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Mapping the Attribute of Digital Competency Framework for Educators

*[1]Farah Zeehan, [2]Rose Alinda Alias,[3]Zaidatun Tasir

ABSTRACT--- *During recent years, digital competence has become a major concept in the discussion of which skills people should have especially in educational field. Educators' digital competence is becoming a key element for designing innovative pedagogical practice in order to improve student learning experience. However, educators may not realize their own digital competency cause them to be complaisant and teach monotonously without any advancement. Study were implemented in two different phases. Phase 1 involving deeper analysis and mapping technique while phase 2 is the process of developing framework based on the result from phase 1. The findings reveal 3 reciprocal domains consisting 7 identified attributes. Relevance of the investigations will focus on the positive impact for the educator in evaluate their own digital competency. Framework may assist them in improving their self-development in leveraging digital technology in their educational practice.*

Keywords--- *Digital Competency, Digital Competency for Educators, Digital Competency Framework, Mapping, Digital Technology.*

I. INTRODUCTION

Digital Competency is an essential part of the organization since technology develops continuously at a faster rate. Systems and practices get outdated in certain duration due to new discoveries in technology (Gil-Flores et. al, 2017; World Economic Forum, 2017; World Economic Forum, 2016). With the rapid expansion of opportunities and changes in the 21st century, technology in education has become no longer an option or a choice, but an inevitable reality.

Various researches and articles (Castellacci & Tveito, 2018; Senkbeil & Ihme, 2017; World Economic Forum, 2017a; 2017b) have found that the value of education integrating with digital technology is directly linked to the educators' capability or how competent the educators towards digital technology; the more knowledgeable and skilful the educators are on digital technology, the more the students are able to understand them. However, in reality, most of educators did not aware their digital competency (Benali & Kaddouri, 2018). Without realising how digital competent they were, will cause educators who feel complaisant of what they are doing and they are teaching now (Gil-Flores et al., 2017). They might think that when they used creative power point slide and showing YouTube videos in lecture were enough to be digital competent educators.

On the other hand, digital technologies evolve faster than ever in Fourth Industrial Revolution. The development of the devices, software or mobile application rapid and vary. Educators should be agile in adapting the changes (Hall, 2018), so they will ready to prepare their students for the future challenges. If educators did not aware how crucial to acknowledge their own digital competency, they cannot expect different result when they are

[1]* *Scholarship and Sponsorship Division, Ministry of Education, Cyberjaya Malaysia, fzeehan@gmail.com.*
[2] *Azman Hashim International Business School, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia.*
[3] *Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, Johor, Malaysia.*

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still using the same way of teaching. Therefore, his study, will try to understand what are the digital competency attribute that can fit a framework of digital competency which can later be a guidance the educators to do self-evaluation on their digital competency.

II. PURPOSES OF STUDY

This study intends to:

1. Analyze the element of Digital Competency from current Digital Competency Framework
2. Identify the reflective attribute of Digital Competency from UNESCO ICT-Competency Framework for Teachers, ISTE (International Society for Technology in Education) Standard for Teachers and Digital Government Competency Capability Readiness (DGCCR)
3. To design initial Digital Competency Conceptual Framework for educators.

III. LITERATURE REVIEW

After extended literature, there were 3 main frameworks used in this study.

1) UESCO ICT Competency Framework for Teachers – Version 3 2018

Information and Communication Tools Competency Framework for Teachers (ICT CFT) is the result of close work between United Nations Educational, Scientific and Cultural Organization (UNESCO) with its partners, CISCO, Intel, ISTE and Microsoft, as well as world renowned subject matter experts. They conducted an extensive consultation to identify the competencies that teachers should develop to use technology effectively in the classroom. This framework was used as a dominant framework as it provides extensive details for digital competency.

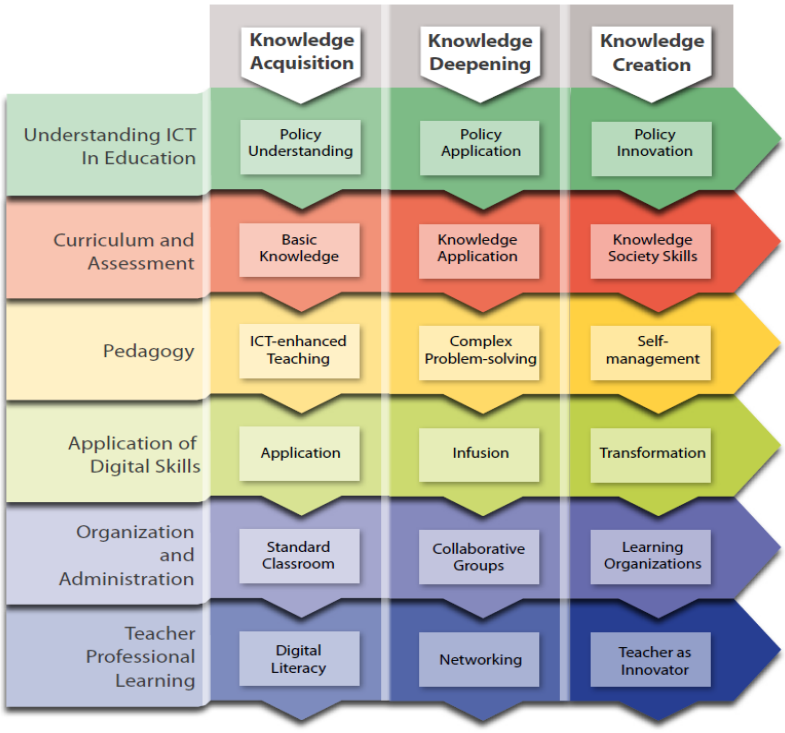

Figure 1: UNESCO ICT-Competency Framework for Teachers (ICT-CFT) (revised 2018)

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2) ISTE Standard for Educators

International Society for Technology in Education is non-profit organization that serves educators interested in the use of technology in education. ISTE helps in bold the roles of educator in their educational practice. There are 7 main roles in standard for educators shown as figure. How educators should behave or perform their journey in teaching & learning is based on these 7 roles.

Figure 2: ISTE Standard for Educators (ISTE.org, 2019)

3) Malaysia Digital Government Competency Capability Readiness (DGCCR) Framework for Individual

DGCCR starts from 2015 is a project to develop competency and capability of civil servants at every level and in every role; covering the breadth and depths of public service delivery, in delivering the best for Digital Government. Malaysia leaders believe a country can be developed by developing human capital that supported with digital competency and capability. Digital Government. The objectives of DGCCR are (1) To strengthen talent and talent-management for the public service of the future; (2) To enhance digital competencies of government civil workforce to deliver efficient public services; (3) To nurture digital champions for more valuable end to end citizen experience. Initially there are two main frameworks, namely Individual Framework and Organisation Framework. Mindfully, digital technology in education is one of the fastest evolution happening, so we contemplate that this latest ongoing framework might provide the sustainability of our digital competency framework for educators.

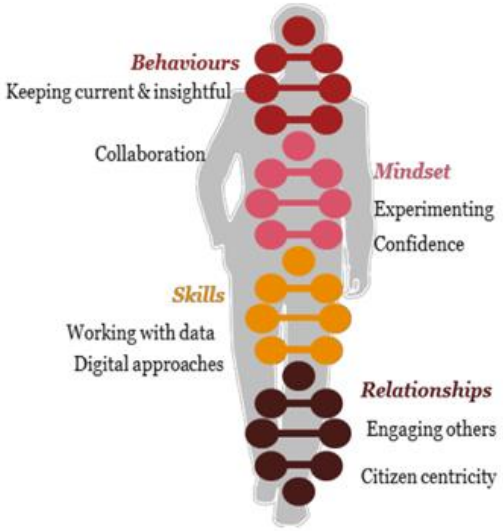

Figure 3: DGCCR Individual Capability

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IV. METHODOLOGY

This study divided into two phases: (1) analysing current digital competency framework, then identify and analysis the reflective attribute from chosen framework, then mapping three different frameworks to identify suitable attributes for digital competency (2) develop a Digital Competency Framework for Educators. In the first phase, comparison table were built by using theory-driven analysis. The mapping technique were implemented comparing two frameworks at a time and later compare back the 3 of them.

V. RESULTS AND DISCUSSION

In the first phase, from the literature we analyze the element of Digital Competency from current Digital Competency Framework. There are a few frameworks from developed and developing countries, and a few from established organization such UNESCO.

Table 1: Comparison for Digital Competency Framework

Framework	*Personal Factor*	*Professionalism Factor*	*Continues Professional Development*	*Underpinning Theory*
UNESCO ICT-CFT 2018	• Understand ICT Policy • Application of Digital Skills	• Curriculum and Assessment • Pedagogy • Organisation & Administration	• Teacher Professional Development	TPACK
DigCompEdu	• Organisational communication • Reflective practice	• Teaching • Guidance • Collaborative learning (student) • Self-regulated learning • Assessment strategies • Analysing evidence • Feedback and planning • Accessibility and inclusion • Differentiation and personalisation • Actively engaging learners	• Professional collaboration Digital Continuous Professional • Development (CPD) • Information and media literacy • Digital communication and collaboration • Digital content creation	TPACK

Korea Teacher competencies for SMART Education	• Creative problem-solving • Social skills • Flexibility • Technology literacy • Ethics • Passion • Evaluation and reflection	• Understanding future • Expertise in content • Rapport building with learners • Instructional design • Network building	• Learning affordance building	TPACK McCelland Motivation Theory
China ICT Competency Standards	• Awareness of importance (of ICT) • Evaluation and reflection • Cooperation and communication • Application awareness • Basic • Basic skills	• Instructional design and implementation • Teaching support and management • Fair application • Effective application • Healthy use • Regulation	• Lifelong learning	TPACK
Model of digital competence for ESL student teachers	• Basic Digital Skills	• Didactic digital competence • Digital Building	• Learning Strategies	TPACK
Malaysia Digital Government Competency Capability Readiness (DGCCR) for Individual	• Experimenting (Mindset) • Confident (Mindset) • Keeping Current and	• Engaging Others • Citizen centricity • Working with data • Digital approach	• Keeping Current and Insightful • Collaborating	No Information

Based on analysis table, after undergo deeper analysis, we found out digital competency details can be categorized into 3 main domains namely (1) Personal (2) Professionalism and (3) Continuous Professional Development. Most of the framework have this similarity. They seem differ for its' attribute they emphasized. What stand out in the result is DigCompEdu Framework, where they point out Professionalism and Continuous Professional Development Factors more than Personal Factors. This might make DigCompEdu being as the most framework that being used in research.

Second step in the first phase, UNESCO ICT-CFT version 3 – 2018 were mapped with ISTE and DGCCR. The reason of mapping the 3 main framework is to reconfirm the attribute that will be chosen for the framework in this study.

1) UNESCO ICT-CFT vs ISTE Standard for Educators

Simple mapping was first developed to compare between UNESCO ICT-CFT with ISTE as shown in Table 2.

Table 2: Mapping between UNESCO ICT-CFT with ISTE

UNESCO ICT-CFT 2018	*ISTE*						
	Learner	*Leader*	*Collaborator*	*Citizen*	*Facilitator*	*Analyst*	*Designer*
Understand ICT Policy							
Curriculum and Assessment	□	□	□	□	□	□	□
Pedagogy	□	□	□	□	□		□
Application of Digital Skills	□	□	□	□	□	□	□
Organisation and Administration	□	□	□	□	□		□
Teacher Professional Learning	□	□	□	□			

The results obtained from the mapping between UNESCO ICT-CFT 2018 and ISTE shows that there are significant relations where almost all aspects in UNESCO ICT-CFT 2018 reflect all the roles represent in ISTE. The one is striking out about the finding in Table 2 is in ISTE Standard of Educators does not emphasize on following institution or national education policy. This research did not deny the importance of policy in ensuring the optimization used of digital technology for educators, but to determine the features that make up educators' digital competency, understanding the digital technology policy may use as guideline; not as one of the attributes. Only 3 aspects of UNESCO ICT-CFT that are not reflects all roles; that are Pedagogy, Organisation and Administration and Teacher Professional Learning.

Pedagogy and Organisation and Administration aspects excludes Analyst role because ISTE Standard of Educator consider Analyst is a role that emphasize on working with data specifically for assessment and supporting student to achieve their learning goals (ISTE, 2019). Manipulating the data as input to reflect teaching strategy using digital technology does not meant reflection is one of the pedagogies; it is a thinking skill (World Economic Forum, 2017b). While the main objectives for Organisation and Administration is for educators to organize and physically manage the classroom and digital technology tools for teaching and learning preparation. Physical classroom in the future will not as important as it now, because classes may be conducted virtually or at any other learning spaces or learning environment.

As a result, UNESCO ICT-CFT version 3 2018 reflecting almost all ISTE Standards of Educators components. This will help researcher to construct actual attributes for the digital competency framework in the future.

2) UNESCO ICT-CFT vs DGCCR

Another framework that will be used to map with UNESCO ICT-CFT and ISTE Standard for Educators is Digital Government Competency Capability Readiness (DGCCR) for civil service development in Malaysia. Considering of building a sustainability framework, it is a somehow a good reference because DGCCR is an on-going national project that involve digital competency. Although least information gathered from general legitimate source, but it is interesting to see most of the description reflects both frameworks. This shows, there are similarity inherent when it comes to digital competency. This research will explore more on educators rather than other civil service employee. Other reason why DGCCR was chosen is because most educators who teaches K-12 students and university are civil services employee. Table 3 shows the mapping for UNESCO ICT-CFT and DGCCR.

Table 3: Mapping UNESCO ICT-CFT 2018 with DGCCR

UNESCO ICT-CFT 2018	DGCCR							
	Behaviour		Mindset		Skills		Relationship	
	Keeping Current & Insightful	Collaborating	Experimenting	Confidence	Working with data	Digital Approach	Engaging others	Citizen centricity
Understand ICT Policy								
Curriculum and Assessment		□	□		□	□	□	
Pedagogy		□	□	□		□	□	
Application of Digital Skills	□	□	□	□		□	□	
Organisation and Administration	□	□				□	□	
Teacher Professional Learning	□	□	□	□		□	□	

Table 3 shows mapping between UNESCO ICT-CFT 2018 with DGCCR. Although limited information from DGCCR, but based on researcher understanding on the legitimate source, almost all UNESCO ICT-CFT 2018 also reflecting DGCCR capabilities. There are 4 main attributes that had been highlighted in DGCCR, but the capability description points out details based on civil service. This mapping table revealing that citizen centricity does not reflect all UNESCO ICT-CFT aspects because citizen centricity in DGCCR is only focusing on civil service job scope. Same as ISTE when comparing Understanding ICT Policy, it does not factually reflect any DGCCR capabilities as they are not mention that they concentrating on following what stated in the policy. Another stands out result is that Working with Data only reflect assessment aspect in UNESCO ICT-CFT as it is focus on using tools and managing data resources. Collaborating and Engaging Others were distinguished in DGCCR but the

function reflecting UNESCO ICT-CFT 2018 are almost similar (Khashkhuu, 2018; UNESCO, 2018; Wilkinson, 2018). What meant by Digital Approach in DGCCR are very general of using digital tools and thinking in every task so it also reflected most of the aspects in UNESCO ICT-CFT.

3) Mapping UNESCO ICT-CFT 2018 with ISTE Standard for Educators and DGCCR

To be more precise in developing initial attribute for digital competency framework for educators in this study, these 3 framework (UNESCO ICT-CFT, ISTE Standard for Educators and DGCCR) were mapped and shows in Table 4.

Table 4: Mapping UNESCO ICT-CFT 2018 with ISTE Standard for Educators and DGCCR

ISTE	UNESCO						DGCCR								UNESCO
							Behaviour		Mindset		Skills		Relationship		
	Understand ICT Policy	Curriculum and Assessment	Pedagogy	Application of Digital Skills	Organisation and Administration	Teacher Professional Learning	Keeping Current & Insightful	Collaborating	Experimenting	Confidence	Workimg with data	Digital Approach	Engaging others	Citizen centricity	
Learner		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		Understand ICT Policy
Leader		✓	✓	✓	✓	✓	✓❍	✓❍	✓❍	✓	✓❍	✓❍	✓❍		Curriculum and Assessment
Collaborator		✓	✓	✓	✓	✓	✓❍	✓❍	✓❍	✓❍		✓❍	✓❍		Pedagogy
Citizen		✓	✓	✓	✓	✓	✓❍	✓❍	✓❍	✓❍		✓❍	✓❍		Application of Digital Skills
Facilitator		✓	✓	✓	✓		✓❍	✓❍	✓	✓		✓❍	✓❍		Organisation and Administration
Analyst		✓		✓			✓❍	✓❍	✓❍	✓❍	✓	✓❍	✓❍		Teacher Professional Learning
Designer		✓	✓	✓	✓		✓		✓	✓		✓	✓		

□ Related to ISTE Standard for Educators

❍□ Combination of UNESCO ICT-CFT 2018, ISTE Standard for Educators and DGCCR

What highlighted in ISTE Standard of Educators is referring to the roles of educators. An interesting result reveal that UNESCO ICT-CFT 2018 and ISTE Standard for Educators does not reflect citizen centricity. Indirectly citizen centricity in DGCCR concentrate on how civil service wellbeing react or use digital technology in giving quality service their client. Although educators that will be the sample of this research may come from government education institution, but the function is focusing on the educational development not as service officer. UNESCO ICT-CFT 2018 were developed to help in structuring training development, modules or policy for developing educators' digital competency (UNESCO, 2018), while ISTE Standard for Educators is concentrating the roles of educators in every task of educational practice (ISTE, 2019). This reinforces that in determining individual digital competency it depends on the job scope or task. Therefore, this research will concentrate on UNESCO ICT-CFT 2018 dimension and will add the missing concern by DGCCR into instrumentation.

Another fair result found that Working with Data only reflect one of UNESCO ICT-CFT aspects and 2 components in ISTE Standard for Educators. It is because, definition of Working with data by DGCCR it looks like the scope is more technical (DGCCR Newsletter, 2018) might be beyond the roles of educators. Therefore, working with data might be excluded from main initial attributes of digital competency framework.

In phase 2, a Digital Competency Conceptual Framework for Educators were built, and it being improvised in a form of info-graphic shown in Figure 5 for easy reference. The framework consists of attributes that had been

chosen from reflecting mapping 3 framework in the second step at the first phase and match with the table of comparison shows in Table 1.

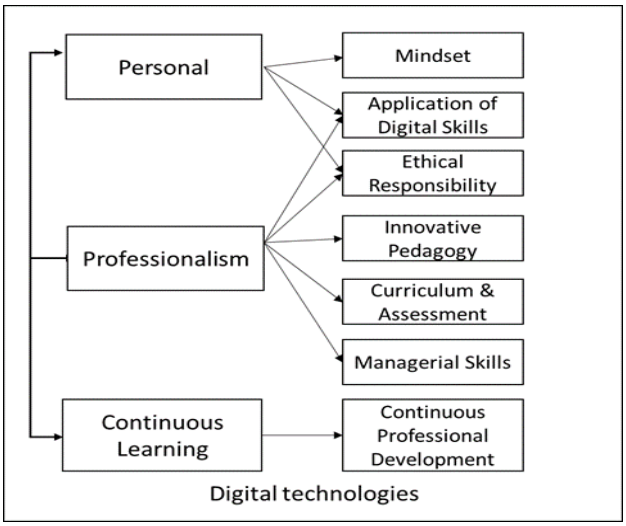

Figure 4: Conceptual Framework of Digital Competency for Educators

Figure 4 shows 3 main domains that emphasized for evaluating digital competency for educators. These 3 domains were pointed out after analysing several digital competency frameworks. The 3 of them were inter-related together as reciprocal determinism. There are 7 attributes were identified from the mapping process then classified by the 3 main domain.

What stands out in Figure 4 mindset is taken from DGCCR but the description is not exactly the same. Ethical responsibility is the new altered attribute taken out as new dimension from safe and ethical practice in Understanding ICT Policies in UNESCO ICT-CFT 2018 as well as ISTE Standard for Educators roles as citizen. Pedagogy was best labelled as innovative pedagogy because of research concern is developing a Digital Competency Framework. This framework will be represented into info-graphic diagram for future ease of use as in Figure 5.

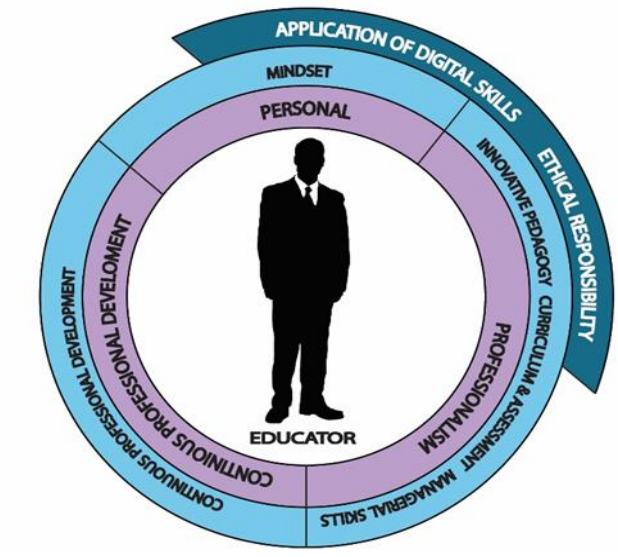

Figure 5: Info-graphic Conceptual Framework of Digital Competency Framework for Educators

VI. CONCLUSION

The fact of the finding of this study indicates attributes of digital competency were at a range of diversity. However, one clear finding shows that all the attributes from current digital competency framework can be classified in 3 main domains namely Personal, Professionalism and Continuous Professional Development. Results of mapping 3 different frameworks with different scope makes the framework more comprehensive incorporates the concept of sustainability and focuses on the role of educators who are ready in leveraging digital technology for their teaching & learning practices. With the existence of this framework might assist educator to do self-evaluation on their digital competency. Nevertheless, this attribute has not validated yet. Therefore, study suggested other future research may use these attributes to build the instrument either qualitative interview questions or questionnaire to testify with the actual data.

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