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DIGITAL COMPETENCY AMONG EDUCATORS IN MALAYSIA FACING WITH FOURTH INDUSTRIAL REVOLUTION (IR4.0)

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Abstract

The Fourth Industrial Revolution (IR4.0) concept is to transform from emergence of Information Communication Technology (ICT) in industry (IR3.0) to digital revolution. The educational settings need to be complied with the changes by adopting the concept of digital education accordance with IR4.0. However, the digital competency among educators to face with IR4.0 in Malaysia need to be discovered. This systematic literature review (SLR) article focuses on to discover issues concerning the digital competency among educators in Malaysia to cope with IR4.0. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was adopted for the review of the current research which utilized two main journal databases, namely Scopus and EBSCO. The searching efforts resulted in a total of fifteen (15) articles that can be analyzed systematically. The analysis managed to discover eleven (11) main digital competencies issues concerning to educators to cope with IR4.0 in Malaysia which are (1) personal attributes including general and specific characteristics, (2) attitude towards technologies, (3) level of confidence and readiness, (4) education level, (5) lacking of professional development, (6) inadequate prior knowledge of computer and technical literacy as well as limited exposure, (7) inexperience in term of years in teaching, (8) restricted resources and insufficient amount of specific content, (9) time constraint to prepare and converting conventional teaching content to technological and digitally basis, (10) institution characteristic, and (11) contextual characteristics. The successful implementation of IR4.0 in the education settings requires a joint effort between authorities and educators. Both parties play vital roles in supporting each other to effectively embrace digital transformation in education. A number of recommendations were presented at the end of this research for the reference of future scholars.

Keywords: *Fourth Industrial Revolution (IR4.0), digital, competency, educators*

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INTRODUCTION

1.1 Industrial Revolution

The Fourth Industrial Revolution (IR4.0) concept is to transform from emergence of Information Communication Technology (ICT) in industry (IR3.0) to digital revolution. As for some of us, the word industrial revolution itself seems irregular, in fact this revolution has been ongoing since 18th century with the discovery of steam-powered engines for industrial and transportation section and known as first Industrial revolution (IR1.0). The revolution advances which thus continue to the second industrial revolution (IR2.0) which emphasizing on the consumption of electrical power which not only focusing on the industrial but also has a huge impact on domestic living as a whole. In 1970's the third industrial revolution (IR3.0), directing on the evolution of Information Communication Technology (ICT), which has a huge impact in every aspect of life rather than industrial purposes only. ICT changes the way we live our life event at some place in the world might not have the exposure nor direct contact as compared to the ICT centered coverage areas, nonetheless the impact can be identified through awareness by the authorities. ICT evolves, the evolution of ICT begins at 2000's which lead to another industrial revolution, glamorously known as fourth industrial revolution (IR4.0). The basic ideas of IR4.0 is to digitally transform mankind and technological roles in industries based on the rises of ICT during IR3.0 (Cheok & Ran, 2023)

The IR4.0 symbolize the new concept of living influence by digital transformation, it is more than just a technology-driven change; it is an opportunity for everyone to improve the way life operates and how it benefits us as a whole (Klaus Schwab, 2019). The IR4.0, also known as the "smart factory," encourages the digitalization of manufacturing processes and the use of cutting-edge manufacturing techniques to reduce the time and effort required to complete tasks. It does this by integrating cutting-edge and innovative technologies such as sophisticated sensors, big data analytics, intelligent robotics, 3D printing, machine learning, cloud computing, cybersecurity, and the Internet of Things (IoT) (TM One, 2019). The influence of industrial revolution (IR) to Asian countries especially Malaysia is not as bold as western world, since the evolution has started and taken place over there or even to some of the APAC (Asia-Pacific) countries such as Vietnam, Thailand or Singapore, though since this is world phenomena, it has a direct impact on every aspect of society throughout the world nonetheless. Malaysia is generally still having trouble adopting IR4.0, and many companies are still using manufacturing technology from Industry 3.0. The difficulties that many manufacturing companies have when deploying IR4.0 are (1) reluctant to convert the conventional business operations oriented into modernize infrastructure and approaches (2) incapable of converting raw data collected into information that beneficial to the business growth (3) deficiency of big data skills to digitizing business processes. Furthermore, the hesitant to invest in innovative automation technologies is one of the challenges that have a significant impact to the integration of IR3.0 to IR4.0. Malaysia is coming all the way to the IR4.0, slowly but surely to welcome the digital transformation and taking compensations it has to offer (TM One, 2019).

1.2 Education system and IR4.0

Education system is one of the sectors experienced indirect impact of these industrial revolution especially in term of the way knowledge and skills are delivered and perceived. IR changes the way mankind live their lives and somehow it converts the conventional ways into modern approaches where more output generated with minimal efforts at all costs. The educational settings expected to be 4IR-ready to make full use of digital technology by incorporated advancement offered by artificial intelligence (AI), Internet of things (IoT), automation, cloud computing, big data and virtual reality to penetrate each aspect of life (Yeoh, 2022). The availability of high volume of internet coverage at various area in Malaysia as well as dedicated networks infrastructure reassures the application of IR4.0 in educational settings (DeWitt & Alias, 2023). The educational settings need to be complied and taking advantages of the changes offered by IR4.0 by adopting the concept of digital education. As for educational perspective, in order to cope with digital transformation evolvement, educational institutions need to shift along with the evolution (Sidek et al., 2022).

At present, Malaysian is aware about the existence of IR especially the infamous IR4.0. Based on survey conducted to 400 public universities students in Malaysia found a majority of respondents aware of an existence of IR4.0 (Idris, 2019). 360 respondents had heard of IR4.0, 280 respondents had some brief understanding on IR4.0, 300 participants familiar with the importance of education funding to upgrade IR4.0 knowledge and skills, 260 respondents aware with IR4.0 implementation, production cost can be lowered. 260 respondents aware the implementation of IR4.0 can reduce human labor workforce; 200 respondents agreed the involvement of IR4.0 can increase income and 120 respondents believe IR4.0 can increase employments (Industrial Revolution 4.0: An Overview of Readiness and Potential Economic Effects in Malaysia from Millennial's Perspective - see Figure 1).

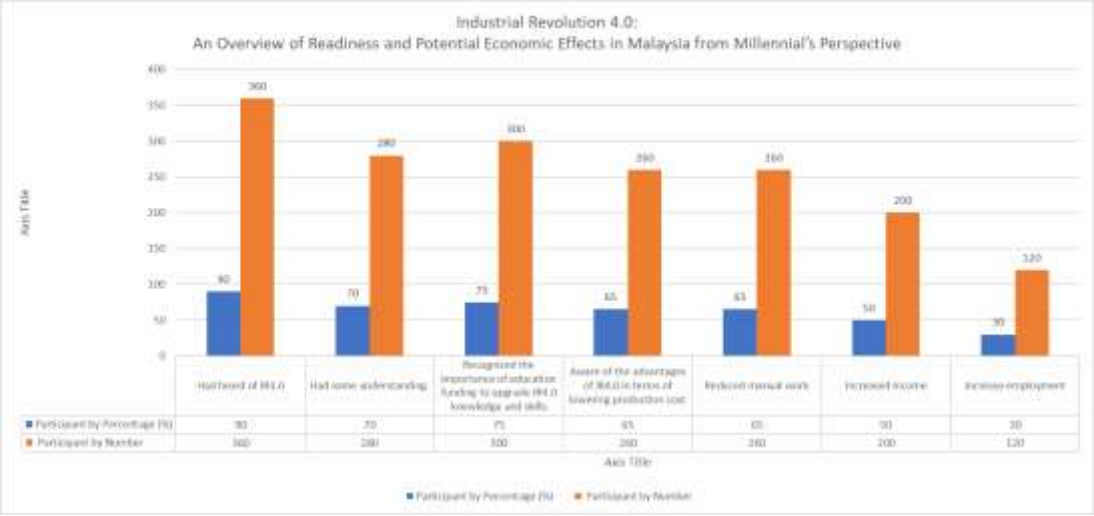


Figure 1: An Overview of Readiness and Potential Economic Effects in Malaysia from Millennial's Perspective
Source: The graph created by owner referring to (Idris, 2019)

A clustered column graph to visualise the readiness and potential economic effects in Malaysia from millennial's perspective on IR4.0.

The results obtained from the preliminary analysis of the readiness and potential economic effects in Malaysia from millennial's perspective on IR4.0 indicates that Malaysia are ready to adopt IR4.0 in education settings (Idris, 2019). However, the digital competency among educators to face with IR4.0 in Malaysia need to be discovered. The objective of this systematic review article is to focuses on to discover issues concerning the digital competency among educators in

Malaysia to cope with IR4.0. The development of the systematic review is based on the main research question: What are the digital competencies among Malaysian educators need to adapt to be accordance with digital transformation in teaching brought by IR4.0? which will be explained in details in the next section.

METHODOLOGY

The SLR conducted by adapting Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020; see Figure 2). Two electronic databases appointed to conduct literature searches which are Scopus and EBSCO; with a variety of keywords to identify articles (see Figure 3).

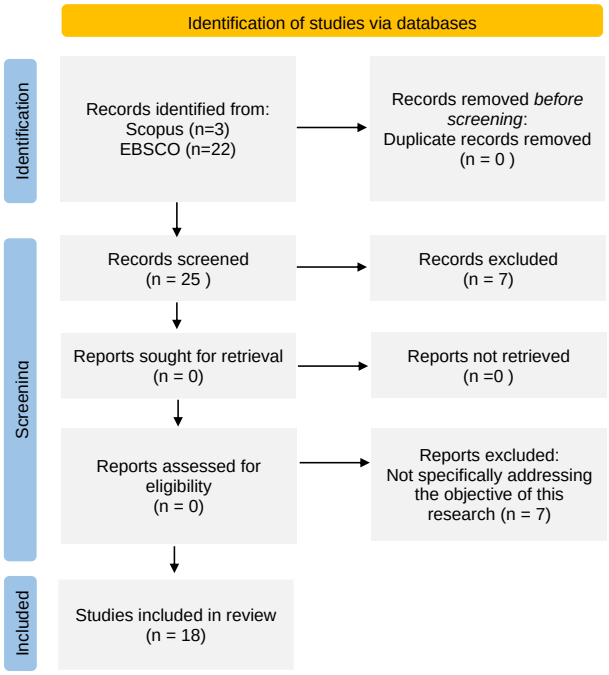


Figure 2: Adapting Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020)

In order to verify that any pertinent research was not overlooked, additional articles were found by searching the reference lists of publications recovered from the databases. For publications published between January 2019 and 2023, the search process's restrictions were in effect. A set of inclusion and exclusion criteria were used to evaluate each study. Excluded research organized according to exclusion criteria (see Figure 2). The finalized set of published studies underwent a qualitative synthesis after undergoing a full-text review for admissible research publications.

From **Scopus** **Database**

TITLE-ABS-KEY (Digital OR Cybernated OR Automated OR Programmed AND Competency OR Aptitude OR Capability OR Competence OR Expertise OR Proficiency OR Skill AND among Educators OR Instructor OR Lecturer OR Professor AND with AND IR4.0 OR Fourth OR 4^{TH} AND Industrial OR Industrialized OR Industrialised OR Mechanical OR Modern OR Technical AND Revolution OR Transformation OR Innovation AND in AND Malaysia)

From **EBSCO** **Database**

(Digital OR Cybernated OR Automated OR Programmed AND Competency OR Aptitude OR Capability OR Competence OR Expertise OR Proficiency OR Skill AND among Educators OR Instructor OR Lecturer OR Professor AND with AND IR4.0 OR Fourth OR 4^{TH} AND Industrial OR Industrialized OR Industrialised OR Mechanical OR Modern OR Technical AND Revolution OR Transformation OR Innovation AND in AND Malaysia)

Figure 3: Advanced keywords used to search for titles, abstracts and full content retrieved from two electronic databases which are Scopus and EBSCO

By implementing the advanced searches using the keyword (see Figure 3) with the consideration made for the synonyms of the keywords to avoid any bias, there are 25 studies found. Three from Scopes and twenty-two retrieved from EBSCO, all studies from Scopes are accepted

and seven studies from EBSCO are rejected because these studies are not addressing the objectives of this research to identify level of digital competency among Malaysian educators to adapt with digital transformation in teaching brought by IR4.0, nor with the similar pattern as the orientation for this research. As an overall there are eighteen studies are identified as part of the systematic search and carefully decomposed to get the insight of the purpose of this research.

FINDING

The SLR analysis managed to discover eleven (11) main digital competencies issues concerning among educators in Malaysia to cope with IR4.0, which are, (1) Personal Attributes (PA), (2) Education Level (EL), (3) Level of Confidence (LoC), (4) Attitude Towards Technologies (ATT), (5) Lacking of Professional Development (LPD), (6) Inadequate Prior Knowledge (IPK), (7) Limited Exposure (LE), (8) Restricted Resources (RR), (9) Time Constraint (TC), (10) Institution Characteristic (IC) and (11) Contextual Characteristics.

In order to screen the SLR precisely each main digital competencies are coded as following by using acronym. Some of the finding retrieved may have one or more than one digital competencies issue. Table 1, listing the study and the authors, then followed by the finding, on the other hand Table 2, summaries the findings for quick reference and accumulated the most significant digital competencies issues concerning Malaysian educators to cope with IR4.0, to the least significant (see Table 1 and Table 2).

Table 1: List of Study and Authors

No.	Study and Author(s)	Status	Digital competencies issues concerning Malaysian educators to cope with IR4.0.
SCOPES			
1.	11 The Role of TVET in IR4.0 for Malaysia. (Cheok & Ran, 2023)	Accepted	• Lack of competencies. [IPK.] • Dated learning methods. [LE.] • Insufficient of ICT and Infrastructure. [RR.] • Lack of ICT familiarity. [LE.] • Resistance to change (mind set). [PA.] • Insufficient time to integrate new and old teaching content. [TC&CC.] • Focusing on student be able to pass the exam. [LPD&CC.] • Loss of control in trying new content. [IPK&CC.] • Reliance on textbooks. [ATT.] • Student is the center of attention instead of educators. [IPK.& CC.] • Instructors' shortage of industry experience. [LPD.]
2.	21st Century Engineering Learning and Teaching: Malaysian Perceptive and Direction. (Hassan et al., 2022)	Accepted	• Lack of technical knowledge and skills. [IPK.] • Lack of competency. [IPK.] • Not trained in teaching the required skills and rapidly changing knowledge and technologies. [LPD.] • Incapable to solve problems using technology. [PA, LPD, EL, ATT, LPD, IPK, LE & LOC.] • Incapable to apply higher-order thinking skills (HOTS). [PA, LPD, EL, ATT, IPK, LE, CC & LOC] • Incapable to adopting technology-based education. [PA, LPD, EL, ATT, IPK, LE & LOC.]

No.	Study and Author(s)	Status	Digital competencies issues concerning Malaysian educators to cope with IR4.0.
			• Transform engineering educators to design and implement innovative teaching and learning. LPD,IPK & IC.
3.	Education and the Fourth Industrial Revolution: Lessons from COVID-19. (Alakrash & Razak, 2021)	Accepted	• Anxieties and concerns among students and teachers as many are unfamiliar with remote learning. PA, LOC, ATT,CC & LE. • Unable to Identify effective models and methods for implementing technology. LPD,IPK & LE. • Effective training and planning required. LPD. • Limited ICT infrastructure as well as cultural and socioeconomic factors. RR & IC. • Lack of reliable Internet connections, limited access to ICT devices, and limited technological knowledge. RR, EL,CC & IC.
	EBSCO		
4.	10th Medical Undergraduate Annual Scientific Research Meeting (MUASRM) • Reimagining Anatomy Education (pg.92) (Hadie, 2019)	Accepted	• By incorporating educational ideas into its theoretical framework and its lesson plans, teaching methodology should advance beyond technologically enhanced innovations. LPD,IPK,LE,TC & IC. • Anatomical education is by design efficient and pertinent during and after the IR4.0. LPD,IPK,LE,TC & IC.
5.	10th Medical Undergraduate Annual Scientific Research Meeting (MUASRM) • P18: Virtual Histology: Adieu to Glass Slide Microscope? (pg.145)	Accepted	• Digital resources are being used more and more by medical educators to improve learning, teaching, and collaboration. PA, LoC, ATT, LPD, IPK, LE & IC

No.	Study and Author(s)	Status	Digital competencies issues concerning Malaysian educators to cope with IR4.0.
	(T Vijaya Sagar, 2019)		
6.	10th Medical Undergraduate Annual Scientific Research Meeting (MUASRM) • NICE: A Data-Driven Dashboard Analytics for the Management of Care at the Hospital Universiti Sains Malaysia (HUSM) (pg.192). (Sukini Yusof, Raudzah Hj Mohamed Ariffin, Mohd Nazri Bin Mat Husin, Mohd Fadzali Bin Bakar, Nuru Asyikin Binti Mamat Saman, 2019)	Accepted	• Data-driven analytics system, user-centric and provides real-time feedback system or application. LPD,IPK,LE & TC.
7.	22nd Medical & Health Research Week 'Inspiring Research Towards Holistic Healthcare'. • Impact of COVID-19 on Digital Learning and Learning Motivation among UKM Medical Students (pg118). (Lee Jun Xin, Ahmad Hathim Ahmad Azman, Ng Jing Yi, 2020)	Accepted	• To promote lifelong learning among medical students, medical instructors should routinely use digital learning in more engaging and creative ways. LPD, IPK, LE, TC, PA, RR, TC,CC & IC.

No.	Study and Author(s)	Status	Digital competencies issues concerning Malaysian educators to cope with IR4.0.
8.	22nd Medical & Health Research Week 'Inspiring Research Towards Holistic Healthcare'. • Digital Learning Usage among Malaysian and Japanese Medical Students: The Current Trend (pg.7). (Jun Xin L , Ahmad Hathim Az , Jing Yi N , Reiko A, 2020)	Accepted	• To prepare medical students for the problems of the future, medical educators should be innovative in promoting medical students' extensive use of digital learning. LPD, IPK, LE, ATT, PA, RR, CC& IC.
9.	A Comparison Between The Existing UNISZA's Mobile Learning And The Proposed Design According To A New Conceptual Framework. (Alkfaween et al., 2023)	Accepted	• Versatile learning is a real way to increase listening ability. LE. • Acceptance of the mobile learning application interface. LE & ATT • Prepares teachers to use and operate the diverse learning procedures in the course. LPD,LOC & IPK.
10.	An Integrated Success Model of Internet of Things (IoT)-Based Services in Facilities Management for Public Sector. (Sidek et al., 2022)	Accepted	• Technology readiness is described from the perspective of individual traits (they are not ready to change and use IoTbs to increase their performance). PA, LOC & ATT. • Technology readiness optimism. PA,ATT,LPD,PK & LE. • Tackling technical issues, such as information quality, system quality, and support services in IoTbs. EL& LE. • Peer influence plays a vital role in promoting employees on using new technology. PA,ATT & LE.

No.	Study and Author(s)	Status	Digital competencies issues concerning Malaysian educators to cope with IR4.0.
11.	Encouraging gender-inclusive acceptance of multipurpose national-identity smart cards. (Yen et al., 2022)	Accepted	• Promoted application should be utilitarian to ensure higher probability of use. LOC & LE. • Concerns about security and/or privacy as a way of improving trust and therefore leading to intention towards adopting the MNIS application. PA,ATT,PK & LE.
12.	Implementing studio-based learning for design education: a study on the perception and challenges of Malaysian undergraduates. (Kumar et al., 2021)	Accepted	• Communication with our lecturers and the presence of the instructor in both these environments and how it influences learning outcomes. TC, CC & RR. • Instructors' personality, experience, and ethics should also be explored, as SBL would only be successful if there is a strong commitment by the instructor. TC,CC & RR.
13.	Mobilizing the Next Generation of Planetary Health Leaders: The Dynamism of Youth Engagement in Malaysia. (Faiesall et al., 2023)	Accepted	• Difficult to reach are those who live outside the bubbles of digital privilege digital privilege gap. RR & CC.
14.	Online Distance Learning: A New Learning Approach in the Malaysian Gifted Education System. (Yusof et al., 2022)	Accepted	• Teachers' preparedness to use computer-based information technology in teaching and learning is only at an average level. LPD & CC. • Level of technological application during teaching activities is at a low level. PA,IPK,LE & RR. • Teachers' tendency to use technological innovation depends on their perceived computer self-efficacy, PA,ATT,LPD,IPK,LE & RR.

No.	Study and Author(s)	Status	Digital competencies issues concerning Malaysian educators to cope with IR4.0.
			• Internet coverage has become the main constraint. RR.
15.	Pedagogical Factors Influencing Training of E-Commerce Entrepreneurs: The Malaysian Case. (Nasri & Iskandar, 2021)	Accepted	• Advantages of smart pedagogy, training organizers and the government need to provide relevant training programs, which in turn cultivate smart learning environments. IC,LPD,IPK & RR. • Lack of awareness related to pedagogy among training centers. LPD,IPK & IC.
16.	Rethinking English Language Teaching Through Telegram, WhatsApp, Google, Classroom And Zoom. (Singh et al., 2020)	Accepted	• Teachers need appropriate training to use modern technology in English language teaching. LPD. • Teachers to embrace and keep abreast with the latest development in technology as to modernize teaching methods for English language. PA & ATT. • Master and equip themselves with the last development in technology for instruction, they could also motivate and encourage students towards an active learning and mastery of higher order thinking. LOC,LPD,CC & LE.
17.	Students' Perceptions of the Twists and Turns of E-learning in the Midst of the Covid 19 Outbreak. (Minghat et al., 2020)	Accepted	• Selection of tools, equipment, apps, and communication preferences that are numerous, widely open, and available. LPD,EL,IPK,LE,RR & IC. • Mindful of the value of planning a strong Internet link. PA & RR.
18.	Tapping into Futuristic Imagination: Are We Ready for Digital Medical Education in Malaysia? (Yeoh, 2022)	Accepted	• Prospect of medical teachers using digital technologies to realize the purest form of OBE.PA,ATT,LPD,IPK & LE. • Universal access to high-speed broadband Internet, which can support highly digitalized medical education. RR.

No.	Study and Author(s)	Status	Digital competencies issues concerning Malaysian educators to cope with IR4.0.
			• Educators should remain agile and respond vigilantly to progress beyond the medical and education sectors that may impact our professional routine. PA,ATT,LE, CC & IC.

Digital competencies issues concerning among educators to cope with IR4.0 in Malaysia coded as Personal Attributes (PA), Education Level (EL), Level of Confidence (LoC), Attitude Towards Technologies (ATT), Lacking of Professional Development (LPD), Inadequate Prior Knowledge (IPK), Limited Exposure (LE), Restricted Resources (RR), Time Constraint (TC), Institution Characteristic (IC) and Contextual Characteristics (CC).

Table 2: Summary of Findings

No.	Study	Author	Digital competencies issues concerning Malaysian educators to cope with IR4.0 in										
			1	2	3	4	5	6	7	8	9	10	11
			PA	EL	LoC	ATT	LPD	IPK	LE	RR	TC	IC	CC
1.	11 The Role of TVET in IR4.0 for Malaysia	(Cheok & Ran, 2023)	✓			✓	✓	✓	✓	✓	✓		✓
2.	21st Century Engineering Learning and Teaching: Malaysian Perceptive and Direction	(Hassan et al., 2022)	✓	✓	✓	✓	✓	✓	✓			✓	✓
3.	Education and the Fourth Industrial Revolution: Lessons from COVID-19	(Alakrash & Razak, 2021)	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
4.	10th Medical Undergraduate Annual Scientific Research Meeting (MUASRM) • Reimagining Anatomy Education (pg. 92)	(Hadi, 2019)					✓	✓	✓		✓	✓	

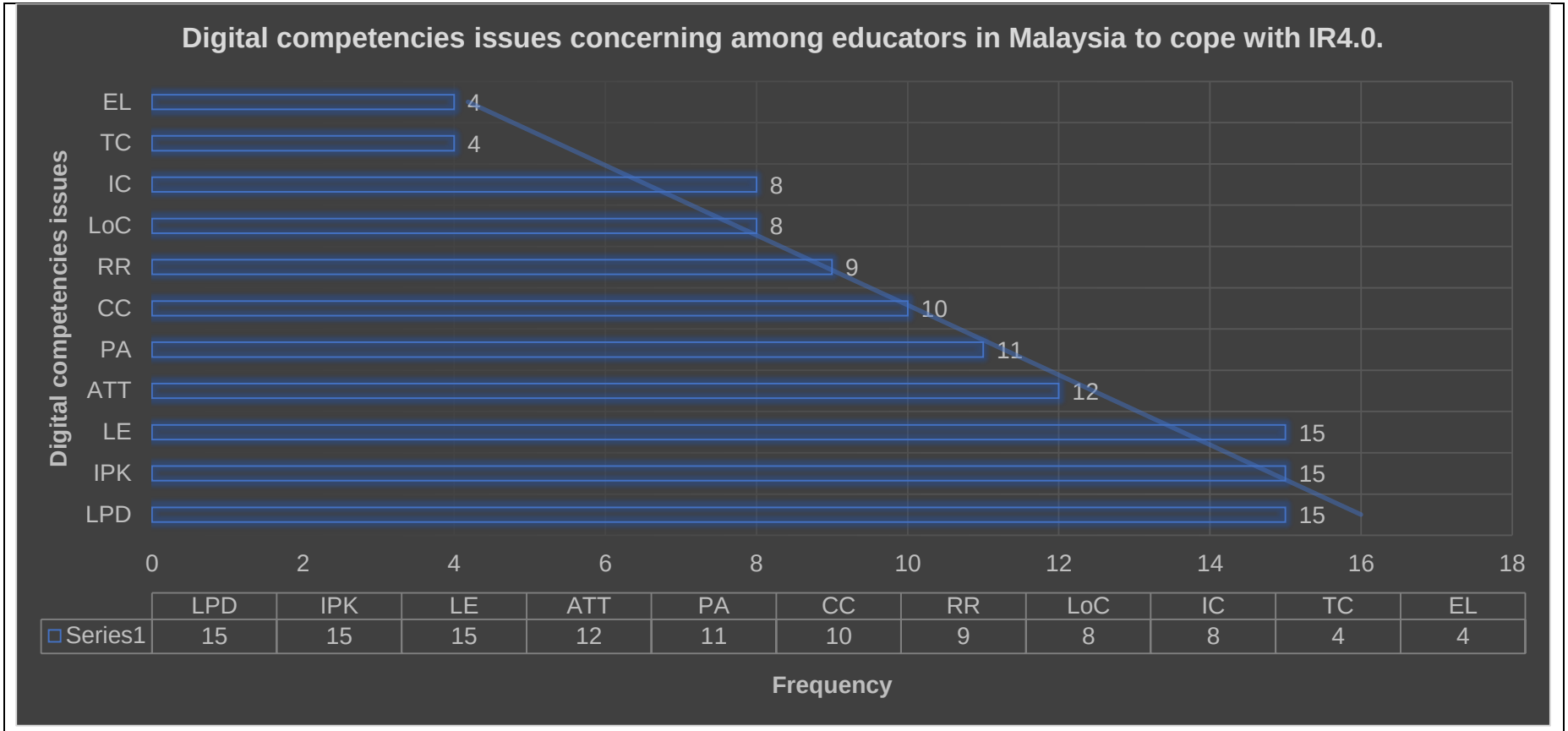
5.	10th Medical Undergraduate Annual Scientific Research Meeting (MUASRM) P18: Virtual Histology: Adieu to Glass Slide Microscope?	(T Vijaya & Haripriya M, 2019)	✓		✓	✓	✓	✓	✓			✓	
6.	10th Medical Undergraduate Annual Scientific Research Meeting (MUASRM) • NICE: A Data-Driven Dashboard Analytics for the Management of Care at the Hospital Universiti Sains Malaysia (HUSM)	(Yusof et al., 2019)				✓	✓	✓		✓			
7.	22nd Medical & Health Research Week 'Inspiring Research Towards Holistic Healthcare'. • Impact of COVID-19 on Digital Learning and Learning Motivation among UKM Medical Students (pg.118)	(Xin et al., 2019)	✓		✓	✓	✓	✓	✓		✓	✓	✓
8.	22nd Medical & Health Research Week 'Inspiring Research Towards Holistic Healthcare'. • Digital Learning Usage among Malaysian and Japanese Medical Students: The Current Trend (pg.7)	(Xin L et al., 2019)		✓	✓	✓	✓	✓					✓
9.	A Comparison Between the Existing UNISZA's Mobile Learning and The Proposed Design According To A New Conceptual Framework	(Alkfaween et al., 2023)	✓	✓	✓	✓	✓	✓					

10.	An Integrated Success Model of Internet of Things (IoT)-Based Services in Facilities Management for Public Sector	(Sidek et al., 2022)	✓	✓	✓	✓	✓	✓	✓				
11.	Encouraging gender-inclusive acceptance of multipurpose national-identity smart cards	(Yen et al., 2022)	✓		✓	✓		✓	✓				
12.	Implementing studio-based learning for design education: a study on the perception and challenges of Malaysian undergraduates.	(Kumar et al., 2021)								✓	✓		✓
13.	Mobilizing the Next Generation of Planetary Health Leaders: The Dynamism of Youth Engagement in Malaysia	(Faiesall et al., 2023)								✓			✓
14.	Online Distance Learning: A New Learning Approach in the Malaysian Gifted Education System	(Yusof et al., 2022)	✓			✓	✓	✓	✓	✓			✓
15.	Pedagogical Factors Influencing Training of E-Commerce Entrepreneurs: The Malaysian Case	(Nasri & Iskandar, 2021)					✓	✓		✓		✓	
16.	Rethinking English Language Teaching Through Telegram, WhatsApp, Google, Classroom and Zoom	(Singh et al., 2020)	✓		✓	✓	✓		✓				✓
17.	Students' Perceptions of the Twists and Turns of E-learning in the Midst of the Covid 19 Outbreak.	(Minghat et al., 2020)		✓			✓	✓	✓	✓		✓	
18.	Tapping into Futuristic Imagination: Are We Ready for Digital Medical Education in Malaysia?	(Yeoh, 2022)	✓			✓	✓	✓	✓	✓		✓	✓
TOTAL			**11**	**4**	**8**	**12**	**15**	**15**	**15**	**9**	**4**	**8**	**10**

Source:Owner

Digital competencies issues concerning among educators to cope with IR4.0 in Malaysia coded as:

EL	Education Level	**TC**	Time Constraint	**IC**	Institution Characteristic
LoC	Level of Confidence	**RR**	Restricted Resources	**CC**	Contextual Characteristics
PA	Personal Attributes	**ATT**	Attitude Towards Technologies	**LE**	Limited Exposure
IPK	Inadequate Prior Knowledge	**LPD**	Lacking of Professional Development		



Digital competencies issues concerning among educators to cope with IR4.0 in Malaysia coded as:

EL	Education Level	**TC**	Time Constraint	**IC**	Institution Characteristic
LoC	Level of Confidence	**RR**	Restricted Resources	**CC**	Contextual Characteristics
PA	Personal Attributes	**ATT**	Attitude Towards Technologies	**LE**	Limited Exposure
IPK	Inadequate Prior Knowledge	**LPD**	Lacking of Professional Development		

Graph 1: Digital Competencies Issues among Educators with IR4.0

According to the SLR, LE, IPK and LPD presents the highest frequencies which is 83.33 % on digital competencies deficiencies for Malaysian educators to cope with IR4.0, followed by ATT with 66.67%, PA with 61.11%, CC with 55.56%, RR with 50%, LoC and IC 44.44% and finally TC and EL with 22.22%.

CONCLUSION

The successful implementation of IR4.0 in the education settings requires a joint effort between authorities and educators. Both parties play vital roles in supporting each other to effectively embrace digital transformation in education.

4.1 Limited Exposure (LE), Inadequate Prior Knowledge (IPK) and Lacking of Professional Development (LPD)

LE, IPK and LPD identified as main factor which influence digital competencies deficiencies among educators in Malaysia to transform education into digital. Government and authorities need to play an importance rule to prepare educators to the concept of digital education accordance with IR4.0 and truly implementing the digitalization in teaching settings. One of the finest methods to enhance educators' abilities and knowledge to digitalize their teaching is through training and professional development. To enable educators to execute their lesson freely and with confidence, digital integration in teaching requires training and ongoing assistance (Khlaif, 2018). Continued advancement of one's career It is necessary to promote digital pedagogy in order to improve the caliber of student teaching and learning experiences. (Had & Rashid, 2019). Proper training which custom made for educators on learning new and beneficial software can improve and upgrade educators teaching approaches (Gurung, 2021).

However, the content, materials, approaches and suitability of the training provided must be given with extra attention by the authorities. Since most of the time training is not provided in accordance with the individual needs of educators, it is important to properly prepare for the efficacy of training and supports offered to educator (García & Weiss, 2020; Gurung, 2021). To ensure efficiency and effectiveness, training and supports must priorities the needs of educators. identifying and addressing the requirements of educators when creating training and support systems (Haron et al., 2018) need to be distinctive, tailored, and on an individual basis. What teachers already know (in terms of knowledge and abilities) and what instructors wish to know should be taken into account by training and support content developers. What information should teachers know? in being ready to integrate digital learning environments. Both formal and informal methods of training can be used; formal methods include workshops, seminars, professional meetings, mentoring, professional talks, up-front and continuation sessions; informal methods include encouraging teachers to read professional publications and watch television documentaries about any academic discipline related to the digital transformation of education. The use of technology in teaching and learning sessions is expected to increase as a result of formal and informal discussions on digital education throughout the model's initial and subsequent sessions. (Had & Rashid, 2019; Haron et al., 2018; Petko et al., 2018).

4.2 Attitude Towards Technologies (ATT)

There are twelve studies on ATT and eleven on PA based on SLR conducted, these two competency deficiencies are focusing on educators response and acceptance towards digital transformation. A modern educational environment through digital transformation has been hoped to be attained through a variety of recommendations and efforts made in a variety of areas by a variety of people, intuitions, and even on a ministry level. If educators don't stop using these strategies, all of these efforts will be useless. Digital competencies must be seen as useful to educators' work. For the digitalizing strategies to be used in educational contexts, educators must have the confidence and necessary abilities. (Petko et al., 2018). Consequently, the readiness and views of educators will determine whether they accept the digital transformation of education. (Rashid et al., 2021). Academic performance, the learning process, and attitude have been shown to significantly improve students' learning experiences when digital technology is integrated into the curriculum and instruction. (Haron et al., 2018). As for the conclusion, educators have a decision to make regarding whether they want to change themselves in order to accept and implement digital transformation in their teaching and enjoy all the benefits presented or remain rejecting the concept of digital transformation in education. Educators are free to make their choice!

4.3 Personal Attributes (PA)

Researchers in several studies came to the conclusion that educator characteristics, such as PA, have a significant impact on educational digital transformation. Their experiences, institutional support, self-efficacy, the technology's ease of use, and increases in internet usage all generally have an impact on educators' attitudes towards the technology they use in their lessons. Environmental learning, technical features, human traits, and intervention design are the four main causes of educators' resistance to the digital transition (Khlaif, 2018).

4.4 Contextual Characteristics (CC)

In terms of CC, factors like the number of pupils in a class and the students' level of literacy affect how educators use technology during instruction. According to the institution's objective and vision, upper management must take responsibility for assisting educators at certain levels who are bringing about digital transformation in educational environments. To maintain the value of the digital transition in education, educators must be reminded and evaluated constantly. (Petko et al., 2018). To improve educators' efforts to adhere to the institution's purpose, administrative levels' awareness and tenacity are crucial.

4.5 Restricted Resources (RR)

RR is referring to the infrastructures of institutions, which are crucial in boosting the percentage of digital transformation in instruction. To enhance the digital transformation of teaching, institutions could consider providing specialized technology support services and the necessary resources, such as help desks and instructional aid. For teachers to be ready to digitize education and give students positive learning experiences, there must be an adequate, useful, and relevant technical infrastructure, including hardware, software, content, and support. (Khlaif, 2018; Petko et al., 2018).

4.6 Level of Confidence (LoC)

Regarding LoC, the technology offered should be simple to use and its value should be established; doing so will encourage educators to embrace technology tools that support digital pedagogy. (Rashid et al., 2021). A user-friendly Education Management System (EMS), software, applications, and programmes should be provided by the institution to enable educators to use it confidently, easily, and accurately and so foster the development of a healthy and positive attitude towards educational digital transformation. (Haron et al., 2018).

4.7 Institution Characteristic (IC)

Institutional characteristics are defined in terms of (1) the infrastructure of the institution, which refers to the adequate quantity of hardware, software, content, and support offered, (2) support from institution higher board, especially in terms of defining expected outcomes of the institution (towards IR4.0), and (3) discussion among colleagues, both formally and informally, regarding the effectiveness of technology and digital usage in teaching practices. (Khlaif, 2018).

4.8 Time Constraint (TC)

Compared to the 1990s or even the early 2000s, teaching is more difficult and crucial today. (Cheng et al., 2016). Educators are no longer relying on whiteboards and marker pens nor sticking to the conventional approaches of conducting lessons activities (Had & Rashid, 2019). The new generation of digital natives has different learning demands than previous generations, and educators must practice and adapt. In the twenty-first century, educators are expected to serve as role models for both their students and the communities they serve, serving as a point of reference and being, for the most part, adaptable in both educational and non-educational situations. (Rashid et al., 2021). Being in this field recently required a full-time commitment over the years. A major expectation of educators is to deliver purposeful, pertinent, and realistic learning experiences in line with the information and abilities needed for job-hunting as well as for tomorrow's workforce. To properly educate students for the difficulties of the industrial revolution, educators are likely to be a representation and responsible for the digital transformation. With the digital transformation of the teaching and learning process, the evolution of the educational system is going through significant changes in order to provide students with the necessary information and skills. The development of digital and information technologies has increased the difficulties faced by this profession.

One of the difficulties educators faces in transforming education to the digital era is time management. Teachers have a limited amount of time to design and build lesson plans and adapt traditional classrooms to the digital era. (García & Weiss, 2020). This method is essential and needs enough time to prepare. How well-designed the instructional design is will determine how effective the idea of digital education is, right? Does it follow a well-defined design and development process? It significantly affects the standard of the education acquired. The preparation of course materials for online instruction takes additional time since they must be converted into digital format (Gurung, 2021).

4.9 Education Level

The level of education has a big impact on how education is transformed digitally. There are four main factors that educators should consider when deciding whether to integrate technology into their instruction: (1) teacher general characteristics, such as education level, years of experience, and gender; (2) specific teacher characteristics, such as readiness and confidence in using technology; (3) school characteristics, such as accessibility of technology and support systems for the technology used; and (4) contextual factors, such as students' literacy and numeracy. (Liu et al., 2016).

LIMITATION AND RECOMMENDATION

This study is subject to at least three limitations. First, the finding of this study is not dividing the educators in higher education or school system, second is the division of educators either they are in public or private institution and finally the representation of the locality where educators are based on according to institution geographical area as well as urbanization. However, more research on this topic needs to be undertaken before the association between digital competencies among educators and IR4.0 in Malaysia education system for more clearly understood. This research has thrown up many questions in need of further investigation based on (11) main digital competencies issues concerning to educators to cope with IR4.0 in Malaysia which are, PA, EL, LoC, ATT, LPD, IPK, LE, RR, TC, IC and CC.

CONFLICT OF INTEREST

The author has no conflicts of interest, whether financial or otherwise, in conducting this research.

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REFERENCE

Alakrash, H. M., & Razak, N. A. (2021). Education and the fourth industrial revolution: Lessons from COVID-19. *Computers, Materials and Continua*, *70*(1), 951–962. https://doi.org/10.32604/cmc.2022.014288

Alkfaween, O. J., El-Ebiary, Y. A., & Mohamad, M. B. (2023). A Comparison Between The Existing Unisza's Mobile Learning And The Proposed Design According To A New Conceptual Framework. *Journal of Pharmaceutical Negative Results*, *14*(2), 1247–1264. https://doi.org/10.47750/pnr.2023.14.S02.153

Cheng, Y.-L., Lee, C.-Y., Huang, Y.-L., Buckner, C. A., Lafrenie, R. M., Dénommée, J. A., Caswell, J. M., Want, D. A., Gan, G. G., Leong, Y. C., Bee, P. C., Chin, E., Teh, A. K. H., Picco, S., Villegas, L., Tonelli, F., Merlo, M., Rigau, J., Diaz, D., … Mathijssen, R. H. J. (2016). Pedagogy of the Twenty-First Century: Innovative Teaching Methods. *Intech*, *11*(tourism), 13. https://doi.org/http://dx.doi.org/10.5772/intechopen.72341

Cheok, C. K., & Ran, L. (2023). The Role of TVET in IR4.0 for Malaysia. *Digitalization and Development: Ecosystem for Promoting Industrial Revolution 4.0 Technologies in Malaysia*, *0*, 189–206. https://doi.org/10.4324/9781003367093-11

DeWitt, D., & Alias, N. (2023). Creative Digital Pedagogies for Student Engagement: Preparing Students for Industry 4.0. *Digitalization and Development: Ecosystem for Promoting Industrial Revolution 4.0 Technologies in Malaysia*, 112–132. https://doi.org/10.4324/9781003367093-7

Faiesall, S. M., Ahmad Tajuddin, S. H., George, A. J., Marzuki, N. H., Lacey-Hall, O., Mahmood, J., Clements, G. R., & Guinto, R. (2023). Mobilising the Next Generation of Planetary Health Leaders: The Dynamism of Youth Engagement in Malaysia. *Challenges*, *14*(1), 18. https://doi.org/10.3390/challe14010018

García, E., & Weiss, E. (2020). COVID-19 and Student Performance, Equity, and U.S. Education Policy. *Economic Policy Institute*, 1–60. epi.org/205622

Gurung, S. (2021). Challenges Faced by Teachers in Online Teaching during the Pandemic. *Journal of Education and Practice*, *9*(1), 8–18. https://doi.org/10.7176/jep/12-2-06

Had, M. Z. C., & Rashid, R. A. (2019). A review of digital skills of Malaysian English language teachers. *International Journal of Emerging Technologies in Learning*, *14*(2), 139–145. https://doi.org/10.3991/ijet.v14i02.8732

Hadie, S. N. H. (2019). Reimagining Anatomy Education. *Medicine & Health*, *14*(1), 1–250. https://doi.org/10.17576/MH.2019.s1401

Haron, H., Hanafi, J., Indonesia, U. I., & Ahmad, Z. (2018). *The Reasons Concerning Tea Chers ' Attitude Toward Computer in*. *May*.

Hassan, S. A. H. S., Mohd-Yusof, K., Yuan, C. C. C., Phang, F. A., Rahman, N. F. A., Samah, N. A., Zakaria, Z. Y., & binti Ghazali, N. E. (2022). 21st Century Engineering Learning and Teaching: Malaysia Perspective and Direction. *ASEE Annual Conference and Exposition, Conference Proceedings*.

Jun Xin L , Ahmad Hathim Az , Jing Yi N , Reiko A, N. A. S. I. (2020). *Digital Learning Usage among*

Malaysian and Japanese Medical Students : The Current Trend. *15*(1), 17576.

Khlaif, Z. N. (2018). Factors Influencing Teachers' Attitudes Toward Mobile Technology Integration in K-12. *Technology, Knowledge and Learning*, *23*(1), 161–175. https://doi.org/10.1007/s10758-017-9311-6

Klaus Schwab. (2019). The Fourth Industrial Revolution, by Klaus Schwab | World Economic Forum. In *World Economic Forum*. https://www.weforum.org/about/the-fourth-industrial-revolution-by-klaus-schwab

Kumar, J. A., Silva, P. A., & Prelath, R. (2021). Implementing studio-based learning for design education: a study on the perception and challenges of Malaysian undergraduates. *International Journal of Technology and Design Education*, *31*(3), 611–631. https://doi.org/10.1007/s10798-020-09566-1

Lee Jun Xin, Ahmad Hathim Ahmad Azman, Ng Jing Yi, N. A. S. I. (2020). *Impact of COVID-19 on Digital Learning and Learning Motivation among UKM Medical Students*. *15*(1), 17576. https://doi.org/https://doi.org/10.17576/MH.2020.s1501

Liu, F., Ritzhaupt, A. D., Dawson, K., & Barron, A. E. (2016). Explaining technology integration in K-12 classrooms: a multilevel path analysis model. *Educational Technology Research and Development*, *65*(4), 795–813. https://doi.org/10.1007/s11423-016-9487-9

Minghat, A. D., Ana, A., Purnawarman, P., Saripudin, S., Muktiarni, M., Dwiyanti, V., & Mustakim, S. S. (2020). Students' Perceptions of the Twists and Turns of E-learning in the Midst of the Covid 19 Outbreak. *Revista Romaneasca Pentru Educatie Multidimensionala*, *12*(1Sup2), 15–26. https://doi.org/10.18662/rrem/12.1sup2/242

Nasri, N., & Iskandar, Y. H. P. (2021). Pedagogical Factors Influencing Training of E-Commerce Entrepreneurs: The Malaysian Case. *TEM Journal*, *10*(3), 1274–1284. https://doi.org/10.18421/TEM103-34

Petko, D., Prasse, D., & Cantieni, A. (2018). The Interplay of School Readiness and Teacher Readiness for Educational Technology Integration: A Structural Equation Model. *Computers in the Schools*, *35*(1), 1–18. https://doi.org/10.1080/07380569.2018.1428007

Rashid, A. H. A., Shukor, N. A., Tasir, Z., & Na, K. S. (2021). Teachers' perceptions and readiness toward the implementation of virtual learning environment. *International Journal of Evaluation and Research in Education*, *10*(1), 209–214. https://doi.org/10.11591/ijere.v10i1.21014

Sidek, N., Ali, N., & Alkawsi, G. (2022). An Integrated Success Model of Internet of Things (IoT)-Based Services in Facilities Management for Public Sector. *Sensors*, *22*(9), 3207. https://doi.org/10.3390/s22093207

Singh, C. K. S., Singh, T. S. M., Abdullah, N. Y., Moneyam, S., Ismail, M. R., Eng Tek, O., Karupayah, T., Chenderan, K., Singh, M. K. R., & Singh, J. K. S. (2020). Rethinking english language teaching through telegram, whatsapp, google classroom and zoom. *Systematic Reviews in Pharmacy*, *11*(11), 45–54. https://doi.org/10.31838/srp.2020.11.9

Sukini Yusof, Raudzah Hj Mohamed Ariffin, Mohd Nazri Bin Mat Husin, Mohd Fadzali Bin Bakar, Nuru Asyikin Binti Mamat Saman, N. A. B. R. and K. I. M. (2019). NICE: A Data-Driven Dashboard Analytics for the Management of Care at the Hospital Universiti Sains Malaysia

(HUSM). *Medicine & Health*, *14*(1), 1–250. https://doi.org/10.17576/MH.2019.s1401

T Vijaya Sagar, H. M. (2019). P18: Virtual Histology: Adieu to Glass Slide Microscope? *Medicine & Health*, *14*(1), 1–250. https://doi.org/10.17576/MH.2019.s1401

TM One. (2019). *Industry 4.0 is here. Where are the Manufacturers?* https://www.tmone.com.my/resources/think-tank/article/industry-4-0-is-here-where-are-manufacturers/

Yen, Y. Y., Yeow, P. H. P., & Hong, L. W. (2022). Encouraging gender-inclusive acceptance of multipurpose national-identity smart cards. *PLoS ONE*, *17*(7 July), 1–19. https://doi.org/10.1371/journal.pone.0271033

Yeoh, B. S. (2022). Tapping into Futuristic Imagination: Are We Ready for Digital Medical Education in Malaysia? *Education in Medicine Journal*, *14*(1), 81–85. https://doi.org/10.21315/eimj2022.14.1.7

Yusof, R., Alam, S., Radzi, A. M., & Lecturer, S. (2022). *Online Distance Learning: A New Learning Approach in the Malaysian Gifted Education System*. *16*(1), 28–46. https://doi.org/http://doi.org/10.51709/19951272/Spring2022/3