
Developing and Validating an Instrument: Teachers' Readiness on TPACK and 21st Century Skills in Relationship with Job Stress at School

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Abstract

Being a teacher is one of the most stressful occupations in the world. The lack of suitable knowledge and teaching skills might hinder a teacher from carrying their role and responsibility as a teacher. There are also situations when even though teachers have the right knowledge and skills, they are not ready to practice both competencies, and this will give pressure to them as well. The paper describes the survey development, the validation process and the results from the pilot study on teachers' readiness on Technological Pedagogical Content Knowledge (TPACK) and 21st century skills in relationship with the job stress at school. This pilot study involved 32 teachers from national secondary schools in greater Kuala Lumpur area. The Cronbach's Alpha statistic of each variable and factor domains were determined. The results suggest that all 110 items are reliable, and the instrument is valid. This finding will help educators to conduct more research pertaining to this topic.

Keywords: TPACK; 21st Century Skills; Readiness; Job Stress, Teacher

I. INTRODUCTION

This study aims to develop and validate an instrument designed to measure teachers' readiness on Technological Pedagogical Content Knowledge (TPACK) and 21st century skills and their relationship with job stress at school. This article details the steps taken to develop and validate the instrument to measure the level of teachers' readiness on TPACK and 21st century skills. At the end, the study examined the results and link them to the level of job stress experienced by the teacher in national secondary school. An instrument plays an important role in research [1]. The researcher must ensure a suitable instrument is used in their study to meet the purpose and objective of research. The instrument development is crucial to ensure the consistency of the instrument.

In the meantime, being a teacher is one of the challenging task in the world as the world changes rapidly in all sectors, including education. The robust development of the education system requires teachers to be knowledgeable and skilful so that teacher can take on the role of facilitators in the 21st century classroom [2]. While being updated with the latest competencies (TPACK and 21st century skills) is important, readiness to apply both knowledge and

skills into the classroom serves as the determiners of the level of job stress in performing these tasks at school. Teachers' job stress at school is a serious issue as the situation will not only impact their role as educators, but also the school management, students' learning, their family wellbeing and the society directly or indirectly. This pilot study aims to answer the research questions below;

A. *Are the items in the instrument suitable to measure variables used in this study?*

B. *Are the scores obtained from the adapted and adopted items valid and reliable?*

II. LITERATURE REVIEW

Teachers' quality can be reflected through the personal value they possess. Possessing a good personal value is a determiner of high knowledge and skills which are valuable in this new era of education. In this regard, the present education system demands teachers to increase their knowledge and skills so that they can be more relevant and significant in the 21st century [3], [2].

There are several main variables involved in this research. The first variable is knowledge, which refers to knowledge on TPACK. The next variable is skills, or to be specific, 21st century skills. In the meantime, readiness refers to teachers'

readiness to apply TPACK and 21st century skills and the last variable is job stress or the level of stress experienced by teachers pertaining to the TPACK, 21st century skills and readiness.

A. TPACK Framework

The TPACK framework was developed based on ideas put forward by Schulman (1986). The idea was on 3 main components developed which Pedagogical Content Knowledge (PCK), however the framework was improvised with injection of technology component forming the Technological Pedagogical Content Knowledge (TPACK) [4], [5].

According to [6], [4], [7], [8] TPACK is a combination of 7 components, which are Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK) and Technological Pedagogical Content Knowledge (TPACK). The TPACK framework highlights the type of knowledge required by teachers to integrate technology in all areas effectively [9].

Technological Knowledge (TK) refers to standard pen and paper technology, including books, and whiteboards. On the other hand, advanced technology associate with the internet and digital videos [4]. Computer hardware, the word processor, spreadsheets, browser and email are examples of digital technologies. TK also includes ways of installing and removing devices, software programs and creating and archiving documents [4].

Content Knowledge (CK) refers to the subject being taught, including theories, concepts and others [8].

Pedagogical Knowledge (PK) refers to the method, technique, process and procedure that are integrated in teaching and learning in the classroom [4].

Pedagogical Content Knowledge (PCK) denotes the teaching methods which are suitable to the content and vice versa. PCK is reflected through knowing on how content components can be organized to improve teaching [4].

Technological Pedagogical Knowledge (TPK) refers to competence of numerous technologies being used in teaching and learning [4].

Technological Content Knowledge (TCK) refers to the knowledge of how technology can

create new representations of a particular knowledge [8].

Technological Pedagogical Content Knowledge (TPACK) refers to the knowledge to integrate technology into the pedagogical approaches in teaching in a subject area. [8]. It can be said that TPACK is a knowledge combining of content, pedagogy and technology [10].

B. 21st Century Skills

Skill is important competency for a teacher. In 1900s, basic skills, specifically writing, calculating and reading are deemed sufficient, however in today's world education system require more than the basic skills which concurrently with the need of futures' education expected students competent in high standards set of skills [11]. The Partnership for 21st Century Skills Framework 2006 is a model of skills required by teachers in the 21st century. This framework highlights 3 main skills which are Learning and Innovation Skills, Information, Media and Technology Skills and Life and Career Skills [9], [12], [13], [14]. Under Learning and Innovation Skills there are 4 sub skills, namely creativity and innovation, critical thinking and problem solving, last but not least is communication and collaboration. There are 3 sub skills under Information, Media and Technology Skills which are information literacy, media literacy and information, communication and technology (ICT) literacy. In regard to Life and Career Skills, there are 5 sub skills which are flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability and the last one is leadership and responsibility. All the sub skills under 3 main skills were discussed based on needs and importance of each skill to be mastered by teachers and how they contribute to the quality of a 21st century teachers [9] [11], [15], [16].

C. Readiness

Teachers' readiness is very significant in determining the success implementation of TPACK and 21st century skills among teachers. Without the readiness aspect the knowledge and skills that they possess will not be practiced accordingly. Readiness in this scope refers to the need for teachers to be ready in every circumstance pertaining to knowledge and skills they possess. In this day and age, such readiness is important as there will always be a new knowledge and skills to be learned and prepared by teachers in line with the current situation. As shown in [4], [10] daily tasks associated with technology such as operating systems and browsers will definitely change,

dissolve and eventually becoming outdated as time goes by.

D. Job Stress

Teaching has become a very challenging and stressful career [17], [18], [19], [20]. Stress is defined as bad emotion which includes the state of anxiety, conflict, frustration, tension, depression diagnosed from psychological and physiological symptoms as a results from unmanaged demands and pressures of work situation [21], [2], [22], [20], [23]. On the other hand, discomposure, fear, tenseness and anxiety while learning and using computer technology ultimately resulting in mental and physical problems is described as technostress [24], [25], [26]. Technostress has a significant negative impact on employee productivity [24]. According to [27] teachers who feel anxious to use

new technology will be less inclined to practicing it in their job scope as compared to teachers who are confident using technology and always integrate technology in their classroom. Technology adoption in teaching is one of the factor that leads to stress. Other factors contributing to stress among teachers are workload, work relationship, role conflict and ambiguity, students' discipline, change, inefficient management and time pressure [28], [29], [30]. The stress experienced by teachers often evident in symptoms such as increased heart rates, blood pressure, alcohol consumption, smoking habit, insomnia, depressive mood and job dissatisfaction [17], [21], [31]. From the research on stress among teachers, it is suggested that to reduce stress, teachers could change their ways of doing things which in turn, could help them improve their functional skills[20].

III. RESEARCH METHODOLOGY

This pilot study employed the quantitative approach to investigate the level of TPACK, 21st century skills readiness among teachers and its relationship with the level of job stress among 32 teachers in national secondary schools located in 3 main zones namely the Bangsar/Pudu zone, Keramat zone and Sentul zone in greater Kuala Lumpur. We constructed the survey using TPACK and The Partnership for 21st Century Skills Framework questionnaire and thoroughly reviewed the items adopted from the questionnaire. First step in developing the questionnaire is reviewing related literature review and viewing similar questionnaire related to this topic. After gathering all items, the researcher grouped the items according to sections. The questionnaire was divided into five sections: demographic, TPACK, 21st century skills, readiness on TPACK, readiness on 21st century skills and job stress at school. There were 110 items in the questionnaire and the participants answered each question using the five-level Likert scale. The scale used in section B and C, the ranges from 1= strongly disagree, 2=disagree, 3=least agree,

4=agree and 5=strongly agree. As for section E, the scale used is a combination of 3 Likert scales, which ranges from 1=not stressful at all, 2=not stressful, 3=occasionally stressful, 4=stressful and 5=very stressful. Another application of Likert scales for the section E was 1=never, 2=seldom, 3=sometime, 4=often and 5=always. All adapted and adopted items were reviewed by panel of experts for content validation. The process of expert validation took around 2-months time. A total of 129 items were reviewed and commented by 11 experts from various field in 5 universities. Selected experts were given an evaluation form to be filled out. Feedback from the form were gathered and reviewed thoroughly. With some of the expertise panel, there were formal discussion been set up in order to get better and clearer view from the experts. Some of the items were deleted based review and comments. The final version of the instrument was prepared for submission the respondents in the pilot study. The questionnaire was sent out via google form to reach more respondents as it allows them to answer the questions faster at their own time and convenience. The breakdown of the items in each section, samples of items in the questionnaire and the sources of instrument are presented in Table 1 and 2 respectively.

Table 1: Number of Items for Each Section in the instrument

Section	Number of Item
A: Demographic	8
B: Technological Pedagogical Content Knowledge (TPACK)	30
C. 21 st Century Skills	19
D. Readiness on TPACK and 21 st Century Skills	14
E. Job Stress	39
TOTAL	110

Table 2: Variables and Sources of the Instrument

Variable	Element	Sample of Items	References From
TPACK	TK	“I keep up with new technologies”	[8],
	PK	“I know how to assess student performance”	[8],
	CK	“I have sufficient knowledge about my subject”	[8],
	PCK	“I know how to select effective teaching approaches to guide student in the subject”	[8],
	TPK	“I know how to use ICT in teaching as a tool for students to plan their own learning”	[8], [32]
	TCK	“I know about technologies that I can use for understanding on the subject”	[8], [32]
	TPACK	“I can use strategies that combine content, technologies and teaching approaches in my classroom”	[8]
21 st Century Skills	Learning and Innovation	“I use engaging instructional strategies suitable to student’s level of acceptance”	[33]
	Information, Media and Technology	“I incorporate and integrate different forms of media into my teaching and learning”	[33]
	Life and Career	“I respect cultural differences among student”	[33]
Readiness	On TPACK	“I am ready with the activities require creativity skill”	[8], [34]
	On 21 st Century Skills	“I am confident in giving feedback to student verbally”	[35], [34], [36]
Job Stress	Factors Perspective	“Dealing with student discipline” “Using technologies for teaching and learning purposes”	[37], [38] [37]
	Feelings of being a teacher	“I love working at this school”	[37], [39], [40]
	Symptoms	“Headache/migraine”	[37], [39]

IV. RESULT AND DISCUSSION

The pilot survey involved 32 teachers from the national secondary schools around the greater Kuala Lumpur area. The reliability coefficients of the items in the instrument are shown in Table 3.

Table 3: Reliability Analysis of the items in the Questionnaire

Cronbach's Alpha Coefficients		
		Reliability (α)
Section B	TPACK	0.975
	TK	0.712
	PK	0.940
	CK	0.841
	PCK	0.972
	TPK	0.923
	TCK	0.844
	TPACK	0.934
Section C	21st Century Skills	0.925
	Learning and Innovation Information, Media and Technology Life and Career Basic Skills	0.814
		0.670
		0.885
		0.834
Section D	Readiness	0.917
	TPACK	0.807
	21 st Century Skills	0.883
Section E	Job Stress	0.956
	Factors Perspective Feelings of being a teacher Symptoms	0.935
		0.968
		0.949
		0.963

In reference to the Cronbach's Alpha values of items in each section, the cumulative values for each section range between 0.917 – 0.975. According to [41], an item needs to have a Cronbach's Alpha value be greater than 0.60 to be used in a research instrument. The cumulative Cronbach's Alpha value for section B on TPACK is $\alpha=0.975$ for the 30 items tested. As for section C on 21st Century Skills, the cumulative Cronbach's Alpha is $\alpha=0.925$ for the 19 items tested while the cumulative Cronbach's Alpha for 14 items tested under section D is $\alpha=0.917$. Lastly, the cumulative Cronbach's Alpha value for 39 items on Job Stress in section D is $\alpha=0.956$. Based on all values from all sections on the questionnaire, all values are greater than 0.80 which indicates it high reliability.

V. CONCLUSION

The development and validation of an instrument is one of the most important elements in conducting research. Researchers might face numerous challenges during the process. In this regard, the first step is to ensure the right and suitable instrument is being used. This process will help ensure a seamless data collection process. Steps involved in developing and validating an instrument are crucial and researchers should not neglect any procedure involved. The process will give an opportunity to a researcher to become more creative and think out of the box in adapting and adopting existing instruments. The choice of words and sentences in the instrument will also have a significant impact and meaning to the respondents. In this regard, words like "can" and "able" could bring a different meaning and perception to the target audience. A good instrument will become a reference for future research.

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