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A Comparison Between Malaysian and Germany Teacher's Technology Competency Standards for 21st Century Teaching and Learning

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Key words: ICT Competency Standards, 21st century teaching and learning, Malaysia, Germany, cultural diversity, global awareness, environment literacy

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Abstract: This working paper aims to give an overview of current status of the teachers Information Communication Technology Standards (ICT) competency that exist in the field of ICT and initial teacher education for Malaysia and Germany. The purpose of comparing these two countries teacher's ICT competency standards as research indicated that technology can significantly increase possibilities cultural diversity especially related to global awareness and environment literacy for students. In Malaysia, teacher's ICT competency standards has been established in 2013 with the support of Malaysian Fundamental Research Grants (FRGS), however from the literature reviews, there is less evidence to conclude that there is an establish ICT competency standards for Germany. As such, this study suggest that Germany also establish an ICT Competency Standards for their teachers, so that, further collaboration between the two countries to promote cultural diversity via technology enhancement could be formed and developed.

INTRODUCTION

Research has found that technology can significantly increase possibilities cultural diversity, especially, for intercultural interactions by broadening the scope of collaborations to distant locations, even across borders[1, 2]. Technology also enables students to collaborate and practice at "their own pace", beyond the formal classroom hours and without limitations of physical location[1-3]. By using technology, teachers are able to expose their students to various intercultural interactions and global awareness during the learning process. Global awareness refers to the concepts that impact the world encompasses but is not limited to environmental, social, cultural, political and economic relations while P21 (2009) suggested that environment literacy includes. Knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water and ecosystems.

Knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.).

OECD[4] suggested that as we seek to further digitally enrich our learning environments, this agenda should include such items as learner's diversity, digital literacy, the new digital divides, the blurring boundaries between formal and informal learning and the use of technology for monitoring and assessing learning. The depth and breadth of technologies available today affords learning environments much diversity and opportunity for leveraging ICT as a through line for educational change[5].

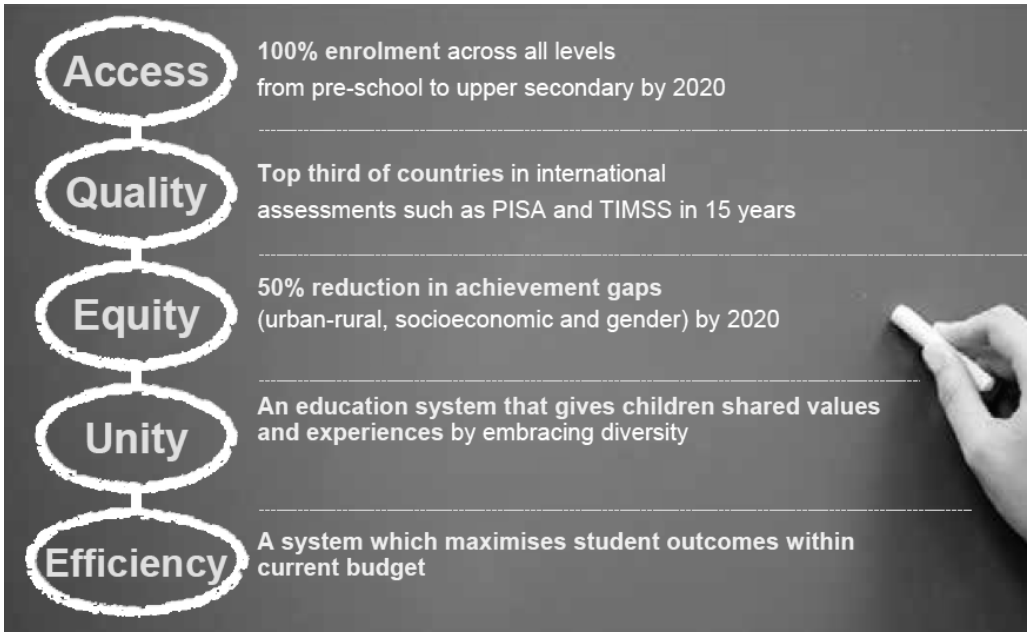

Fig. 1: The five system aspirations for the Malaysian education system

According to the MEM[6] in the Malaysia Education Blueprint 2013-2025, a comprehensive review of the education system was conducted in October 2011 by the Ministry of Education. It was participated by various stakeholders from various interest groups and experts that provided multiple perspectives on the state of education in Malaysia. Those that participated according to MEM[6] were "education experts from UNESCO, World Bank, OECD and six local universities to principals, teachers, parents, students and other members of the public from every state in Malaysia". The main objective was to raise education standards to be at par with other nations and more importantly to prepare Malaysia's youth to meet the challenges of 21st century workplace. In the TIMSS results in 2007, Malaysian student's performance had slipped to below the international average in both Mathematics and Science and it was further confirmed by the 2009 PISA assessment where Malaysia ranked in the bottom third of 74 participating countries[6]. This and other factors led to the forming of the "Aspirations for the Malaysian Education System and Malaysian Students" by MEM[6] to leapfrog Malaysia to perform better at international level.

The aspiration was divided into two main groups, the five system aspirations for the Malaysian Education System as shown in Fig. 1 and the six key attributes needed by every student to be globally competitive as shown in Fig. 2.

Important points of Malaysia education Blueprint 2013-2025

Student aspirations: In order to be competitive in the global arena and participate in the 21st century workplace the MEM[6] refocused and stressed "on developing critical, creative and innovative thinking skills leadership skills proficiency in Bahasa Malaysia and the English language character and values and a strong sense of national identity" besides gaining knowledge and content. In the area of thinking skills, according to the MEM[6]. "every student needs to possess a spirit of inquiry and learn how to continue acquiring knowledge throughout their lives to be able to connect different pieces of knowledge and most important of all in a knowledge-based economy to create new knowledge." Another important aspect was leadership skills where students " work effectively with others and leading others is critical, especially in our increasingly inter-connected world" according to the MEM[6].

Teacher development: The Malaysia Education Blueprint 2013-2025 recognised the importance of high-performance teachers as stated and made aware by the MEM[6], "Seminal research conducted showed that high-performing teachers can improve student achievement by up to 50% over a 3 year period, relative to low-performing teachers." The significance of this piece of information had an effect on education policymakers who were now beginning to develop policies to ensure teacher effectiveness is vital to the

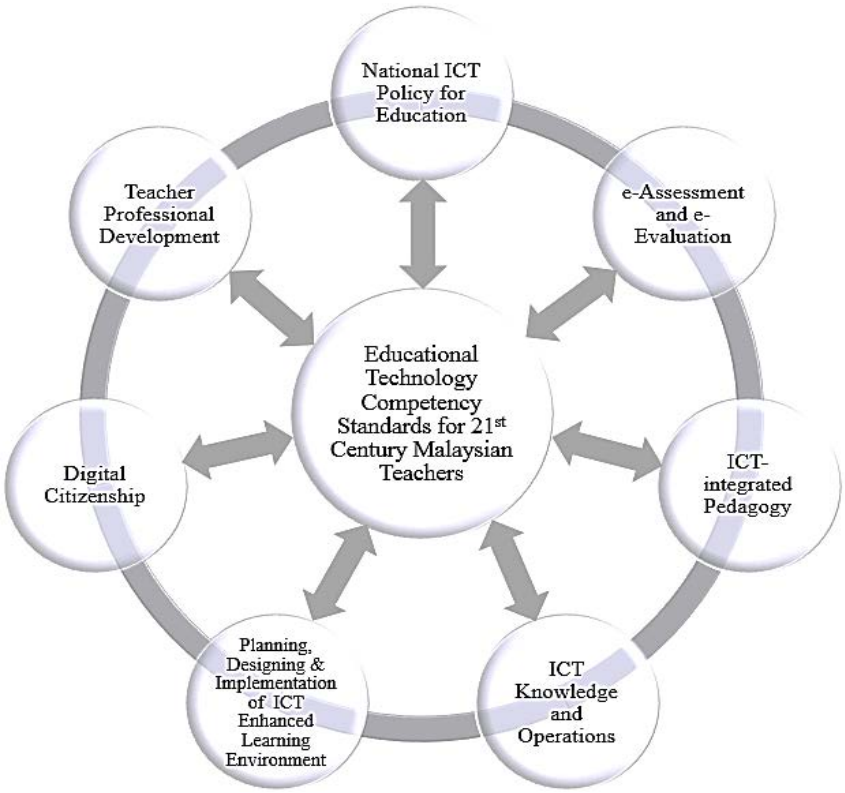

Fig. 2: ICT competency framework[7]

the success of student performance. It was without a doubt that good teachers lead to higher achievement among students while ineffective teachers are a hindrance to student's progress and achievement.

In order to develop new competencies among teachers, the ministry was "deeply committed to providing teachers with the support they need to succeed". Training programs were built to address the lack of competencies and the MEM[6] mentioned that it will start by " covering fundamental competencies expected of all teachers such as pedagogy to support the development of student's higher-order thinking". In order to achieve this, teacher standards should be established and act as standard guidelines to ensure teachers after training retain the minimum competency and level of quality required. Other policies to improve the level of teaching by Ministry of Education (2013) included:

- Raising entry standards for teacher trainees and new intakes
- Strengthening the link between performance and competencies
- Emphasizing continuous professional development
- Improving working conditions for teachers
- Enhancing career pathways
- Revamping career progression

ICT for education-what happened and where are we (Malaysia) heading to: ICT education in Malaysian schools, since, the inception of the computer labs in 1992 was very technology centric and little thought was given to leverage on these labs to enhance learning. As mentioned by the MEM[6] while the intention was groundbreaking at that time more could have been planned to "foster higher-order thinking skills" among students but on the upside at least students were able to learn basic ICT functions such as using word processors, the Internet and email.

It's a technology journey that one has to take to reach the stage where one begin to realise its potential as more and more innovative Web 2.0 solutions started to appear. The MEM[6], said that ICT infrastructure for schools was "one of the most capital-intensive investments the Ministry has made in the past two decades" and since, 1999, the ministry has invested close to RM6 billion in ICT initiatives. Furthermore, the ministry mentioned that the majority of the funds went into building additional computer labs to support PPSMI (RM2.6 billion) and the building of a computer lab in every school (RM2.5 billion).

Although, such huge capital investments have been allocated and used the Ministry was perplexed with its

relatively limited usage by members of the teaching staff. So much so, according to MEM[6], the ministry found out that 80% of teachers spend <1 h a week using ICT. Only a third of students perceive their teachers to be using ICT regularly." As mentioned by UNESCO's findings in MEM[6] "even when ICT is used in teaching in most cases it has not gone much beyond the use of PowerPoint as an instructional tool. There is no evidence that ICT is being used to foster student's creativity, problem-solving and critical thinking and communication skills." Other contributing problems included insufficient and unsustainable training plans for teachers and most of the computers and equipment broke down due to wear and tear and infected by viruses. This was further aggravated by the lack of sustainable support services to schools. In the end, computers were not working properly and eventually teachers moved back to their conventional teaching without computers. The Ministry of Education (2013) further added that " the lack of a long-term strategy for sustaining and scaling up key policy implementation elements such as ICT infrastructure and teacher competencies" was not put in place. There is no plan for continuity.

Moving along the MEM[6] developed a long-term plan on "Leveraging ICT for Learning" as shown in Table 2. The idea was to move forward at a gradual pace by firstly enhancing the foundation and followed by introducing ICT innovations and finally embedding ICT throughout the pedagogy and curriculum.

The roadmap: leveraging ICT for learning in Malaysia
Wave 1 (2013-2015): Enhancing the foundation:

- Providing network infrastructure and a learning platform through 1 BestariNet
- Delivering more ICT devices
- Ensuring that all teachers and Ministry officials are ICT literate
- Shifting towards more user-created content
- Integrated data management for schools and Ministry

Wave 2 (2015-2020) Introducing ICT innovations:

- Exploring ICT solutions for specific groups, reviewing best practices for the system
- Achieving a critical mass in ICT devices

Wave 3 (2021-2025): maintaining innovative, system-wide usage: ICT should be fully embedded throughout the pedagogy and curriculum of the education system. The Ministry will focus on scaling up and intensifying ICT usage among students and teachers. The Ministry will also continue to expand efforts around distance and self-paced learning[6].

Teachers' ICT competency standards in Malaysia: The terms "ICT competence" or "Digital competence" were taken as reference terms for different types of knowledge, skills and competencies that are needed for teachers to work with ICT in educational settings. These can be the competencies that are sought to be developed by teachers by the use of ICT in education (administration, preparation and to reach pedagogical purpose), the mastering of ICT tools and knowledge about ICT and its wider societal impact. The UNESCO ICT competency standards for teachers (ETS, 2002) address six components of the educational system that includes that includes:

- Policy
- Curriculum and assessment
- Pedagogy
- The use of technology
- School organization and administration
- Teacher professional development

As such Fong *et al*.[7] has designed, developed and established the Educational Technology Competency Standards for 21st Century Malaysian Teachers by using the modified Delphi technique in order to provide guidelines on the competency needed specifically for Malaysian teachers. Education technology experts from local and foreign universities as well as practitioners of ICT in local schools, colleges and universities formed the Delphi panel of experts in their research. The standard was design and developed using an initial draft version of the standards developed through literature review, document analysis, exploratory interview and expert roundtable discussion, the experts went through an iterative cycle of review, compare, amend and comment until the expert group's responses achieve consistency for each of the competency elements. The consistent and valid responses for each of the competency elements that achieved consensus then formed a reliable final draft of an all-encompassing ICT Competency Standards for the teaching profession in Malaysia. It is with this ICT Competency Standards that teacher's training programme can be adequately designed and developed to train teachers to achieve the desired ICT Competency Standards in compliance with the Malaysia National Education Blueprint 2013-2025. Fong *et al*.[7] has finalised the form and structure of the ICT competency standards and produce the ICT Competency Framework which was made up of 7 main categories as shown in Fig. 2. Educational Technology Competency Standards For 21st Century Malaysian teachers[7].

Educational technology competency standards for 21st century Malaysian teachers

Cat1: National ICT policy for education: Sets the required standards for Malaysian teachers to be aware of

National ICT Policy for Education. In knowing such policies define by MOE, teachers are able to identify, articulate and adhere to guidelines for ICT in classroom. Teacher's reflection of actual practice can contribute constructive feedback to improve and reform education policies and guidelines:

- C1: aware of National ICT Policy for Education and articulate policy guidelines to support teaching and learning in schools
- C2: demonstrate in-depth knowledge of National ICT Policy for Education by designing and implementing ICT-enhanced teaching and learning that supports the policy
- C3: reflect and contribute by providing feedback to improve and reform education policies and guidelines
- C4: MOE type of reward for innovations leading to better use of ICTs

Cat 2: e-assessment and e-evaluation: Sets the required standards for Malaysian teachers to use ICT supported assessment and evaluation tools in assessing student's progress and achievement of learning outcomes. With the right analytics, teachers will be able to pinpoint issues with student progress and helps in evaluation of learning outcomes to further improve content and delivery:

- C1: utilise ICT supported formative and summative assessment methods and tools to assess student's learning progress of subject matter
- C2: utilise ICT supported formative and summative assessment methods and tools to assess learning outcomes of subject matter
- C3: apply multiple methods of ICT supported evaluation to assess student's appropriate use of technology resources for learning, communication and productivity
- C4: apply continuous evaluation and reflection on the use of ICT that supports meaningful learning

Cat 3: ICT-integrated Pedagogy: Sets the required standards for Malaysian teachers to identify, analyse, design and implement ICT technologies that can be integrated with pedagogy to promote meaningful learning. They will be able to improvise and create meaningful learning environments that will promote student's higher-order thinking, communication and collaborative skills:

- C1: identify various ICT tools and resources that will enhance student-centered learning
- C2: utilise ICT-integrated Pedagogy to design and develop a meaningful learning environment
- C3: implement ICT-integrated Pedagogy that will increase student higher-order thinking skills, communication skills and collaborative skills
- C4: improve student learning outcomes as a follow-up of teacher's reflective exercises through ICT-integrated Pedagogy

Cat 4: ict knowledge and operations: Sets the required standards for Malaysian teachers to be knowledgeable and experience in using ICT tools to improve work productivity, communicate with stakeholders (students, parents and peers) and leverage on the web for professional development:

- C1: knowledgeable and confident in using appropriate ICT tools at work
- C2: utilising ICT to communicate and collaborate with various stakeholders for instance students, parents, fellow educators, authorities for learning, disseminating information/feedback or sharing of experience and expertise
- C3: leverage and utilise the web for research, continuous learning and upgrading of knowledge

Cat 5: planning, designing and implementation of ict enhanced learning environment: Sets the required standards for Malaysian teachers to be able to plan, design and implement ICT enhanced learning environment that will promote meaningful learning:

- C1: plan and manage ICT-integrated meaningful learning by analysing goals of the curriculum and ICT technologies
- C2: design ICT-integrated meaningful learning at the curriculum level and cascading down to topics and lessons within a learning environment
- C3: implementation of ICT-integrated meaningful learning at topic and lesson level within a learning environment

Cat 6: digital citizenship: Sets the required standards for Malaysian teachers to be knowledgeable and practice digital citizenship which covers social, ethical, legal and human aspects:

- C1: knowledgeable of the social, ethical, legal and human aspects of the 9 themes of digital citizenship
- C2: practice and promote responsible digital citizenship

Cat 7: Teacher professional development: Sets the required standards for Malaysian teacher's professional development through learning community networking and self-reflection on knowledge and skills in supporting student's meaningful learning:

- C1: network with learning communities using ICT in ongoing professional development and lifelong learning

- C2: evaluate and reflect on ICT-integrated knowledge and skills in support of student meaningful learning for continuous improvement

With the Educational Technology Competency Standards for 21st Century Malaysian Teachers established in 2016 by Fong, Boey and Azidah, it is suggested that Malaysia has developed their own competency standards for teachers to guide them in the use of ICT for classroom and educational purposes.

Teacher's ICT competency tandards in Germany: Motivation for and interest in using ICT in class still is a big issue in several European countries[8]. Jiri[8] further explain that In Europe, 16% of those teachers who do not use computers in class express the opinion that the use of ICT yields "no or unclear benefits".

For example, in Germany, the German teachers not using ICT in class seem to be by far the most sceptical with respect to the benefits which can be achieved by using ICT in class and reaches an extremely high 48% (or 10% of all teachers)-three times higher than the European average[9]. From the literature search, it is found that information concerning ICT competency for teachers and teacher education was not easily found for Germany. Rizza[10] indicated that the report "Assessment Schemes for Teacher's ICT competence-a policy analysis" (May 2005) explains that.

In a lot of cases information about initial teacher training could simply be not given as they are mostly run by universities or teacher training institutes and ICT is integrated into the teaching curriculum to different extents this is the case for Germany.

Gerick *et al*.[11] indicated that as far as Germany is concerned, the most relevant school-level predictor for the use of ICT by teaching staff seems to be the availability of corresponding pedagogical support in the classroom. Eickelmann *et al*.[12] mentioned about the indication of teachers in Germany are not sufficiently trained in using ICT. This result is complemented by the finding that the focus of the development of support systems for schools in Germany is still more technical than pedagogical and furthermore, the responsibility for implementing technical ICT support lies at regional or local authority level which leads to great variation in support systems across the country which in some cases can cause problems when teachers need immediate technical support in the classroom[11]. Future developments in the German education system could therefore focus on providing better pedagogical support for schools and on better preparing teachers for the demands of the pedagogical integration of new technologies in teaching and learning[12].

Teacher's poor ICT competence and lack of confidence in using new technologies in teaching are two very significant determinants of their levels of engagement in ICT and these are directly related to the quality and quantity of teacher training programs. From the report by Mekota[13], almost all German schools use computers for teaching and have equipped with internet access. According to Mekota[13] there is some variation with regard to broadband access between urban and rural areas 70% of schools in densely populated areas have broadband access compared to 56% of schools in thinly populated areas. Those schools with a broadband connection to the internet are much more likely to have a more sophisticated ICT infrastructure including a school website, the use of a LAN or the availability of an intranet. Mekota[13] further explain that "most teachers in Germany use computers for presentation purposes but also let the pupils use them in class and small deviances occur with respect to the subject of teaching. Furthermore, the computer is seen as a means for preparing lessons among 89% of the teachers. Most of the teachers using computers in class use them in <10% of all lessons (Only 6% state that they use computers in more than half of their lessons)".

With regards to teachers' ICT competency in Germany, there are less studies that reported how Germany's teachers are assessed in terms of their ICT competency in teaching. The "Key Data on Information and Communication Technologies in School in Europe" study further explains that. In Germany, education in the teaching of ICT is one of the core curriculum options. Consequently, the institutions of teacher education concerned are obliged to offer the subject but it is left to the trainees to decide whether or not to include it in their overall course of education. This applies to the initial education of primary and secondary school teachers. Uing[14] mentioned that training for teachers in Germany is needed because teachers are too stressed and have very little time to keep up with the latest technologies and not everyone is as keen on technology. OECD[15] reported Information concerning ICT in initial teacher education was not easily found for Germany. OECD[15] particularly reported that. The report "Assessment Schemes for Teachers' ICT competence-a policy analysis" 23 (May 2005) explains that. In a lot of cases information about initial teacher training could simply be not given as they are mostly run by universities or teacher training institutes and ICT is integrated into the teaching curriculum to different extents this is the case for Germany.

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However, the report "Assessment Schemes for Teachers' ICT competence-a policy analysis" (May 2005) does mention the existence of a specific diploma dedicated to the use of ICT in education. This is the case of the pedagogical university in Weingarten or "Fernuniversität Hagen"-Distance University Hagen which offers a two-year study course to become a "Master of Arts in Media Education". The aim is to teach knowledge and skills that enable students to use and create traditional and new media in education. Training is also offered for organising project work and further training, design classroom modules as well as strategic concepts for ICT in education[15].

From the researchers review of current literature, there are less indicator to highlight the existence of Educational Technology or ICT Competency Standards for 21st Century German Teachers. Mekota[13] suggested that teachers in Germany needs motivation for and interest in using ICT in class as teachers thought that they are lack of computers in the school (49%), no benefit of using computers in class (48) and 46% believe that they lack the necessary skills to utilize computers in their teaching. As such it is suggested that a similar concept of ICT competency standards for Germany teachers is established, so that, teachers has clearer view and directions on where and how the ICT usage in school will lead them.

The importance of ICT Competency for teachers: The teacher is responsible for establishing the classroom environment and preparing the learning opportunities that facilitate student's use of technology to learn and communicate. It is also potentially enhancing learner's engagement with technology irrespective of possible limitations in their historical or prior use of ICT[10]. Furthermore, how do we support their teachers in developing their creativity and competency in ICT[10] in ways that positively inform, shape and enhance their pedagogical practice and continuous professional development as educators in the 21st Century[16]. OECD[15] suggested that three categories are proposed for understanding the extent to which European countries have addressed the issue of ICT and initial teacher education:

- Category 1: lack of relevant information concerning ICT and initial teacher education
- Category 2: developing awareness of the stakes of ICT and initial teacher education
- Category 3: inclusion of ICT in initial teacher education at several levels

The way to go about addressing the issues stated by OECD[15] has been address by Fong *et al*.[7] though the framework of ICT competency for Malaysian teachers. Collaboration and networks offer great potential for the local and global diffusion of innovations including in education[4]. Zhu[3] suggested that technology enabled collaboration can encourage student group work skills, interaction and engagement, although activities might differ across culture. As such the comparison between Malaysia and Germany's teacher ICT competency could be a basis to explore how ICT could support the cultural diversity between the two country. It can also become the foundation on how the global awareness can be embedded in both countries ICT implementation in schools. Basalla[17] proposes that the concept of technological progress is based on assumptions in Western culture such as the belief that technology development is always an improvement and that the advancement of technology directly contributes to the betterment of our lives. Bryant[18] reminds us it is the social affordances, not the technology itself that is new and exciting. Bryant[18] also stated that young people are often operating within entirely new online social contexts that provide alternative spaces in which to explore, interact and learn new skills such as massively multiplayer online games, online social networking sites, blog networks, wikis and online groups. There are many positives to take from the way young people are using these spaces, despite the inevitable scare stories and so it makes sense to engage with them and embrace online social networking and social tools within education and the way the young people interact are already being used as places in which new forms of learning and skill development can take place but in general this is still not regarded as 'serious' learning[18].

CONCLUSION

This study would like to highlight and suggest the need of teacher's ICT competency to enable teachers to support the young learners to be able to optimised the use of ICT to promote diversity especially related to global awareness and environmental literacy. The establishment of the Educational Technology Competency Standards for 21st century Malaysian Teachers that suggested 7 main competency categories, 22 competency indicators and 56 competency items that a teacher should possess. It is suggested that Germany also established a specific ICT competency for teachers, so that, teachers could be the bridge for the adoption of ICT tools and use of emerging technology in education over the next few years, so that, the social affordances, not the technology itself would lead to global awareness and environment literacy, especially, between Malaysia and Germany. This will be a new and exciting learning journey for Malaysian and Germany teachers and students.

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