman's construct of pedagogical Content Knowledge (PCK) by including technology knowledge in the context of content and pedagogical knowledge. Although the term TPACK was introduced not very long time ago, the idea has been around for decades. Prior to the introduction of TPACK, the triad of content, theory (instead of pedagogy) and technology were briefly mentioned by Mishra, within the context of educational software design (Lee & Cereto, 2011).

Angeli (2005) and Savery (2002) identified technology, pedagogy and content as the main components of knowledge, although the relationship between the three has also been explored by several other scholars including Kotrlik and Redmann (2005), Mumtaz (2000) and Angeli (2005). At the intersection of the three components of knowledge lies an intuitive understanding on what to teach using appropriate pedagogical methods and technologies. The seven components of the TPACK framework and how they interact with each other are discussed below

Components of TPACK and their interaction with each other:

1. Pedagogical Knowledge (PK): this refers to different methods and processes of teaching, including knowledge on how to manage classrooms, assessing progress and planning lessons. Pedagogical knowledge encompasses overall educational purpose, values and aims.
2. Pedagogical content knowledge (PCK): Pedagogical content knowledge is the content knowledge that revolves around the teaching process and usually varies depending on the content area. It blend both content and pedagogy as a way of developing better teaching practices in different content areas. According to Shulman (1986) PCK involves transformation of teaching subject matter as

the teacher interprets the content and comes up with different methods of representing it. It covers the core business of teaching, learning, assessment and pedagogy.

3. Technology Knowledge (TK): Technology knowledge is the type of knowledge that focuses on certain ways of thinking about and working with technology, tools and resources. The knowledge is concerned with both low-tech and digital technologies used in education. The technologies range from pencil and paper to the internet and interactive whiteboards (Mishra &Shin, 2009)
4. Content Knowledge (CK): This is the knowledge about the actual subject matter that students are taught and what they are expected to learn. To ensure the right content is delivered to students, teachers must be aware of what they are supposed to teach and how content knowledge differs in different areas.
5. Technological pedagogical knowledge (TPK): It is the knowledge on how different technologies can be utilized when teaching and the extent to which technology affects learning outcome.
6. Technological content knowledge (TCK): it is the knowledge on how technology ca be applied in the creation of new representations for different types of content. TCK suggests that teachers are aware that using a particular technology will significantly affect the way learners understand taught concepts.
7. Technological pedagogical content knowledge (TPACK): TPACK refers to the knowledge that teachers require in order to effectively integrate technology into their teaching in various fields. It is a framework focused on the design and evaluation of teacher knowledge to ensure effective learning in various areas of technology education. TPACK is useful in establishing the knowledge that teachers must have for successful integration of technology in their teaching methods.

Components of TPACK.

Technological Pedagogical Content Knowledge (TPACK) provide teachers with the framework for integrating technology in teaching and it is essential that every teacher understands this concept very

well (Luik, Taimalu, & Suviste, 2018). TPACK has a complex interplay of three knowledge forms which act as its heart. These include technology (TK), pedagogy (PK) and content (CK). Through the framework, other kinds of knowledge are emphasized from the intersections of the three primary knowledge forms. These include technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK), technological content knowledge (TCK) and finally the technological pedagogical content knowledge (TPACK) (Luik, Taimalu, & Suviste, 2018). Each of these forms of knowledge are explained below:

- Content Knowledge (CK): the teacher should have the knowledge on the subject matter that he/she is teaching. This form of knowledge includes knowledge of the theories, concepts, ideas, proof or evidence, approaches and practices towards the subject matter (Koehle & Mishra, 2017),
- Pedagogical Knowledge (PK): the teacher should possess deep knowledge of the practices, processes and methods of teaching. This form of knowledge encompasses the overall values, aims and purposes of education including planning of lessons, classroom management and assessment of students (Luik, Taimalu, & Suviste, 2018).
- Technology Knowledge (TK): this includes knowledge on thoughts about technology and how it resources and tools can be applied in everyday life to achieve a particular goal and how to well adapt to the technological changes (Koehle & Mishra, 2017).
- Pedagogical Content Knowledge (PCK): this includes knowledge on how to transform the subject matter through interpretation, multi-way representations and tailoring of the subject matter to suit the students. It mostly includes learning, teaching, reporting and assessment of conditions which encourage learning in the curriculum and pedagogy (Loughran, Berry, & Mulhall, 2012).
- Technological Content Knowledge (TCK): This includes knowledge on how the content and technology influence and restrain one another. The teacher must understand the subject taught profoundly as well as proper knowledge of how particular technologies can change the subject

matter. It's upon the teacher to choose the best suited technology for addressing a particular subject matter depending with the context (Angeli, 2016).

- Technological Pedagogical Knowledge (TPK): This includes understanding how different application of particular technologies affects learning and teaching. It also includes knowing how wide range of technological tools affect pedagogy while developing appropriate strategies and designs (Owusu, 2014).
- Technological Pedagogical Content Knowledge (TPACK): This includes incorporation of the three primary forms of knowledge. It creates the basis for incorporating technology in teaching, applying pedagogical techniques through use of technology while teaching content and understanding how different technologies can be used to improve the existing knowledge to strengthen the old ideas or coming up with new ones (Luik, Taimalu, & Suviste, 2018).

Literature review.

The need to integrate technology in education has been influenced by the fact that today, students are being brought up surrounded by technological tools. Increasing access to technology in schools however, does not seem to enhance the use of technology in education (Tondeur et al., 2016).

Studies suggest that teachers play a key role in improving the learning process and outcome by adopting technology-enhanced practices in the classroom. Nonetheless, teacher training institutions (TTI) are constantly faced with the challenge of preparing future teachers to effectively integrate technology in education. In order for pre-service teachers to be fully equipped with knowledge and skills necessary in technology education, there is a pressing need among TTIs to bridge the gap between technology, pedagogy and content knowledge (TPACK).

According to Koehler and Mishra (2009) competence among teachers in the three areas coupled with the ability to integrate all the three types of knowledge is necessary for effective technology

integration in education. TPACK therefore emphasizes on the need to prepare teachers to be able to make informed choices on what technology to use when teaching particular content to a specific group of students.

In the recent past, a good number of researchers have highlighted the need to align the preparation of pre-service teachers to integrate technology education in the curriculum with pedagogical issues (Agyei and Voogt 2014, 2015; Aslan and Zhu, 2016).

Preparing teacher for TPACK; however, still remains a complex process. This is because not all pre-service teachers are intrinsically motivated to use technology in the classroom. Consequently, a good number of researchers centre on individual characteristics associated with TPACK such as the attitudes of pre-service teachers (Holland and Piper, 2016) and self-efficacy (Scherer, and Tondeur, 2016). However, this approach has a major downside in that focusing solely on pre-service teachers' characteristics is likely to result to individual blame rather than system blame when explaining different TPACK variables.

Mouza et al., (2014) argue that pre-service training plays a key role in successful integration of technology in education. The content and delivery method used during training significantly influence the success of technology integration. This has resulted to adoption of various strategies by teachers training institutes (TTI) aimed at aligning the training of pre-service teachers with pedagogical issues that develop their TPACK. Such strategies include using teacher educators as role models and scaffolding authentic technology experience.

Pre-service teachers and technology integration.

Integration of technology in pre-service teachers is greatly affected by a number of factors. Gender is one of the factors which influence the perception of TPACK by teachers. According to Keengwe, Onchwari, and Hucks (2014), male teachers were found to be more confident while working with

computers while compared to their female colleagues. More so, the study found out that male teacher were highly rated on technology knowledge and content knowledge. However, since TPACK items of survey could not be isolated as a factor in analysis of exploratory factors thus the effects of TPACK couldn't be accessed in the study.

According to Easter (2012), there is enough evidence the perception of the teacher towards TPACK could be influenced by the construct of the TPACK, where strong correlations were found between technological knowledge, pedagogical knowledge, content knowledge and TPACK. Easter (2012) found out that technology integration by pre-service teachers is greatly affected by pedagogical knowledge and technology and pedagogical knowledge, especially in the context of a university. However, the results of this study are subject to change since the study did not include all the seven constructs in the study.

It is very challenging to conduct a survey which models the TPACK relations while incorporating all the seven constructs of TPACK (Koehle & Mishra, 2017). However, Petrucco & Grion (2015) conducted a study on the knowledge of pre-service teachers on teaching while incorporating technology which was administered on 124 pre-teachers in USA. They were able to isolate technological knowledge, technological pedagogical knowledge, and technological content knowledge and TPACK factors but were unable to isolate pedagogical and pedagogical content knowledge items as factors.

The inability to isolate all the form of knowledge individually while conducting this study makes it challenging to make use of statistical models on these studies (Luik, Taimalu, and Suviste, 2018).

Faculty's integration of technology.

According to King and Cox (2011), institutions of higher learning cannot ignore the importance of technology, especially assessing their pedagogical needs. In concurrence, Savery (2002) not that how

the faculty perceive the usefulness of technology is a major determinant on whether they will employ ICT into the learning environment.

Although a deep analysis of studies from the last two decades show evidence on the positive effects of integrating technology in the learning process, a literature review analysis by Mumtaz (2000) also revealed a number of factors that hinder an instructor's willingness to use ICT. Such factors include lack of prior teaching experience with technology, lack of on-site support for instructors when using technology as well as inadequate time to effectively integrate technology to the curriculum.

A different study by Kotrlik and Redmann (2005) suggests that the issues identified by Mumtaz's (2000) continue to persist. The researchers observed that teachers did not have time to plan for the integration of technology into lesson plans, technology was sometimes unavailable, lack of support by the administration as well as anxiety among teachers when using technology (Kotrlik and Redmann, 2005).

A study conducted by Lee and Cereto (2011) to investigate the decision by secondary and high school to use computers to create and deliver lessons revealed that teachers only use technology if they are convinced of its value in teaching. Faculty members who are convinced that technology has a positive effect on their work are likely to use it. Additionally, faculty members who become more knowledgeable on the use of technology through practice tend to use it more often.

The findings further suggested that teachers' attitude and perceived relative importance may vary across different technologies, thus affecting both the intention and outcome of implementing technology in education.

Faculty's integration technology and affected student.

Technology adoption rate and access in higher education has received much remarkable improvements in institutions of higher learning. However, it has been reported that most of faculty

members never incorporate technology while offering instructions in a manner which would bring a difference in the learning process (Keengwe, Onchwari, & Hucks, 2014). The need for the faculty to make informed decisions on learning practices which bring impact on students lies on the need for faculty to integrate new practices. This has led to education stakeholders such as parents and administrators to push towards integration of technology in education.

Petrucco & Grion (2015) argue that there is overwhelming evidence in the ways through which technological changes is affecting the way teachers are teaching in classes. In a study, which was conducted by Schrum (2011) on how incorporation of technology is effective in schools, positive and consistent patterns while studies took place in an environment which is rich in technology. However, lack of integration of technology throughout the education curriculum has been regularly reported. Adoption of computer technology in education neither provides solution to all education problems nor reforms the education sector but is a tool which supports effective learning (Angeli, 2016).

A study was conducted by Cennamo, Ross and Ertmer (2019) to determine the students who would be affected when technology is incorporated in the curriculum. They made use of two-way analysis of variance (ANOVA) and multiple regression to analyze the results. The results didn't show any variations depending on the course levels and gender of the students. In other words, there was no any statistical significant effect on course levels and gender.

According to Keengwe, Onchwari, & Hucks (2014), the only students who would be affected by faculty's integration of technology are the ones who lack or have have low computer skills in the applications which are intended to support or improve the learning process.

Pervasive availability of technology in university and school.

The impact of technology in education is evidently significant where institutions of higher learning are developing many diverse ways through which they can engage students to take part in technology

(Cennamo, Ross and Ertmer, 2019). Moreover, they argued that technology is playing a major role in attracting more attention to pedagogy where even being healthly present in facebook would benefit a student. Integration of technology in education had been viewed as a controversial issue by some professors where some were against it while others greatly embraced it (Carraway, 2015).

Pervasive availability of technology is an advanced paradigm which makes technology and technology tools such as computers, smartphones and laptops available everywhere. Leh (2005) points that technology is pervasive in our everyday live, thus students and faculties in universities demand that technology is made part of the curriculum. A growing body of research exists on the integration of digital technology into education curriculum.

Digital technology in education is employed in a wide area of educational environments where it is viewed as an integral part of instruction rather than an object. Schools and universities are adapting to the external conditions that have come up as a result of wide-spread adoption of technology. The integration of technology in both schools and institutions of higher learning is however facing a few barriers, including lack of technology support programs for staff and also lack of incentives to motivate instructors. Despite some professors still viewing integration of technology in education as a distraction, technology has become pervasive in universities and schools and has become part of life in students in higher learning (Carraway, 2015).

University faculties have also made integration of technology a requirement in their respective institutions and students have also embraced use of technology in technology as it is a phenomenon they are conversant with. Teachers have also been able to incorporate technology as they teach where they have been able to adapt to changes in technology and modify their subject matter to fit their context and bring out the objective they intended (Owusu, 2014).

Methodology.

In this study, an explanatory research design was used and the survey method was adopted for the collection of primary data. Survey approach was most appropriate as it provides a comprehensively background analysis of the target population. The participants were randomly selected from various schools provided they met the required criteria of being post-service teachers in either degree or postgraduate programs. Primary data was collected by use of questionnaires from 120 respondents who were pre-service of the bachelor and postgraduate program teachers.

The collected data was analyzed using statistical methods and the findings presented using tables as shown below.

Results.

Demographic Information.

Table 1: Demographic Information of Respondents.

	Frequency	Percentage
Degree		
Bacluruis	110	91.7
Postgraduate	10	8.3
Total	120	100
Gender		
Male	112	93.3
Female	8	6.7
Total	120	100
Age		
20 – 24 years	90	75
25 – 29 years	24	20
30 years and above	6	5
Total	120	100

Major		
Islamic Studies	47	39.2
Linguistic	62	51.7
Science	9	7.5
Math	2	1.7
Total	120	100

Table 1 above shows the demographic information of the respondents of the study, 110 (91.7%) were Bacluruis while the remaining 10 (8.3%) were postgraduate teachers. The gender details of the respondents show that the study was dominated by male teachers at 93.3% while only 6.7% were female.

In regard to age, a good number of the respondents were aged below 25. 90 respondents were aged between 20 to 24 years, which translates to 75% of the study sample. 24 respondents were aged between 25 to 29 years while only 6 (5%) were 30 years and above. On the other hand, the characteristics of the respondents in regard to their major indicate that Islamic studies are highly represented as 47 of the respondents majored in it. Linguistics had the highest number of respondents at 62 (51.7%), Science had 9 respondents (7.5%) while Math had the lowest representation with only 2 respondents majoring in math, which translates to only 1.7% of the study sample

Research Question 1. What are the competency levels of each of the seven TPACK scores, among pre-service teachers?

Table 2: Competency levels of the seven TPACK scores.

Item	Statement	SA	A	N	D	SD	X(S.D)
1	I know how to solve my own technical problems	3.3	3.3	14.2	50	29.2	3.9(0.93)
2	I can learn technology easily	0.8	2.5	7.5	36.7	52.5	4.3(0.79)
3	I keep up with important new technologies	0.8	1.7	15	45	37.5	4.1(0.80)

4	I frequently play around the technology	1.7	7.5	10.8	40	40	4.0(0.97)
5	I have the technical skills I need to use technology	0.8	7.5	11.7	43.3	36.7	4.0(0.92)
6	I have had sufficient opportunities to work with different technologies	8.3	14.2	25	30	22.5	3.4(1.22)
7	I have sufficient knowledge about (the particular content) I teach	1.7	0	13.3	35	50	4.3(0.89)
8	I have various ways and strategies of developing my understanding (the particular content) I teach	0.8	1.7	10.8	47.5	39.2	4.2(0.77)
9	I know how to improved student learning lessons	2.5	3.3	18.3	33.3	42.5	4.1(0.98)
10	I can adapt my teaching based-upon what students currently understand or do not understand	0	4.2	18.3	33.3	44.2	4.1(0.87)
11	I can adapt my teaching style to different learners	0	1.7	13.3	34.2	50.8	4.3(0.77)
12	I can use a wide range of teaching approaches in a classroom setting	1.7	5.0	14.2	35	44.2	4.1(0.95)
13	I can assess student learning in multiple ways	0.8	5.8	10.8	40	42.5	4.1(0.90)
14	I am familiar with common student understandings and misconceptions	1.7	2.5	12.5	39.2	44.2	4.2(0.88)
15	I know how to organize and maintain classroom management	0	4.2	16.7	28.3	50.8	4.2(0.88)
16	I can select effective teaching approaches to guide student thinking and learning	0	5	15	36.7	43.4	4.1(0.86)
17	I can choose efficient teaching methods to illustrate difficult concepts in the subject	1.7	4.2	10.8	44.2	39.2	4.1(0.89)
18	I can select effective teaching approaches that reflect my student's prior knowledge	0.8	4.2	18.3	33.3	43.3	4.1(0.91)
19	I know about technologies that I can use for understanding and doing concepts	0	2.5	15	35	47.5	4.2(0.80)
20	I know about technologies that I can use to clarify the concepts in the content that I teach	3.3	1.7	19.2	32.5	43.3	4.1(0.99)

21	I know about technologies that can deepen my content area knowledge	1.7	4.2	20	36.7	37.5	4.0(0.94)
22	I have the ability to choose technologies that enhance the understanding of the content of the subject matter	4.2	0	19.2	35.8	40.8	4.0(0.98)
23	I can choose technologies that enhance the teaching approaches for a lesson	0.8	1.7	15.8	40.8	40.8	4.1(0.82)
24	I can choose technologies that enhance students' learning for a lesson	0.8	3.3	18.3	33.3	44.2	4.1(0.90)
25	I am thinking critically about how to use technology in my classroom	2.5	6.7	19.2	34.2	37.5	3.9(1.03)
26	I can adapt the use of the technologies that I am learning about different teaching activities	0.8	8.3	16.7	32.5	41.7	4.0(0.99)
27	I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn	0.8	5	14.2	39.2	40.8	4.1(0.90)
28	I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom	0	8.3	13.3	38.3	40	4.1(0.92)
29	I can provide leadership in helping others to coordinate the use of the content, technologies and teaching approaches at my school and/or district	0	5	20	37.5	37.5	4.0(0.88)
30	I can teach lessons that appropriately combine subject matter technologies and teaching approaches	0	2.5	20	39.2	38.3	4.1(0.81)

To investigate the competency of TPCK among pre-service teachers, the level of competency was measured using a scale of six options. These include; Strongly Agree (SA), Agree (A), Not agree (A), disagree (D), Strongly Disagree (SD) and Not sure (X) as shown in Table 2. The competency levels were represented as a percentage of the respondents.

29.2% of the sample strongly disagreed that they do not know how to solve their own technical problems while 50% disagreed. In regard to learning technology 52.5% pointed that it is not an easy task as only less than 5% agreed and to being able to easily learn new technology. Furthermore, 37% of the sample do not keep up with new technology while 40% of the respondents reported to not being around technology most of the times.

In answering the question of having opportunities to work with different technologies, 25% of the sample population were neutral while a larger percentage of the sample showed that they do not have the opportunities of being exposed to different technologies. Two questions cover the content knowledge and in response to the first, half of the sample revealed that they do not have sufficient knowledge of what they teach. Also, 39.2% and 47.5% of the sample strongly disagree and disagree respectively about having various ways and strategies of developing their understanding in what they teach.

The third part of the TPACK which is pedagogical knowledge has seven questions to capture the competence of the teachers in it. 42.5% of the pre-service teachers showed that they do not know how to improved student learning lessons while 44.2% and 44.3% of the sample have a challenge with adapting their teaching based upon what students currently understand or do not understand.

In adapting the teaching style to different learners, 50.8% of the sample strongly disagree that they can do this while only a very small number agree to it. In using wide range of teaching approaches in classroom setting, 44.2% and 35% strongly disagree and disagree respectively with using different approaches in teaching.

A higher percentage of teachers also disagree about assessing student learning in multiple ways. Over half of the sample in the study also shows that they are not familiar with common students' understandings and misconceptions. Similarly, they do not also know how to organize and maintain classroom management. In the pedagogical content knowledge three questions were put forward to

capture competence of the pre-service teachers. 43.4% strongly disagree about being able to select effective teaching approaches to guide student thinking and learning. Also 39.2% and 44.2% respondents strongly disagree and disagree respectively about being able to choose efficient teaching methods to illustrate difficult concepts in the subject. More than half of the respondents cannot select effective teaching approaches that reflect their student's prior knowledge.

To investigate the competency level of the respondents on technological content knowledge, four questions were used. 47.5% revealed that they do not know the technology to use for understanding and doing concepts. 43.3% and 32.5% of the respondents do not know about technologies that they can use to clarify the concepts in the content that they teach. Also, over 60% of the pre-service teachers have no idea on how to deepen their content-area knowledge. Lastly, a larger part of the sample admitted to not having the ability to choose technologies that enhance the understanding of the content of the subject matter.

To measure Technological pedagogical knowledge competency, five questions were used. Over 80% of the pre-service teachers maintained that they are unable to choose technologies that enhance the teaching approaches for a lesson. Similarly, over 70% do not have the ability to choose technologies that enhance students' learning for a lesson. Also, the response shows that the respondents are not thinking critically about how to use technology in their classroom and they cannot adapt the use of technologies learnt to different teaching activities. 40.8% and 39.2% of the teachers are not competent enough to select technologies to use in their classroom that can enhance what they teach, how they teach and what their students learn.

In assessing competency for technology pedagogy and content knowledge, three questions were thrown to the respondents. The larger part of the respondents as shown in Table 2, disagreed about being able to use strategies that combine content, technologies and teaching approaches that they learned about in their coursework when in the classroom. Over 70% of the pre-service teachers cannot

provide leadership in helping other to coordinate the use of content, technologies and teaching approaches at their school and district, only 5% are able while 20% remained neutral. Lastly, 39.2% and 38.3% of the respondents strongly disagree and disagree respectively about having the ability to teach lessons that appropriately combine subject matter technologies and teach approaches.

Research Question 2. **Is there a statistically significant difference among pre-service teachers and postgraduate program teachers' self-perception of their TPACK?**

Table 3: Difference between pre-service teachers and postgraduate program teachers' self-perception of their TPACK.

	Degree of Respondents	N	Mean	Std. Deviation	Std. Error Mean
TPACK	Bacluruis	110	12.3818	2.15875	.20583
	Postgraduate	10	11.5000	2.99073	.94575

		Levene's Test for Equality of Variances		t-test for Equality of Means.						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
TPACK	Equal variances assumed	3.168	.078	1.196	118	.234	.88182	.73759	-.57880	2.34244
	Equal variances not assumed			.911	9.871	.384	.88182	.96789	-1.27860	3.04224

To determine whether there is a significant difference between pre-service teachers and postgraduate program teachers', the independent sample test was employed, where the 120 respondents comprised of 110 pre-service teachers with a mean of 12.38 in the TPACK response while the remaining 10 were postgraduate with an average of 11.5 in their response to TPACK perception.

Levene' test for equality of variance has a p-value of 0.078 which is higher than the 5% significance level. Also, the t-test for equality of means has a p-value of 0.234 under the assumption of equal

variance and 0.384 under the assumption of variances no equal. We, therefore, conclude that there is no statistically significant difference among the TPACK perception of pre-service teachers and teachers' postgraduate program.

Research Question 3. **Is there a statistically significant difference among pre-service teachers' TPACK competencies levels based on their major?**

Table 4: difference among pre-service teachers' TPACK competencies levels based on their major.

			Sum of Squares	df	Mean Square	F	Sig.
I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom * Major of the Respondents	Between Groups	(Combined)	6.569	3	2.190	2.639	.053
	Within Groups		96.231	116	.830		
	Total		102.800	119			
I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school and/or district * Major of the Respondents	Between Groups	(Combined)	1.705	3	.568	.727	.538
	Within Groups		90.620	116	.781		
	Total		92.325	119			
I can teach lessons that appropriately combine subject matter technologies and teaching approaches * Major of the Respondents	Between Groups	(Combined)	2.488	3	.829	1.243	.297
	Within Groups		77.378	116	.667		
	Total		79.867	119			

The ANOVA table was used to examine whether there is a statistically significant difference among pre-service teachers' TPACK competency levels based on their major. The descriptive analysis shows that linguistics has the highest respondents followed by Islamic studies. As shown in Table 4, the p-value of the variables between groups is not statistically significant and we can, therefore, conclude that there is no significant difference among pre-service teachers' TPACK competency levels based on their major.

Research Question 4. **Is there a relationship between university teaching environment, school learning teaching environment for technology integration and pre-service teachers' integration technology during their internship?**

Table 5: The relationship between university teaching environment, school learning teaching environment for technology integration and pre-service teachers' integration technology during their internship.

		Faculty in college of Education a model for combine the content, technology and teaching methods in their teaching	Teaching equipment and support available within my university	Teaching equipment and support available within the school
Faculty in college of Education a model for combine the content, technology and teaching methods in their teaching	Pearson Correlation	1	.236**	.151
	Sig. (2-tailed)		.010	.100
	N	120	120	120
Teaching equipment and support available within my university	Pearson Correlation	.236**	1	.514**
	Sig. (2-tailed)	.010		.000
	N	120	120	120
Teaching equipment and support available within the school	Pearson Correlation	.151	.514**	1
	Sig. (2-tailed)	.100	.000	
	N	120	120	120

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

A correlation was used to check if there is any relationship between the university teaching environment, school learning teaching environment for technology integration and pre-service teachers' integration technology during their internship. The results show that there is a positive correlation between the environment and the support available in the school learning environment with $r = 0.236$ with p-value of 0.010.

The university teaching environment has a positive relationship with pre-service teacher's integration technology during their internship but the result is not statistically significant as the p-value is 0.100. In between school learning teaching environment for technology and pre-service teachers' school during their internship, a statistically significant positive relationship was found with $r = 0.514$.

Discussion.

The intersection of the pedagogical content knowledge (PCK) which focuses on the ways of teaching particular content-based material to students, technological pedagogical knowledge (TPK) focusing on a particular technology when teachers are teaching a certain subject matter, and technological content knowledge (TCK) covering the selecting and then using technologies to teach particular content knowledge form what is being referred to as TPACK (Thompson & Mishra, 2007).

The findings of this study show that the competency of the pre-service teachers on the TPACK is very low in Saudi Arabia. The response to the seven contents of the TPACK shows that the confidence of the teachers to handle each of the TPACK is not up to what is expected. They are more comfortable with the nontechnology related knowledge domains.

The Findings further reveal that there is no difference in the perception of pre-service teachers of TPACK and the perception of the postgraduate teachers about TPACK.

The findings are in line with the work of Turgut (2017) who did a comparison of pre-service, in-service and formation program for teacher's perception of TPACK found that there is no significant difference in the perception among the teachers.

The major of the pre-service teachers does not have a significant effect on their TPACK's competency. This concurs with Yua and Yuhang (2012) argument that irrespective of how knowledgeable a teacher is in ICT, it is not always easy to automatically transform the knowledge into their ability to utilize it in their teaching.

Lastly, the findings suggest there is a relationship between the university teaching environment and the support available in their university. Also, there is a connection between the support available between the university and that the school in which the teachers are interning (Jita, 2016).

The findings have further highlighted the lagging of the use of technology in the university-based coursework serves as the gap for the integration of technology into teaching and low competence in the use of technology among the pre-service teachers in delivering their tasks.

CONCLUSIONS .

The study aimed at identifying the competency of pre-service teachers in the context of university or a higher learning institution. Their abilities and knowledge and how to integrate them with technology have been elaborated.

The correlation between the TPACK framework and its implementation by pre-service teachers have been explained and faculty's integration technology explained and affected students identified.

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DATA OF THE AUTHOR.

1. Yousef A Aljemely. Department of Educational Science, College of Education, Majmaah University, Majmaah 11952, Kingdom of Saudia Arabia. Email: y.aljemely@mu.edu.sa

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