TECHNOLOGY INTEGRATION KNOWLEDGE ASSESSMENT AMONG CRIMINAL JUSTICE EDUCATORS

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Abstract - Technology integration in education became prevalent during the pandemic. This study aims to determine the knowledge of criminal justice educators' Technological Pedagogical and Content Knowledge (TPACK) and to investigate how their attributes affect the former. With this, a survey tool was administered to faculty members from three private universities in Baguio City. Specifically, weighted mean, frequency distribution, and analysis of variance (ANOVA) were used to analyze the data. The findings show that they are highly knowledgeable on the content they are teaching (CK); know how to interpret the subject matter and find various methods to represent it (PCK); and finally, know about the methods of teaching and learning (PK). Further, only age and teaching experience emerged to have a significant difference on their level of knowledge. Nevertheless, educators in criminal justice have moderate TPACK knowledge where age and teaching experience are a factor that contribute to their level of knowledge in the successful integration of technology in teaching.

Keywords - Criminal Justice Education, Technology Integration, Technology, TPACK

I. INTRODUCTION

The advent of educational technologies around the world revolutionizes the learning process (Christensen, 2020) and transformed the education system(Saez, 2020). As a result, traditional methods of teaching are deemed insufficient in the current era surrounded by technologies (Joseph et al., 2015). Its positive effects on harnessing students' learning process and outcomes (Noor-Ul-Amin, 2013) and influence on education hold massive potential for the improvement of education if properly integrated. Thus, promising a better quality of education (Ifinedo et al., 2019). Due to the sudden emergence of the pandemic, government sectors worldwide imposedphysical restrictions that led to the disruption of face-to-face instruction (ECLAC-UNESCO, 2020; United Nations, 2020). With this, many higher education institutions (HEIs) have shifted to flexible learning modalities (Gayon& Tan, 2021; Palaoag et al., 2020; Pham & Ho, 2020) to sustain learning. Flexible learning modality permits flexibility of schedule, place, and audience including but not limited to the use of technology (CMO 4, 2020). Nevertheless, the pandemic revealed a widespread loss of learning due to the poor integration of technology (Wilichowski& Cobo, 2022). In the Philippines, the Commission on Higher Education (CHED) permitted the use of technology (CHED Memorandum Order No. 4, 2020) to sustain learning. Guided by the provision, various universities and colleges in the country made use of diverse software, applications, and learning management systems to deliver their courses.Hence, the use of technology in education cannot be disputed, rather, emphasis should be made on the integration of technology among teachers to ensure effective learning. Moreover, several studies recognized that teachers play a vital role in the successful integration of technology in teaching (George Lucas Educational Foundation, 2007). Yet, the model used for technology integration must be equally regarded as well. Among the commonly used models in HEIs is the Technological Pedagogical and Content Knowledge (TPACK) model proposed by Mishra and Koehler in 2006 (Adams, 2019). This aids educators to consider how their knowledge domains intersect to effectively teach and engage students with technology. In relation to this, various studies have investigated teachers' knowledge, attitudes, and perceptions of technology integration (Dinc, 2019; Ifinedo et al., 2020; Joo et al., 2018; Kim et al., 2013; Njiku et al., 2019), while others focused on the acceptance of the TPACK model in HEIs (Alsofyani et al., 2012; Blackburn, 2014; Cubeles & Riu, 2018; Fahadi & Khan, 2022; Lin et al., 2012). However, most of the studies do not address the technology integration competency among criminal justice educators. This generates an academic gap to investigate the knowledge of the criminal justice faculty members using the TPACK framework in teaching.

In this regard, this study aims to determine the perceived competency of criminal justice educators in integrating technology to deliver courses using the TPACK framework and how their attributes affect their knowledge of the domains. The findings of the study may serve as a basis for the development of policies and programs that aims to further capacitate faculty members in the application of technology to facilitate learning.

II. METHODOLOGY

2.1. Research Design

A descriptive survey method was used to measure the knowledge required for the successful integration of technology in the field of criminal justice education.

2.2. Population and Locale of the Study

Faculty members of criminal justice education were selected as respondents using a non-probability sampling method, specifically, purposive sampling. To qualify, they must be currently teaching in the field of criminal justice education and utilize technological tools in teaching. Hence, 44 criminal justice faculty members out of 58 participated in the study. A sample size between 30 and 500 is sufficiently large for most researchers (Delice, 2018: Roscoe, 1975 as cited by Mohamed and Daud, 2018). Below is the demographic profile of the respondents (See Table 1).

Variables	Content	Number	%
School Affiliation	University A	32	73%
	University B	7	16%
	University C	5	11%
Age Group			
	20-29	17	39%
	30-39	10	23%
	40-49	12	27%
	50 and above	5	11%
Field of Discipline	Criminology	26	59%
	Forensic Science	4	9%
	Law	7	16%
	Others (i.e Martial Arts, History, Political Science)	6	14%
Teaching Experience	Below 5 years	17	39%
	5 to 10 years	9	20%
	11 to 20 years	10	23%
	Above 20 years	8	18%
Employment Status	Full-time Permanent	13	30%
	Full-time Probationary	12	27%
	Part-time Contractual	19	43%
	Part-time Tenured	1	2%

Table1: Respondents' Demographic Profile

Furthermore, the study was conducted in the three (3) universities in Baguio City, Philippines offering degree programs in the field of criminal justice education. Particularly, these universities were chosen for it adopts flexible learning modality, specifically online distance learning (ODL) which relies heavily on the use of technology in the delivery of their courses. Also, the respondents anonymity and voluntariness to participate in the study were assured.

2.3. Research Instrument

Asurvey questionnaire was administered and draws inspiration from the data-gathering instrument developed by Zahra Hosseini and Anand Kamal (2013) which was adopted and modified from Cubeles and Riu (2018) and Chen and Jang (2014). In the study, a five-point Likert scale was used with the following choices: (1) Strongly Disagree, (2) Disagree, (3) Undecided, (4) Agree, (5) Strongly Agree (See Table 2).

Scale	Mean Range	Verbal Description	Interpretation
5	4.20 – 5.00	Strongly Agree	The respondents are highly knowledgeable in the domain.
4	3.45 – 4.19	Agree	The respondents are moderately knowledgeable in the domain.
3	2.60 – 3.44	Undecided	The respondents are uncertain if he is knowledgeable of the domain.
2	1.80 – 2.59	Disagree	The respondents are partially unfamiliar with the domain.
1	1.00 – 1.79	Strongly Disagree	The respondents are unfamiliar with the domain.

Table 2: Five (5) Point Rating Scale

The instrument was piloted among faculty members in criminal justice education outside the locale of the study which was later subjected to Cronbach's Alpha test for the reliability test of the data-gathering tool. In this regard, the internal consistency revealed a coefficient of 0.90 which shows that the instrument is reliable and has an excellent measure of internal consistency. Moreover, the survey questionnaire designed in a Microsoft form is composed of two (2) sections, Section A and Section B, where Section A includes the demographic data of the respondents, while Section B is composed of the seven (7) domains of knowledge in the TPACK framework. Further, Technological Knowledge (TK) has nine (9) indicators, Pedagogical Knowledge (PK) has seven (7) indicators, Content Knowledge (CK) has two (2) indicators, Technological Content Knowledge (TCK) has five (5) indicators, Pedagogical Content

Knowledge (PCK) has six (6) indicators, Technological Pedagogical Knowledge (TPK) has nine (9) indicators, and Technological Pedagogical and Content Knowledge (TPACK) has four (4) indicators. Overall, the researchers have 42 indicators measuring the seven (7) domains of knowledge in the TPACK framework.

2.4. Statistical Treatment

A quantitative approach using different statistical methods were used for the data analysis. Before the administration of the survey questionnaire, the tool underwent reliability testing using Cronbach's Alpha test. Further, a descriptive analysis was utilized to gain the mean values of the level of knowledge among criminal justice educators with the different domains in the TPACK framework. Moreover, to determine the effect of the faculty members' attributes on the different domains, analysis of variance (ANOVA) was used to confirm the similarity of variances.

III. RESULTS AND DISCUSSION

3.1. Criminal Justice Educators' knowledge of the seven domains of the TPACK Framework

	TK	PK	CK	TCK	PCK	TPK	TPACK
Mean	3.881111	4.252857	4.405	4.122	4.261667	4.182222	4.055
Median	3.98	4.23	4.405	4.23	4.33	4.2	4.09
Mode	4.11	4.36	0	0	4.34	4.23	4.09
Standard Deviation	0.257024	0.086548	0.06364	0.176409	0.148918	0.089132	0.136748

Table 3: The descriptive scores of the knowledge of criminal justice educators on the seven domains of the TPACK framework

Table 3 illustrates the descriptive scores of the knowledge of Criminal Justice Educators on the seven (7) domains of the TPACK Framework. As shown in the table, the CKconstruct obtained the highest mean value of4.40, followed by PCK with a mean of 4.26, and PK with a mean of 4.25. This indicates that criminal justice educators are highly knowledgeable on the subject matter that they are teaching; know how to interpret the subject matter, find various methods to represent it, adapt and align instructional materials to facilitate learning; and finally, possess deep knowledge about the processes, practices or methods of teaching and learning (Koehler & Mishra, 2009). Further, the study on the impact of teacher knowledge on student learning outcomes suggests that better content knowledge and pedagogical content knowledge of teachers produces higher student achievement (Guerriero, 2022).

In relation to this, PK or conventional teaching knowledge obtained the highest mean in several studies (Blackburn, 2014; Cubeles & Riu, 2017; Fahadi & Khan, 2022), yet educators in other countries were highly knowledgeable as well with their TPK and TK. This suggests thatunlike teachers from other countries they are not that familiar with the various technologies that may be used in learning and how to identify and use appropriate technology in facilitating learning. This is apparent in the studies of Fahadi & Khan (2022) where it revealed that educators in HEIs in Bangladesh are perceived to have a high TPK, followed by PK and TK. While Blackburn (2014) and Cubeles and Riu (2018) discovered that educators in the United States have high TPK and TK. Nevertheless, most educators believe that they know the different methods that may be adopted in teaching and learning. This may be due to the generic form of knowledge that an educator must have to understand how students acquire knowledge and skills for it requires an understanding of cognitive, social, and developmental theories of learning and how they apply to students in the classroom. Although academicians in criminal justice were not a professional licensed teachers, some of them had undergone training on the basic teaching methods before teaching. While others obtained units in education, most of them have been relying on their discretion on what mechanism they would see fit in educating their students. In addition, the study showed that criminal justice educators have moderate knowledge of the remaining domains in the TPACK framework. Particularly, TK, TCK, TPK, and TPACK. Among these domains are the TK with a mean of 3.88whichobtained the lowest mean score followed by TPACK with a mean of 4.05 and TCK with a mean of 4.12. This indicates that criminal justice educators somehow know about various technologies, ranging from low-tech technologiessuch as pencil and paper to digital technologies such as the Internet, digital video, interactive whiteboards, and software programs. For instance, educational technologies such as virtual laboratories particularly Labster have been used by some faculty members of one (1) participating university; learning management systems like canvas and google classroom were also used and online communication platforms such as zoom, google meet, and skype during synchronous sessions. In addition, they also have moderate knowledge in understanding the manner in which technology and content influence and constrain one another and in understanding the interactions among content,

pedagogy, and technology knowledge which serve as the basis of effective teaching in technology (Koehler & Mishra, 2009).

In summary, CKemerged as having the highest level of knowledge among criminal justice educators while TK obtained the lowest level which is consistent with the findings of Akram et al. (2021). Hence, criminal justice educators are highly knowledgeable on the subject matter that they are teaching yet their awareness andability to use various technologies is limited. Nevertheless,criminal justice educators know the seven (7) domains of the TPACK framework to facilitate learning.

3.2. The level of knowledge of criminal justice educators on the seven domains of the TPACK framework based on their attributes.

DOMAIN	AGE BRACKET				F	p
	20-29	30-39	40-49	50 and above		
TK	4.065359	3.911111	3.564815	3.955556	3.83	0.04*
PK	4.260504	4.528571	4.071429	4.114286	3.94	0.03*
CK	4.323529	4.3	4.625	4.4	1.21	0.32
TCK	4.075	4.222222	4.218182	3.7	1.37	0.27
PCK	4.166667	4.277778	4.409091	4.166667	0.70	0.56
TPK	4.20915	4.222222	4.212963	3.933333	0.64	0.59
TPACK	4.117647	4.15	4	3.8	3.66	0.044*

Table 4: Descriptive scores of the level of knowledge of criminal justice educators on the TPACK framework based on Age

Table 4 illustrates the level of knowledge of criminal justice educators on the seven (7) domains in TPACK framework in reference to their age. Based on the findings, the null hypothesis is rejected where the computed p-value of 0.44*reveals that the age of criminal justice educators did have a significant difference in their TPACK. Specifically, age groups from 20-29, 30-39 and 40-49 are moderately knowledgeable in TPACK to facilitate learning effectively, while those who belong to the age group of 50 and above are found to be uncertain if their knowledge in integrating technology using the framework is sufficient. Such finding suggests that younger respondents tend to be more confident that they are knowledgeable than their older counterparts in integrating the knowledge of technology, pedagogy, and content. This is consistent with the study of Fahadi and Khan (2022) where the utilization of technology enhanced teaching in engineering education is influenced by their age group. However, their study revealed that older teachers are more likely to achieve higher TPACK despite being moderately knowledgeable in their TK while younger teachers are likely to have lower TPACK despite having technology knowledge. Hence, contrary to findings of this study, their study asserts that despite being not highly knowledgeable to various technologies, older teachers are more likely to understand the interactions of the use of technology in aligning with the content and pedagogy in teaching.

Further, the computed p-value of 0.04* in TK showed a significant difference between the above-mentioned constructs based on their age. Particularly, those who belong to age groups of 30-39, 40-49 and 50 and above obtained lower mean value compared to those who belong to the age group of 20-29. This shows that younger respondents are more knowledgeable of and have the ability to use different technologies and technological tools than the older faculty members. This is consistent with the study published by Lieberman (2017) where younger adults (between ages of 18 and 34) expressed they learn better from technology that from fellow humans. While in the study of Vaportiz et al. (2017), older adults perceives that the lack of instructions and guidance, lack of knowledge and confidence serve as barriers in using technology. Moreover, the computed p-value of 0.03*revealed that PK did have a significant difference based on their age. Specifically, those who belong to the age groups of 40-49 and 50 and above obtained the lowest mean in PK compared to those faculty members belonging to the age groups of 20-29 and 30-39. This indicates that younger faculty members are confident that they are more appraised with the practices, processes, and methods regarding teaching and learning compared to their older counterparts. Such finding is consistent with the study of Hsu& Chen (2018) where age produced a significant difference in pedagogical knowledge. Ultimately, younger respondents tend to have high TPACK, TK, and PK than their older counterparts. The result of the study may be due to number of respondents in the study where most of them belongs to the age group of 20-29 (39%). This suggests that younger faculty members seem to dominate criminal justice education in Baguio City. Nevertheless, it is apparent that younger respondents have more confidence in integrating technology to teaching using the TPACK framework.

DOMAIN	FIELD OF DISCIPLINE				F	p
	Criminology	Forensic	Law	Others		
TK	3.862222	4	3.787037	3.844444	0.16	0.92
PK	4.28	4.155844	4.085714	4.085714	0.57	0.64
CK	4.3	4.75	4.583333	4.4	1.48	0.24
TCK	4.144	4.2	4.2	3.8	1.07	0.37
PCK	4.22	4.5	4.333333	4.1	0.72	0.54
TPK	4.191111	4.277778	4.185185	3.933333	3.63	0.041*
TPACK	4.12	3.9375	4.125	3.8	0.62	0.61

Table 5: Descriptive scores of the level of knowledge of criminal justice educators on the TPACK framework based on the field of discipline.

Table 5 shows the level of knowledge of criminal justice educators on the seven (7) domains of the TPACK Framework based on their respective field of discipline. Based on the results, their level of knowledge in reference to their field of discipline does not significantly differ as evidenced by a p-value of 0.61. This means that the respondents have a comparable level of knowledge when integrating technology into teaching regardless of whether they are in the field of Criminology, Forensic, Law, or other disciplines which is also similar with the findings of Fahadi and Khan (2022). Despite the differences in the field of specializations, criminal justice educators have the same level of TPACK knowledge. However, a p-value of 0.041* revealed that there is a significant difference in the TPK among the criminal justice educators in reference to their respective fields of discipline. Specifically, the Forensic science instructors obtained the highest mean value in the TPK compared to those who belong in the fields of Criminology, Law and other disciplines. This shows that forensic science educators are highly knowledgeable in understanding how particular technologies can change both the teaching and learning experiences by introducing new pedagogy compared to those who belong to other disciplines. This indicates that among them, those who belong to the field of forensic science have sufficient knowledge in the interactions of technology in the delivery of their courses. For instance, courses that are being taught by those in the field of Forensic Science are technical courses where the use of various tools, equipment, and technology is necessary in delivering their courses. Courses such as Personal Identification Techniques, Forensic Ballistics, DNA analysis Techniques requires the use of specialized skills and equipment such as Labster and other simulation technologies being used by one of the participating universities. Nonetheless,this study shows that regardless of the field of discipline, criminal justice educators have the same knowledge when integrating technology using the framework.

DOMAIN	**TEACHING EXPERIENCE**				**F**	**p**
	Below 5	5-10	11-20	Above 20		
TK	4.111111	3.763889	3.765432	3.571429	3.85	0.033*
PK	4.25	4.321429	4.333333	4	1.02	0.39
CK	4.53125	4.25	4.333333	4.357143	0.75	0.53
TCK	4.0875	3.95	4.177778	4.428571	1.44	0.25
PCK	4.3125	4.020833	4.277778	4.357143	0.95	0.43
TPK	4.125	4.097222	4.234568	4.301587	0.43	0.73
TPACK	3.9375	3.8125	4.305556	4.25	3.97	0.032*

Table 6: Descriptive scores of the level of knowledge of criminal justice educators on the TPACK framework based on teaching experience.

Table 6 shows the level of knowledge of criminal justice educators on the seven (7) domains of the TPACK framework in reference to their teaching experience. The respondents' technology integration knowledge using TPACK framework in reference to their teaching experience revealed that there exists a significant difference with a p-value of 0.032*. Hence, the null hypothesis is rejected which means that the respondents' technology integration knowledge using the TPACK framework differs with regards to their teaching experience. Specifically, those who have been teaching below 5 years and 5-10 years obtained a lower mean value compared to those who have been teaching for 11-20 years and above 20 years. This suggests that those seasoned faculty members are more familiar in understanding the interactions among content pedagogy and technology knowledge (TPACK) compared to those novice faculty members. This may be due to the wisdom and knowledge that one acquires through experience. Similarly, Antony et al., (2019) found that teaching experience affects the TPACK knowledge of biology teachers.Contrary to this finding, the study of Akram et al. (2021) shows that those who have been teaching for 2-5 years have higher TPACK than those who have been teaching for at least a year. Further, Fahadi and Khan (2022) also found that the use of TPACK in teaching seems not to be influenced by the number of

years they have been teaching in Engineering education. The varying results among the studies showed that the teachers' TPACK knowledge varies among countries and their field of education.

In addition, findings revealed that there is a significant difference on the TK of criminal justice educators in reference to their teaching experience as evidence by the p-value of 0.033*. Particularly, those who have been teaching for more than 20 years have lower TK compared to the others. This indicates that seasoned faculty members are not that knowledgeable as to the different technology to be used in teaching compared to those novice faculty members. As mentioned in the study of Winter et al. (2021), their perception towards their own skills and the challenges posed by the utilization of technologies affects how they use different technologies. In this regard, the longer teachers spent teaching translates to a better understanding the major components of TPACK.

DOMAIN	EMPLOYMENT STATUS				F	p
	Full-time Permanent	Full-time Probationary	Part-time Contractual	Part-time Tenured		
TK	4.025641	3.842593	3.759259	4.666667	1.31	0.29
PK	4.373626	4.214286	4.150794	5	1.85	0.15
CK	4.307692	4.291667	4.583333	4	1.57	0.21
TCK	4.138462	4.1	4.166667	3.4	0.87	0.47
PCK	4.25641	4.180556	4.342593	3.833333	0.63	0.60
TPK	4.222222	4.157407	4.191358	3.777778	0.35	0.39
TPACK	4.096154	4.104167	4	4	0.13	0.93

Table 7. Descriptive scores of the level of knowledge of criminal justice educators on the TPACK framework based on employment status

Table 7 shows the level of knowledge of criminal justice educators on the TPACK framework based on employment status. In the study, the respondents were classified as Full-time permanent, Full-time probationary, Part-time Contractual and Part-time tenured. The computed p-value of 0.93 shows that the null hypothesis is accepted where the knowledge of the respondents when grouped according to employment status does not significantly vary.

IV. CONCLUSIONS

The major conclusions are as follows:

1. Criminal Justice Educators are more familiar with the traditional teaching compared to the use and successful integration of technology in teaching. Thus, educational administrators may consider providing capacity building activities designed to equip and enhance criminal justice educators' TPACK coupled with clear policies that encourages academicians to integrate technology in the delivery of their courses.
2. Age and seniority in teaching does matter in the successful integration of technology in teaching. However, to address the limitation of the study, future researchers may considerincreasing the number of respondents and broaden the locale of the study to generate a more generalizable result.

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