

Review Article

Issues and Challenges of Primary Education Toward Implementing Technical and Vocational Education Training to Meet the Fourth Industrial Revolution Demand: A Systematic Literature Review

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ABSTRACT

The present wave of the fourth industrial revolution (4IR) technology and trends is drastically affecting nearly every economic sector and preparing for profound changes in people's lives. The benefits of the technology include higher safety, better decision-making, increased productivity, efficiency, and quality in processes, as well as increased competitiveness. Thus, every effort towards raising awareness of the 4IR should begin early in primary education. This study critically evaluated the literature on the issues and challenges of implementing Technical Vocational Education and Training (TVET) preliminary courses in primary education in Malaysia towards raising awareness of the future 4IR. Using two databases, namely Scopus and Web of Science, the review was conducted in accordance with the ROSES (Reporting Standards for Systematic Evidence

Syntheses) publishing standard. The findings showed that the role of primary education in facilitating skills development for socio-economic and technological development for the students was significant. Based on the thematic analysis, two primary themes emerged: a lack of 21st-century skills and support, supplemented by six sub-themes. In addition, the issues and challenges of other countries' primary education in meeting the 4IR demand are also discussed. The paper

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offered solutions for the issues that arose to fulfil the objective of TVET preparatory courses: to increase pupil awareness of the present 4IR in elementary education in Malaysia.

Keywords: Fourth Industrial Revolution, issues and challenges, primary education, systematic literature review, technical vocational education and training

INTRODUCTION

TVET refers to all forms and levels of education and training that provide knowledge and skills related to occupations in various sectors of economic and social life through formal, non-formal, and informal learning methods in both school-based and work-based learning contexts. Education is essential for economic development, growth, and productivity. Since education is vital to every country, primary education should be the leading platform to expose and develop a child's potential and ability toward specific skills. Early talent identification can help children become experts and competent in their fields, producing more competitive human capital that businesses can use to satisfy the future demands of the fourth industrial revolution (4IR; Ilori & Ajagunna, 2020).

Pre-school, Primary, Secondary, Tertiary, and Post-graduate education are Malaysia's five learning levels. Pre-school education is not universal since wealthier families can send their children to pre-school. Moreover, religious organisations conduct pre-school programmes for children aged four to five. Meanwhile, primary education lasts six years, from seven to twelve. These years of study are known as year 1 through year 6. The UPSR (*Ujian Penilaian Sekolah Rendah*) is a requirement for primary school pupils,

which includes Malay Comprehension, Written Malay, English Language, Science, and Mathematics (Bush et al., 2018). After completing elementary school, the students will proceed to secondary school, where they will receive teaching for five years, from Form 1 to Form 5. In secondary school, students must take two exams: Form 3 PT3 (*Pentaksiran Tingkatan 3*) and Form 5 SPM (*Sijil Pelajaran Malaysia*). Students who pass after that can enrol in Form 6 or Matriculation Programs to continue their education. Consequently, following their Form 6 or Matriculation courses, students are eligible to continue their education in university courses or tertiary training programs. Universities, both private and public, offer post-secondary education. The private sector and the Malaysian Qualifications Agency (MQA) work together to guarantee that inclusive education is available in public and private schools (Malaysia Qualification Agency, 2017).

Primary education is the fundamental and principal right of every child. According to Porter (2022), primary education is the foundation of the entire education system. Success or failure in primary education affects the whole system. Thus, a solid foundation of primary education is vital for sustainable secondary and tertiary education. The government's responsibility to parents and various communities is

its availability and provision. Primary education is intended to help a youngster in many parts of life. Supporting a child is critical in many aspects of life. According to Mogas et al. (2022), elementary education should focus on high principles, overcoming the challenges brought by technological advancements, and instilling national pride in fundamental values and critical thinking. The first six school years in Malaysia are critical for developing these abilities. As a result, a high-quality curriculum framework in elementary education should meet the requirements for achieving these goals.

As a developing country, Malaysia continually improves its education policy and delivery, management, access, and quality. Malaysia Education Plan 2013-2025 seeks to improve access, quality, equity, unity, and efficiency (Kementerian Pendidikan Malaysia, 2013). Schools must provide a quality curriculum structure where supervised learning can accomplish these goals. Students in primary school are taught to think critically, strive for high standards, tackle the challenges posed by technological advances, and develop citizenship with vital values (Oke & Fernandes, 2020).

According to Setyaningsih (2020), technology transformations in the 4IR should also encourage elementary school education institutions to prepare students with the modern ability to face the 4IR challenges. In the era of the 4IR, it is critical to build an education system for cultivating abilities deemed fit for new technical and social situations. Kim et al. (2022) presented the core competencies for the

4IR education in elementary and secondary schools: convergence/insight competency, intelligence information competency, and coexistence/empathy competency. These core competencies can be used to meet the 4IR revolution challenges. According to Menon and Castrillón (2019), current education should prepare students for the demands and challenges of the 4IR. Thus, new approaches to curricula for a more empowering pedagogy for the 4IR are needed.

According to the Malaysia Education Plan 2013-2025, pre-school to post-secondary education is under the Ministry of Education, and the new KSSR is separated into two levels: first level (years one to three) and second level (years four and five). Bahasa Malaysia, English, Mandarin, Tamil, Mathematics, Physical Education, Health Education, Islamic Studies, and Moral Education are examples of Level 1 fundamental courses. Science, technology, the visual arts, and music are all important topic components. As elective courses, Arabic, Chinese, Tamil, Iban, and Kadazan-Dusun are taught. The second level includes 12 basic modules: Bahasa Malaysia, English, Chinese or Tamil (for Chinese or Tamil vernacular schools), Health Education, Mathematics, Physical Education, Islamic studies, Science or Moral Education, History, Visual Art, Music, Design and Technology/Information and Communication Technology.

Additionally, as an elective, students can participate in a language program in Arabic, Chinese, Tamil, Iban, or Kadazan-Dusun. Over the past few years, the education

approach of Malaysia has continuously developed, with each new education minister bringing in a new system for the betterment of the country. Still, the nation's educational standards are something that every Malaysian thinks about frequently. When compared to other nations, the competencies of Malaysian graduates and students are lacking (Misni et al., 2020).

Therefore, it is essential to adopt an effective curriculum design that strikes a balance between academic and practical foundations. To fulfil the country's ambitions, primary education must also carefully address several difficulties. Many empirical studies have focused on various issues and challenges supporting TVET in Malaysia, in secondary schools, colleges, and other higher institutions. For example, a study by Bakar and Mahmud (2020) identified profiling of career aspirations and interests of Malaysian lower secondary school students in both TVET and Science, Technology, Engineering, and Mathematics (STEM) fields, where a systematic review was conducted to determine best practices for STEM education efforts in creating and innovating Mathematical mode (N. A. Rahman et al., 2021), issues in secondary school (Minghat & Yasin, 2010), polytechnics challenges (Ahmad et al., 2017) and other vocational schools and institutions. Mukhtar and Ahmad (2015) discuss the competence of the instructors, the roles of TVET leaders in institutions, vocabulary usage in technical colleges for better comprehension, disclosure relating to the quality of the curriculum in TVET

institutions, and training in industries. According to the studies, there is no link between Malaysian primary schools and any TVET-related difficulties mentioned above. A strong foundation is required, starting with elementary school. Bakar and Mahmud (2020) state that children with professional goals in STEM and TVET sectors require assistance as early as primary school.

Likewise, in primary school, empirical studies focus mostly on issues and challenges that the Ministry of Education (MoE) constantly needs to solve. For example, pupils who are receptive to using mathematical computer tools yet receive lower marks (Reed et al., 2010), issues with comprehending curriculum reform (N. H. A. Rahman, 2014), lack of awareness of math primary school teachers in STEM education (Bakirci & Karisan, 2018), challenges on equipping HOTS skills by teachers and pupils in the 21st century (Hassan et al., 2017), using ICT tools in teaching and learning process (Razak et al., 2019), learning disabilities students' needs and for better comprehension (Jalil et al., 2017), and using School-Based Assessment (SBA) in the current schooling system (Velloo & Ali, 2016). Hence, studies on TVET-related issues or challenges in primary education are quite limited and should be addressed immediately by the MoE. This study aims to add to the current body of knowledge by conducting a thorough literature review on the concerns and challenges of elementary education to promote TVET in Malaysia.

A systematic literature review is a method for conducting a more thorough

analysis of the available material. SLR is described by Shaffril et al. (2020) as a method that classifies, selects, and evaluates prior research to address a given question. Before the SLR review process, the procedure or strategy is decided. Other researchers may adopt a similar strategy because SLR is an organised and transparent method for scanning numerous databases. It uses a systematic search strategy that helps researchers answer and focus on specific questions (Xiao & Watson, 2019).

The systematic review includes details on the review technique so others can repeat the inquiry, validate the findings, or evaluate the generality (e.g., keywords used, articles selected). Malaysia needs many skilled workers and experts in the vocational and technical fields to assist the country's development. The Malaysia TVET agenda has been given serious attention since 2019 when a committee at the MOE was established to ensure that the country provides a qualified workforce to meet the industrial demands. The plan involves an industry engagement model, a TVET financing model, matching demand to supply, and strategic collaboration among TVET providers (Subramaniam et al., 2020).

Furthermore, six significant initiatives have demonstrated the path of the TVET empowerment aims. The initiatives include developing a sustainable funding model, creating policies to encourage industrial participation, developing a national TVET branding plan, setting up a TVET collaboration hub, creating a policy to coordinate TVET programs, and developing

TVET data (Hussain et al., 2021). However, there is no data on the effectiveness of implementing these initiatives.

Indeed, the role of primary school is to teach basic skills such as psychomotor and cognitive-based skills. Children should be taught positive ethics and moral principles in elementary school to recognise their talents and determine which skills they are more adept at (Rusmin et al., 2020). The curriculum for primary schools was redesigned with a focus on fostering the development of the whole person, learning the necessary skills, instilling moral principles, and doing away with early specialisation (Muzakkir et al., 2022). However, there are still problems that need to be addressed in primary schools to meet the national TVET agendas.

Another attempt by the MoE to expose primary-level students to TVET-related skills was introducing the Rekabentuk dan Teknologi (RBT) course in primary schools in 2014 (Prabu & Nesamalar, 2021). The announcement of 'STEM for All' programs and the application of 21st-century teaching and learning skills recommended by the MOE called the 4C1V (communication, collaboration, critical thinking, creative thinking, and values as well as ethics) have brought greater attention to the use of technology and 21st-century skills efforts (Ramdzan et al., 2022). However, the issues and challenges in implementing these strategies have not yet been explored.

The review was triggered by the fundamental research question, "What are the issues and challenges of implementing

TVET preliminary lessons in primary education in Malaysia towards raising awareness of the future 4IR?" The purpose of this study was to address a gap in knowledge by carefully evaluating prior relevant studies to better understand the concerns and challenges of elementary education in Malaysia. Primary education was selected due to several reasons. First, education is commonly understood to benefit economic development, growth, and productivity. Since education is a vital attribute to every country, primary education should be the leading platform to expose and develop a child's potential and ability towards specific skills. Identifying the child's ability from a young age and direction to become experts and competent in respective areas could generate more competitive human capital, which the industries benefit from, indeed catering to the 4IR demands in the future. Second, past empirical data revealed a dearth of information regarding TVET-related disciplines in Malaysian primary schools.

The present study offered several contributions to knowledge and life practicality. Furthermore, a necessary measure should be taken to prevent any predicament from arising in primary school in the future. Therefore, policymakers, researchers, educational stakeholders, and educators should be able to comprehend and be aware of the issues and challenges in primary education in the TVET-related field, as it is one of the nation's aspirations.

Accordingly, the findings of this study were expected to aid in charting

the course for improvements in primary education, as well as to assist and prepare primary education students to have a solid foundation and acquire TVET-related skills to meet the needs of TVET and, eventually, the demands of the 4IR. Thus, from the perspective of primary education, emergent themes are anticipated to provide insights that will support and promote the Malaysia TVET strategy, thereby educating kids for appropriate TVET-related preparation at an early age to meet future 4IR demands. It would be possible to focus on the areas and content of the studies and narrow down this investigation more.

METHODS

The Review Protocol – Reporting Guidelines for Systematic Evidence Syntheses (ROSES)

The investigation's driving force was ROSES, created specifically for systematic review (Haddaway et al., 2018). ROSES aims to motivate researchers to supply the necessary data at the proper depth. In light of this evaluation process, relevant research questions were developed before beginning their systematic literature review. Next, three components of the systematic search technique, namely eligibility, screening (inclusion and exclusion criteria), and identification, were addressed.

Theoretical Framework: Human Capital Theory

The Human Capital Theory offers a lens through which the integration of TVET introductory lessons in primary education

curriculum can be understood in response to the 4IR demands. This theory emphasises that investments in education, particularly in skill development and knowledge acquisition, enhance productivity and economic growth. When applied to primary education, especially in the context of TVET, it underscores the crucial role of early investment in human capital, aligning skill development with the technological advancements characterising the 4IR. This framework allows an assessment of how TVET programs contribute to nurturing the necessary human capital for the 4IR, evaluating the effectiveness of these programs in equipping students with the technical skills, adaptability, and problem-solving abilities essential for the rapidly evolving technological landscape.

By employing the Human Capital Theory as a guiding framework, this systematic literature review aimed to assess the challenges, successes, and implications of implementing TVET in primary education to meet the demands of the 4IR. This framework enables a comprehensive examination of how investments in human capital, specifically through TVET programs, shape the readiness of individuals to engage with and contribute to the technological advancements characterising the 4IR. The review delved into the effectiveness of TVET in nurturing the requisite skills, knowledge, and adaptability crucial for preparing individuals to thrive in the rapidly evolving landscape of the 4IR, as guided by the principles of the Human Capital Theory.

Formulation of Research Questions

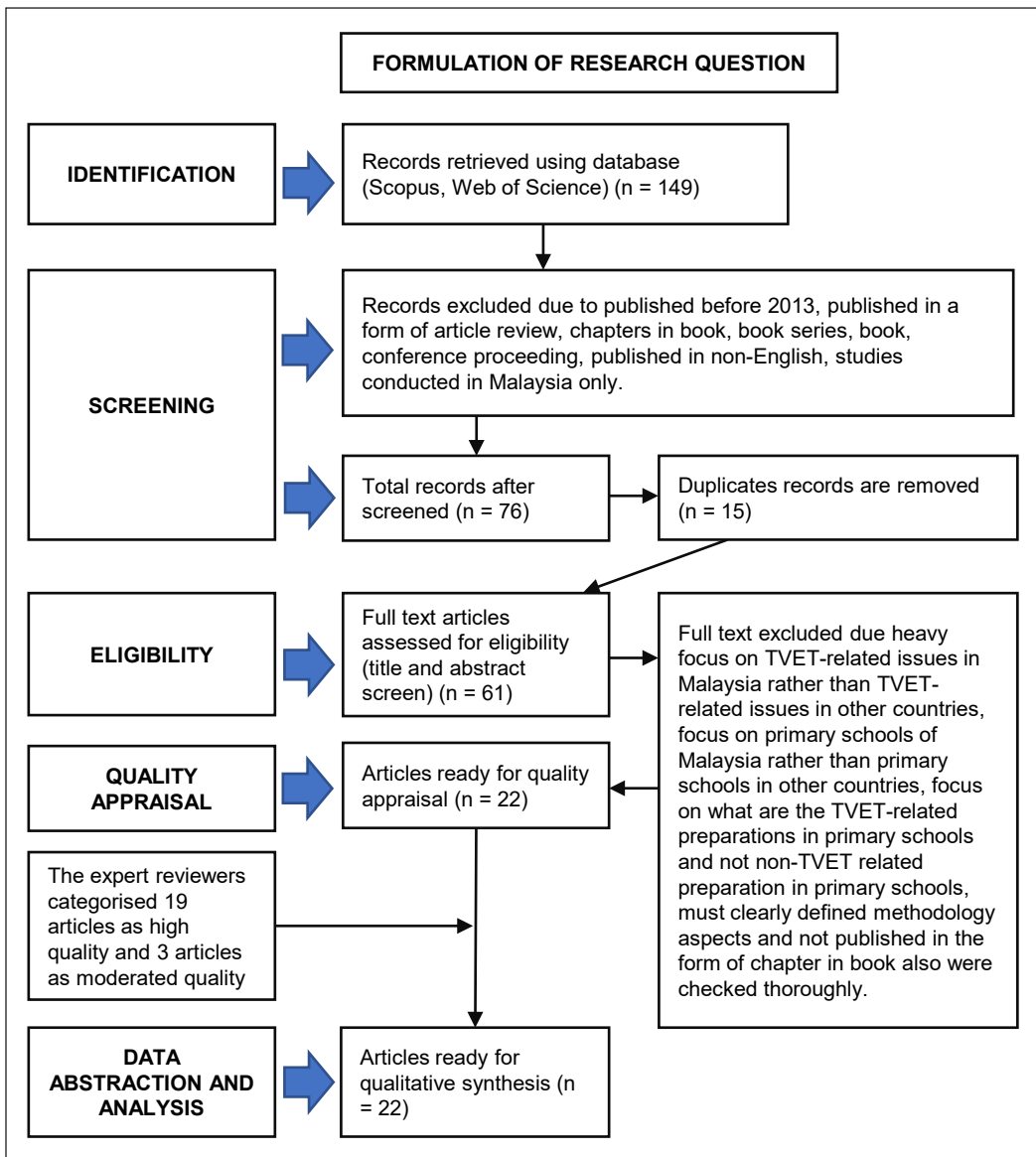
The study's research question was created using Problem, Interest, and Context (PICO). The PICO population, issue, interest, and context were three fundamental components. These ideas served as the foundation for the inclusion of three key elements in the review: issues and challenges (Population/Problem), Primary Education (Interest), and TVET Malaysia (Context). These elements helped define the main research question: What are the issues and challenges of implementing TVET preliminary lessons in Malaysian primary education to raise awareness of future 4IR?

Systematic Searching Strategies

Three main processes were used in the systematic searching strategy: identification, screening, and eligibility, as shown in Figure 1.

Identification

Identification was an act of seeking out any synonyms, phrases similar to those in the study, or other main keywords, including problems, challenges, primary education, and TVET Malaysia. Its objective was to provide more search options for similar articles to be reviewed in specified databases. An online thesaurus, keywords from prior studies, keywords from Scopus, keywords from specialists, and keywords created based on the study subject were all employed in the identification process (Okoli, 2015). In addition to creating a detailed search string (based on Boolean operators, phrase searching, truncation, wild



Source: Authors' work

Figure 1. The flow diagram of the search strategies

card, and field code functions), the present keywords were optimised on two major databases, Scopus and Web of Science, as shown in Table 1.

These two databases are important in a systematic literature review and have several

advantages. With its multidisciplinary focus, extensive indexing of over 5000 publishers, advanced search capabilities, and quality control over articles, Scopus is a valuable resource for researchers. In contrast, Web of Science is a robust database

Table 1
The search strings

Database	Search String
Scopus	TITLE-ABS-KEY (("issues" OR "challenges" OR "concern*" OR "difficulties" OR "problems" OR "troublesome" OR "matters" OR "demand*" OR "lack") AND ("primary education" OR "primary school*" OR "elementary school*" OR "preparatory school*" OR "training school*" OR "trade school*") AND ("TVET" OR "training" OR "employment" OR "work" OR "vocational" OR "technological" OR "job related" OR "industrial" OR "career" OR "mechanical" OR "revolution*" OR "technical" OR "technology" OR "design*" OR "STEM" OR "science" OR "engineering" OR "training" OR "technology" OR "hands-on" OR "Mathematics" OR "manipulative" OR "skills"))
Web of Science	TS= (("issues" OR "challenges" OR "concern*" OR "difficulties" OR "problems" OR "troublesome" OR "matters" OR "demand*" OR "lack") AND ("primary education" OR "primary school*" OR "elementary school*" OR "preparatory school*" OR "training school*" OR "trade school*") AND ("TVET" OR "training" OR "employment" OR "work" OR "vocational" OR "technological" OR "job related" OR "industrial" OR "career" OR "mechanical" OR "revolution*" OR "technical" OR "technology" OR "design*" OR "STEM" OR "science" OR "engineering" OR "training" OR "technology" OR "hands-on" OR "Mathematics" OR "manipulative" OR "skills"))

Source: Authors' work

that provides comprehensive citation data to over 1800 high-impact journals with over a decade of extensive coverage. Whenever appropriate, the combination of keywords such as “concerns and troubles in primary schools”, “difficulties and problems”, “public schools”, “elementary schools”, “skills”, “devices”, “tools”, “TVET Malaysia”, “design”, “innovation”, “training”, “TVET in Malaysia”, “technology” and “technical skills” was used via functions of phrase searching and Boolean operator (OR, AND). The search process in Scopus and Web of Science databases yielded 22 articles.

Screening

This study screened all 149 articles by choosing article selection criteria, executed automatically based on the database's sorting process. Therefore, it was difficult to assess all previously published studies. As

a result, Okoli (2015) advised researchers to plan their review time. The search revealed limited research studies linked to elementary education concerns and challenges, particularly in promoting TVET-related disciplines in Malaysia. Furthermore, most research reveals various elements of the concerns and challenges of elementary education in Malaysia. However, none of the studies linked the issues and challenges concerning TVET as one of the national agendas.

Journal articles were chosen for ten years (2012-2021) as one of the inclusion criteria, allowing for an adequate view of previous research and publication progression. Only research with real data published in a journal was included to ensure the review's quality. Besides, to minimise misconceptions regarding the issue, only papers published in English were included in the review, and

articles published on issues and challenges in Malaysia were included as one of the criteria during the screening process. Table 2 illustrates the inclusion and exclusion criteria. Subsequently, due to their failure to meet the inclusion criteria, 73 articles were excluded. Next, the author found 15 duplicated articles. Finally, the remaining 61 articles were used for the next eligibility process.

Eligibility

Eligibility is the third process in which the authors manually checked the retrieved articles during the eligibility phase to ensure that all the remaining articles (after the screening method) fit the standards. The next step was to read the titles and abstracts of the articles. This process excluded 39 articles for various reasons, such as focusing on TVET-related issues in other countries, non-TVET-related preparation in primary schools, and book chapters rather than journal articles.

Eventually, there were only 22 articles chosen. The criterion was set because of the constant demands in TVET-related fields, which was aligned with IR 4.0 needs. As a result, the MoE has committed to

generating 60% of scientific and technology graduates of higher education and secondary education by 2025, compared to 40% of art graduates, as stated in the PPPM 2013–2025 (Kamarulzaman & Hashim, 2013). Since TVET is one of the nation’s agendas, preparation and support from primary education should be considered to help students explore career interests in early schooling so that their career aspirations are built based on the actual potential of the students (Bakar & Mahmud, 2020).

Quality Appraisal

Two professionals reviewed the remaining articles to ensure the content was of the highest standard. Experts should categorise the remaining papers into three quality groups: high, middle, and low, according to Shaffril et al. (2020). Reviews should only be done for items with a high or moderate rating. The experts focused on the methods to assess the quality of the papers. Both authors must agree that the papers’ quality must be adequate to be included in the review. They investigated discrepancies before deciding which to include or exclude from the evaluation. Four articles with intermediate ranks and 18 articles with high

Table 2
The inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Timeline	2012–2021	< 2012
Document Type	Article Journal (empirical data)	Article review, chapters in the book, book series, book, conference proceeding
Language	English	Non-English
Regions	Malaysia	Not Malaysia

Source: Authors’ work

rankings were created using this strategy. All 22 of the remaining items were qualified for the review process.

Data Abstraction and Analysis

The 22 papers were evaluated and studied. Themes and sub-themes were identified by analysing the abstracts of the publications and then reading the full articles (in-depth). Themes on concerns and challenges in

elementary education were discovered using qualitative content analysis in the 22 papers linked with the TVET-related subject. Sub-themes were then arranged around the primary topics created via typology by the writers (Table 3). The reviewers did a thematic analysis to identify prior research findings by grouping them and categorising them based on their similarities or relevance (Adams et al., 2021).

Table 3
Themes and the sub-themes on issues and challenges in primary education

Author	Lack of 21 st Century Skills			Lack of Support		
	Life Skills	Learning Skills	Literacy Skills	Inadequate funding resource support	Insufficient training support	Lack of support from stakeholders
Alalwan et al. (2020)		/	/	/	/	/
Wasriep and Lajium (2019)	/	/	/	/	/	
Julius et al. (2018)	/	/	/	/		
Abdullah et al. (2020)		/		/	/	
Husin et al. (2017)			/	/		/
Savita et al. (2017)	/	/	/	/		/
Hendrik et al. (2020)	/	/	/		/	
Masril et al. (2021)	/	/	/	/		
Ismail et al. (2013)			/	/	/	/
Tahir et al. (2018)			/	/	/	/
Hwang et al. (2021)		/	/	/	/	/
Wong et al. (2021)			/	/		/
Singh et al. (2020)		/	/		/	
Saif et al. (2021)	/	/	/			/
Singh et al. (2021)	/	/	/		/	/
Razak et al. (2019)		/	/	/	/	/
Kasinathan et al. (2018)		/	/	/		/
Fadzil and Saat (2014)	/	/	/	/	/	/
Mohamad et al. (2013)	/		/	/	/	
Kho and Chen (2017)		/	/			
Siew et al. (2014)	/	/	/	/		
Azhar and Azman (2021)						/

Source: Authors' work

RESULTS AND DISCUSSION

Background of the Selected Article

The review obtained 22 publications, categorised by year and content based on difficulties and challenges in primary education in Malaysia, as well as research questions that drove our search and analysis. None of the 22 articles chosen was published in 2012, one in 2014, four in 2014, none in 2015, one in 2016, one in 2017, three in 2018, five in 2020, and six in 2021. The reviewers observed that nine research employed quantitative methods, eleven employed qualitative methods, and the other two employed a mixed-methods approach. Based on the thematic analysis, two primary themes emerged: a lack of 21st-century skills and support, supplemented by the six sub-themes described below.

Lack of 21st Century Skills

21st-century talents are qualities that current students must have to excel in their employment in the information age. Critical thinking, creativity, collaboration, communication, information literacy, media literacy, technology literacy, flexibility, leadership, initiative, productivity, and social skills are all vital in the Internet age (Thornhill-Miller et al., 2023). These abilities are designed to assist pupils to keep up with the fast-paced nature of today's modern marketplaces. Each talent is unique in how it benefits pupils, yet they all have one trait. These 22 carefully chosen articles highlighted the inadequate understanding of 21st-century abilities among Malaysian primary school

pupils and instructors in one or more areas. Therefore, the MoE should act immediately on the issues and challenges in nurturing and promoting these skills among primary education students to prepare to face the rapid changes for unknown future demands and jobs that have yet to be created. The 21st-century skills also can be categorised into three sub-themes: life skills, learning skills, and literacy skills.

Life Skills. Life skills are also known as career skills. These abilities are relevant to a person's personal life but also relate to professional contexts. The life skills that resemble leadership quality, productivity, and social skills are crucial to be cultivated early. Accordingly, several studies (Fadzil & Saat, 2014; Hendrik et al., 2020; Julius et al., 2018; Masril et al., 2021; Mohamad et al., 2013; Saif et al., 2021; Savita et al., 2017; Siew et al., 2014; Singh et al., 2021; Wasriep & Lajium, 2019) revealed the issues and challenges of primary schools towards instilling these skills among students.

According to Julius et al. (2018), Mohamad et al. (2013), and Wasriep and Lajium (2019), leadership quality is seen as low among primary school students, especially during group work or blended learning lessons initiated in class. Despite the teacher having briefed students on the procedures, no systematic operation is sometimes visible during a school lecture. For example, in the lab during a science lecture, pupils often work alone and do not share the equipment despite teachers assigning group leaders.

Besides, instruction by group leaders to take turns in cleaning the working area and appropriately storing tools and apparatus is often ignored by students purposively. Thus, it is important to stop these attitudes and behaviours in children early on to keep them from becoming self-centred, irresponsible individuals and ensure that they eventually follow the rules.

Four studies (Fadzil & Saat, 2014; Saif et al., 2021; Siew et al., 2014; Singh et al., 2021) addressed the issue of low productivity. They found that when teachers use two-dimensional materials for teaching and learning, students' imaginations become abstractive and lacking in creativity. Thus, they could not produce or complete simple original products, projects or draw specimens (Mohamad et al., 2013). Lacking hands-on and practical activities in daily lessons in school leads to incompetency in manipulative skills, eventually affecting productivity (Omar et al., 2020)

Subsequently, social skills are another important skill under the 'life skill' category, and they are necessary for all individuals to use daily to interact, collaborate, and communicate with others (Savita et al., 2017). A person has strong social skills, provides good knowledge, and behaves in social situations, both written and implied rules, when communicating with others. However, enhancement in social skills (Hendrik et al., 2020) among students in primary schools is essential. It is evident that students lack confidence when working in a lab as a team and are not motivated to share their thoughts and opinions during science

projects and digital multimedia technology presentations in the classroom (Masril et al., 2021). Likewise, the attitude of the students acting as a passenger and not wanting to emit a word during interaction could worsen the attainment of the group or individual task by the end of the lessons.

Learning Skills. Developing the 4Cs—critical thinking, creativity, collaboration, and communication—is essential for students and educators. To succeed in teaching and learning, adapting to and improving upon a modern work environment in the future, educators and students must possess these skills. Nevertheless, these skills still require attention because of the low accomplishment in primary schools. Sixteen out of twenty-two studies (Abdullah et al., 2020; Alalwan et al., 2020; Fadzil & Saat, 2014; Hendrik et al., 2020; Hwang et al., 2021; Julius et al., 2018; Kasinathan et al., 2018; Kho & Chen, 2017; Masril et al., 2021; Razak et al., 2019; Saif et al., 2021; Savita et al., 2017; Siew et al., 2014; Singh et al., 2020; Singh et al., 2021; Wasriep & Lajium, 2019) discussed poor acquisition in learning skills among students and educators.

Deficiency in critical thinking in schools occurs because teachers do not give ample time to think about solving certain problems due to time constraints for the lesson (Kho & Chen, 2017). Similarly, obstacles to critical thinking can also result from a student's self-centred or culturally-centred thinking (Hwang et al., 2021), excessive dependence on feelings or emotions (Abdullah et al.,

2020; Hendrik et al., 2020; Julius et al., 2018; Masril et al., 2021; Singh et al., 2020; Wong et al., 2021). It keeps the thinker from being impartial, curious, and broad-minded in the future. Moreover, the students will not apply logic, experience, or common sense to arrive at well-informed conclusions.

Creativity is another high-valued dominant skill under ‘Learning Skills’ in teaching and learning. Nonetheless, it showed a low impact on students and educators. Students were unable to create simple products or drawings; they additionally displayed low levels of innovation (figural creativity); they had trouble understanding math and graphics; students from vulnerable communities had low levels of creativity; teachers are not creative in how they present the material for their lessons; and there are problems integrating blended learning in the classroom, causing students to lag without having the chance to express their creativity (Hendrik, 2020; Hendrik et al., 2020; Hwang et al., 2021; Mohamad et al., 2013; Saif et al., 2021; Shahali et al., 2017; Siew et al., 2014).

According to Savita et al. (2017), Tahir et al. (2018), and Wong et al. (2021), collaboration skills between educators and students are crucial for fostering positive relationships and encouraging mutual engagement in the teaching and learning process in the classroom. Administrators need to address problems like incompetent teachers and disruptive student behaviour immediately to prevent further degradation of the final product. Consequently, communication skills are

essential for all stakeholders involved in education. However, the lack of two-way interaction hints at poor learning outcomes. Likewise, collaboration should be initiated through peer work, teamwork, discussion, and sharing sessions, not individual-based tasks (Alalwan et al., 2020). Fadzil and Saat (2014), Kasinathan et al. (2018), Razak et al. (2019), and Saif et al. (2021) asserted that communication and a good rapport among stakeholders, specifically between students and educators, are very important.

Literacy Skills. Literacy skills, which include information literacy, media literacy and technology literacy, are skills acquired by the present generation in the world of the modern arena. It focuses on technology and how students and educators can discern facts obtained and separate the misinformation that floods the internet. Information Literacy is the skills needed to find, retrieve, analyse, and use information. Literacy skill is a basic and must-have skill for students in primary school (Fadzil & Saat, 2014; Husin et al., 2017; Hwang et al., 2021; Kho & Chen, 2017; Mohamad et al., 2013; Razak et al., 2019; Siew et al., 2014; Singh et al., 2020; Tahir et al., 2018; Wasriep & Lajium, 2019).

Although they are important skills for students and educators, the government’s effort to impart knowledge concerning these skills is still challenging. Twenty articles highlighted these issues (Alalwan et al., 2020; Fadzil & Saat, 2014; Hendrik et al., 2020; Husin et al., 2017; Hwang et al., 2021; Ismail et al., 2013; Julius et al., 2018; Kasinathan et al., 2018; Kho & Chen.,

2017; Masril et al., 2021; Mohamad et al., 2013; Razak et al., 2019; Saif et al., 2021; Savita et al., 2017; Siew et al., 2014; Singh et al., 2020; Singh et al., 2021; Tahir et al., 2018; Wasriep & Lajium, 2019; Wong et al., 2021).

As a result, obstacles to students' literacy skills were left undiagnosed, such as hearing or vision issues, a lack of role models because no one in the family or household stresses the value of education (for B40 and vulnerable students), poor manipulative skills and poor laboratory management during science experiments and projects, a lack of exposure to data analysis, and inadequate training for problem-solving in science learning and mathematical reasoning during the lesson due to limited resources and time constraints.

The capacity to access, analyse, evaluate, and produce media is often referred to as media literacy. Television, radio, internet, newspapers, magazines, books, billboards, video games, music, and all other media should all be able to interpret the complex information received. However, several issues regarding this skill were discussed in five studies, such as unstable internet connection, especially in rural schools, teachers' readiness towards utilising mobile learning in the classroom, challenges in conducting advanced computer vision skills, 3D modelling, desktop web or mobile programming, the use of two-dimensional materials in place of three-dimensional materials in the classroom, which hinders students' ability to think creatively since the concepts and ideas being taught—such

as “air pressure,” “current flow,” and photosynthesis—are too complicated and resemble mere abstractions (Abdullah et al., 2020; Ismail et al., 2013; Julius et al., 2018; Singh et al., 2021; Wong et al., 2021).

Subsequently, technology literacy skills are also quite challenging for educators and students in primary schools. Even though most schools are encouraged to use the technology-based approach in teaching and learning, few issues have arisen regarding technology literacy skills, and five studies discussed the matter (Alalwan et al., 2020; Kasinathan et al., 2018; Masril et al., 2021; Saif et al., 2021; Savita et al., 2017). Lack of exposure to cutting-edge technological tools like virtual reality and augmented reality, a lack of support for educational robots in the classroom, and the gap between urban and rural schools' technology integration due to inadequate facilities are all issues that educators and students must deal with. Adding technology to gamification is exciting and entertaining (Mee et al., 2021). However, it can be difficult for students from low-income families. The Bring Your Device (BYOD) policy worries parents about safety concerns and issues with uncontrollable, limited supervision when students use technology-based tools in the classroom.

The Implication of a Lack of 21st-century Skills. The 21st-century skills found in this study can be categorised into three sub-themes: life skills, learning skills, and literacy skills. The life skills are leadership quality, productivity, and social

skills. Learning skills such as critical thinking, creativity, collaboration, and communication. Literacy skills include information literacy, media literacy, and technology literacy. It is insufficient to prepare children with basic literacy skills such as reading, writing, and arithmetic to meet the demands of the 21st century to overcome the issues and challenges of implementing TVET preliminary courses in primary education in Malaysia towards raising awareness of the future 4IR. They should also be nurtured in critical thinking, problem-solving, good communication, and collaboration. This ability can be trained at the primary educational stage. The implication of lacking 21st-century skills in primary school children will result in their inability to face the coming 4IR global community challenges. In addition, this condition implies that children will lag in adopting science and technology compared to other countries.

Furthermore, another implication could be that teachers with strong critical thinking, problem-solving, creativity, communication, and cooperation capabilities could provide primary school children with a learning environment that is more open to inquiry for positive student attitude development. The literature review also shows that 21st-century competency methods of instruction are not successfully implemented currently. The causes include a lack of integration of 21st-century competencies in curriculum and assessment and inadequate teacher preparation to implement new teaching and learning practices. Another implication

could be that when teachers engage in more teaching and learning activities incorporating 21st-century abilities in the curriculum, this could also develop a positive learning environment for primary school children's skills and attitude development.

Lack of Support

Primary education is a fundamental level of education for every child to begin. Support from a variety of sources is therefore continuously required to guarantee that the school's administration and the MoE are appropriately handling every part of the institution. However, several issues arose, including lack of support as the main theme and sub-themes, namely lack of funding and resource support, insufficient training support, and lack of collaboration among stakeholders. There were 20 out of 22 studies that displayed issues concerning a lack of support in primary schools (Abdullah et al., 2020; Alalwan et al., 2020; Azhar & Azman, 2021; Husin et al., 2017; Hwang et al., 2021; Ismail et al., 2013; Julius et al., 2018; Kasinathan et al., 2018; Masril et al., 2021; Mohamad et al., 2013; Razak et al., 2019; Saif et al., 2021; Savita et al., 2017; Siew et al., 2014; Singh et al., 2020; Singh et al., 2021; Tahir et al., 2018; Wasriep & Lajium, 2019; Wong et al., 2021).

Inadequate Funding and Resources Support. A crucial problem that directly affects student success is the school budget. The financing-related concerns were covered in seventeen articles. A discrepancy in education is caused by lower

student accomplishment in schools with less funding, which are frequently unable to provide fewer classrooms and better programs. Expenses on technology-based (augmented reality and virtual reality) modelling, tools, equipment, apparatus, and devices are expensive and require much maintenance. A limited allocation of funding by the government leads to ineffectiveness and slow progress in attaining knowledge or skills (Alalwan et al., 2020; Fadzil & Saat, 2014; Julius et al., 2018; Kasinathan et al., 2018; Mohamad et al., 2013; Wasriep & Lajium, 2019).

Inadequate resources are other challenges primary schools face due to lack of funding, such as inadequate environmental resources and low device adaptability due to low cost and restricted instructional design materials, including technology integration, project-based learning techniques, and evaluation.

Additionally, some materials do not appear appealing to the pupils and fail to adjust to educational settings or experiences (Alalwan et al., 2020; Wong et al., 2021). Similarly, intended money for rural schools showed that there are fewer facilities offered, no technical support is offered to address issues that arise during the class, ICT tools are poorly managed, and they require continual maintenance to ensure that teaching and learning proceed smoothly every day in the schools (Abdullah et al., 2020; Alalwan et al., 2020; Hwang et al., 2021; Ismail et al., 2013; Masril et al., 2021; Mohamad et al., 2013; Razak et al., 2019; Savita et al., 2017; Siew et al., 2014; Tahir et al., 2018).

Insufficient Training Support. Teachers and administrators require regular training opportunities to keep up with their game. Even the greatest instructors and school personnel will fall behind if they do not continue to strive for excellence to enhance their career requirements for future demands. In addition, administrators and teachers are urged to enhance their skills and acquire in-depth knowledge in the field of education. Thus, primary school teachers face challenges due to certain factors in gaining training support, and the issues were disclosed by 10 out of 22 research studies.

Masril et al. (2021) and Wasriep and Lajium (2019) believe high-quality development is in educators' self-efficacy. Teachers need skills to get pupils involved in the lesson and actively participate. Teachers are encouraged to train and take short courses to enhance their school skills and maintain motivation. Issues on workloads such as clerical work demand at the workplace, no administration support, ineffective tools and devices to teach, and teachers' knowledge of comprehending science and mathematics concepts without training or exposure lead the teachers under pressure (Husin et al., 2017; Ismail et al., 2013; Masril et al., 2021; Mustam & Adnan, 2019; Razak et al., 2019; Singh et al., 2020; Tahir et al., 2018; Wasriep & Lajium, 2019).

Besides, training and support are needed for an educator to gain technical skills in handling the laboratory, attracting students to stay focused during the lesson. Lack of focus and attention while using devices allows students to navigate to other websites

and apps without the teacher's permission (Alalwan et al., 2020; Mohamad et al., 2013).

In addition, teachers' attitudes were also reported as a failure to commit to and comply with the school regulations. Many educators lack the drive to research further information on teaching careers. The teachers were losing out on information by missing the monthly workshops organised by the school administration to increase teachers' understanding (Mohamad et al., 2013; Razak et al., 2019; Singh et al., 2020).

Meanwhile, administrators, specifically novice school heads and teachers, revealed their issues and challenges in primary school, such as lack of training in the program to handle in school and less opportunity to attend any short courses, workshops, and forums. Furthermore, there was hardly any sharing session with other primary school heads organised by MoE to ease the doubts among the school heads or other administration staff. School heads usually put effort into applying for short courses or workshops merely to upskill their professional development to improve their headship quality (Husin et al., 2017; Tahir et al., 2018).

Subsequently, the uncontrollable emotional interference of the school heads is also mentioned as a challenge to run the school efficiently. Negative views or actions may lead to strained relationships with fellow school personnel and impact the organisation's overall performance. Therefore, constant training is needed, particularly for novice school heads, as

they are new leaders in the new school environment, and they need to be supported continuously due to forthcoming matters in school, for instance, parent demands, MoE policy reform, problematic teachers, and student's behaviours.

Lack of Support from Stakeholders.

Stakeholders in education include anybody interested in the welfare and success of a school or its students, including administrators, teachers, staff, students, parents, families, community members, local business leaders, elected officials, school board members, and NGOs. While collaboration between those possessing knowledge and experience in student learning is necessary, several barriers may make it challenging. Twelve researchers covered the sub-themes of lack of support and collaboration among stakeholders.

Lack of collaboration skills in primary school is a common issue- particularly in rural schools. They are hardly heard or assisted by nearby communities, industries, private agencies, or NGOs, such as low computer literacy, low academic attainment, and learning difficulties due to no exposure to technological devices offered by stakeholders for the schools. Budgeted financing did not help resolve problems, even though the government had provided funds to operate the remote school. Due to the unwelcoming environment and uncomfortable facilities, students, especially those from B40 families and the vulnerable community, are more likely to skip class and become truants, which increases their

risk of dropping out of school. In short, enhancement is required in CSR programs by industries nearby, corporate companies or communities.

Moreover, the government should be attentive to the imminent consequences of neglecting rural schools. Thus, government and corporate companies should collaborate, sharing burdens and ideas to provide necessities and help rural schools with academic programs. Accordingly, CSR initiatives should be through long-term service, not merely one-off help. With that, other children could benefit in the future (Azhar & Azman, 2021; Husin et al., 2017; Hwang et al., 2021; Kasinathan et al., 2018; Razak et al., 2019; Saif et al., 2021).

Similarly, significant support from school administrators and parents/teachers is necessary to foster students' interest in academic success and address their diverse behaviour. However, several articles revealed problems regarding a lack of collaboration and support from parents to school and support from school heads to teachers. Teachers are under pressure due to not getting help in terms of welfare and demand extra classes after school hours. Moreover, many educators and administrators feel that there are not enough hours in the school day for sharing sessions because the Professional Learning Community (PLC) does not exist. Parents disregard school records, absentee notices, kid dropout rates, and teacher's request for class experiments. They also refuse to collaborate and show no support during parent-teacher conferences.

Parents hardly prepare children with things needed for school projects and lessons, indicating no collaboration between parents, school heads, and teachers. Furthermore, it seems teachers are struggling alone to meet the objectives. In summary, the collaboration among parents, teachers, head teachers, and society will significantly impact education. Teachers' financial strain in the classroom may be reduced by sponsoring pricey equipment, spaces, and supplies for instruction and learning. In the upcoming years, administrators will be in favour of organising and providing youngsters with thorough knowledge with the assistance of schoolteachers (Alalwan et al., 2020; Azhar & Azman, 2021; Fadzil & Saat, 2014; Hwang et al., 2021; Ismail et al., 2013; Saif et al., 2021; Savita et al., 2017; Tahir et al., 2018; Wong et al., 2021).

The Implication of Lack of Support

The lack of support found in this study can be categorised into three sub-themes: inadequate funding, insufficient training, and deficiency of collaboration among the stakeholders. A discrepancy in education is caused by lower student accomplishment in schools with less funding. The implication of a limited allocation of funding by the government could steer to ineffectiveness and slow progress in attaining knowledge or skills among primary school children. Therefore, students, particularly those from poor backgrounds, are at risk of dropping out of school because they lose interest in attending school due to the unfriendly atmosphere and are discomforted by the

facilities provided in the school. Thus, the implication of partnership with parents, teachers, head teachers, and society will make a difference in school.

Sponsoring devices, facilities, and tools for teaching and learning purposes could ease teachers' burdens. Likewise, the implication of parents' and teachers' partnership, as well as school heads' support, could move towards nurturing interest in academic achievement and solving the issue of various misbehaviours of students in school. Besides, training and support are needed for teachers to gain technical skills, thus attracting students to be active during the lesson. In addition, school heads need to be continuously supported with training due to forthcoming matters in school, such as parents' demands, MoE policy reform, problematic teachers, and students' misbehaviours.

Issues and Challenges of Primary Education in Other Countries to Meet the Fourth Industrial Revolution Demand

Na (2021) explored what primary school teachers believe about the learning contents of primary science education in South Korea for the 4IR. According to the findings, many teachers said the existing learning materials are unsuitable for the 4IR and should be updated. Many teachers stated that the subject's learning content did not reflect the features of the 4IR and suggested a few methods to embrace technological advancements, such as utilising project learning methods, introducing software education, and safety education.

Ilori and Ajagunna (2020) examined how the 4IR influences education at all levels. They discovered that introducing smart communication systems incorporating the internet, artificial intelligence, virtual reality, digital textbooks, and robots has changed how and what is learned in schools. As a result, they argued that curriculum creation and evaluation must keep up with technology changes, dynamics, and skills needed in the 21st century. Furthermore, they added that examples of 4IR innovations today include Airbnb, cyber-security, Uber, cloud services, 3D printers, artificial intelligence, robots, driverless automobiles, drone technology, and machine learning. However, many institutions do not include these components in their curriculum structures.

Oke and Fernandes (2020) investigated the African educational sector's preparation for the 4IR. Semi-structured interviews were used to acquire information about the readiness and adoption of the 4IR from 33 key stakeholders. The findings revealed that even though 4IR can improve students' learning experiences and revolutionise the workplace, the current education system is unprepared for the 4IR. The findings also show that the educational sector can harness 4IR innovations through research and teaching to improve learners' experiences; nevertheless, this may necessitate considerable improvements in education curriculum as well as funding.

Children in elementary school are renowned for being digitally aware, multitaskers, and active through playing,

imagining, singing, and enjoying themselves in groups. Teachers in the 21st century may be adaptable to technology, bewitching, creative, and caring. Indriani et al. (2019) defined the design of innovation learning within the framework of the 4IR. Characteristics of 21st-century learning include HOTS, ICT, and literacy in the learning process. The active learning model that should be emphasised is project- and problem-based learning. The results show that for elementary school students to be 21st-century competent, four key factors must be considered: the traits of elementary school students as members of the 21st-century generation, the characteristics of 21st-century teachers, the traits of 21st century learning itself and the consideration of active learning models that foster student creativity.

An instructional robotics workshop using an Arduino robot was conducted by Shipepe et al. (2022) in a Namibian elementary school in 2022, using educational robotics, which has proven to be a field that facilitates computational thinking and design thinking. The findings revealed that children without programming experience are able to apply both computational and design thinking skills. The researchers suggest that this method can be used in schools to help elementary school students apply computational and design thinking to get ready for the 4IR technologies.

According to R. Rahman et al. (2019), education is the most effective strategy for shaping proper human behaviour and preparing individuals for the 4IR. They

investigated the new literacy ideas to be emphasised in primary education in Indonesia, namely technology literacy and data literacy. The results showed that for teachers to be well-versed in the concepts, they need to be incorporated into every class activity. Ayanwale et al. (2022) investigated mathematics teachers' willingness to accept 4IR skills to improve their pedagogy and learning. They found that math teachers are ready to embrace the 4IR era's diversified abilities and possibilities. The study has consequences for school administrators, mathematics teachers, and educational stakeholders in terms of policy development in the direction of 4IR. It would contribute to successfully applying the 4IR in mathematics education, necessitating creativity, complex problem-solving, and social and system abilities.

In Catalonia, 37 primary and secondary school principals were interviewed by Mogas et al. in 2022. Thematic analysis concentrating on management systems, inclusivity, sustainability, and technical and pedagogical advances reveals that schools are far from using cutting-edge technologies. The 4IR's influence depends on the technology's level of maturity and usability, as well as stakeholders and policymakers, even though schools are not yet equipped to handle it.

Software education is required to promote computational thinking via experience in spontaneously addressing issues in daily life. According to Lee et al. (2018), it is desirable to begin software education at the age of five to build

the abilities necessary for the future of society. Furthermore, it is vital to exchange knowledge with friends, and problem-solving abilities are required through communication techniques, attitudes, and teamwork.

Media literacy is a fundamental skill children need in the 4IR era because they are highly adaptable and capable. Primary school pupils' media education is crucial (Jeong, 2021). They look at the conversation in Korean society. Based on the findings, there are numerous media educational options, particularly for English and coding education, and primary school pupils use many handphones or other digital devices to provide effective media education. The time has come to work harder at enhancing education using media in an elementary school environment that supports it. Most of the literature above indicates that primary education in other countries is not well suited to meet the current demands of the 4IR, resulting from a lack of engagement of the various stakeholders in curriculum structures and learning material. It is believed that children who have not been exposed to technological changes from the early stage will have challenges and discomfort in learning when the technology is included in the learning process later. However, the findings indicate that the children and teachers are willing to accept 4IR skills embedded in their teaching and learning process.

As the resources for transformative learning are already overwhelming, the 4IR is expected to significantly change how

primary school children are taught and what they must learn. Schools will increasingly become hubs for producing and incubating innovation, with excellent learning, teaching, and knowledge impartation. Jobs will be scarce for those lacking the necessary abilities, while those having the necessary skills will need to keep up with the rate of technological advancement or risk being left behind. Thus, all stakeholders and policymakers should take the necessary actions to meet the 4IR demands from the early stage of primary education.

CONCLUSION

The literature review reveals that the TVET preparatory courses now offered in elementary education in Malaysia and other nations are poorly structured to increase awareness of the upcoming 4IR. The primary education scenario should adapt to the advancements and developments of the 4IR to align with 21st-century education. To accomplish the aim of TVET preparatory courses to increase awareness of the current 4IR in Malaysian primary education, studies on the 22 articles revealed problems and difficulties with primary education. Lack of support and 21st-century skills are the two main themes extracted. Six sub-themes are then thoroughly identified under the main theme: inadequate funding, inadequate training, incompetent literacy skills, low learning skills, lack of life skills, and stakeholder collaboration. Besides, the 22 research studies also reveal that none of the studies relate to the primary schools' issues and challenges to the TVET field.

By analysing the issues and challenges, the issues can be determined to motivate stakeholders in the policy-making process of Malaysia's education system to plan to address the issues and challenges and create a suitable curriculum that aligns with the needs, capabilities, and interests of the country's primary schools. Information on the specific areas and research topics that should be the main focus of future studies, particularly in the area of primary education in Malaysia, which supports the Fourth Industrial Revolution by raising children's awareness from an early age, can also be determined. Eventually, this will prepare teachers to embrace technologies in the teaching and learning process that will, in turn, assist them in focusing on developing the student's creativity, knowledge, and various skills rather than being occupied with too many clerical tasks.

Furthermore, by recognising problems and obstacles in elementary education, the involved parties could plan and come up with appropriate solutions. The 21st-century skills include life skills that help develop a career, learning skills primarily taught in the classroom, technology-integrated literacy skills, and the use of cutting-edge tools and devices in the classroom that help expose the students to the realities of the modern world. Furthermore, Malaysia's approach to education has evolved over the past few years, with every new education minister introducing new systems for the nation's benefit. Still, the nation's educational standards are something that every Malaysian thinks about frequently.

There is a lack of students and graduates compared to other countries. Thus, primary education needs to handle various issues properly to realise the nation's ambitions. Addressing the problems and challenges at the elementary education level points to holding a solid foundation early in children's schooling. In short, to achieve its goal of becoming a high-income nation, Malaysia must propel its output expansion. Similarly, it should abandon the prior low-cost labour approach, which relies primarily on foreign workers. Education plays a crucial role in creating the required human capital. Regrettably, despite substantial financial outlays, educational quality is inadequate. So far, technical and professional education and training have contributed only slightly to the fundamental elements of the educational system. However, it loses the opportunity to cultivate individuals, which might have a significant long-term impact. As a result, the MoE should have major responsibility for resolving problems and obstacles, as elementary school is the foundational level of education where children build their abilities, values, and skills prior to enrolling in the secondary level.

Implications for Practice

From the results obtained, two main themes were discussed. The themes are anticipated to provide insights into primary schools' issues and challenges in raising awareness of the future 4IR technologies. In addition, the results of this literature review are expected to aid in setting the course for improvements in primary education in

Malaysia. Furthermore, this research emphasises that investments in education, particularly in skill development and knowledge acquisition, enhance productivity and economic growth. When applied to primary education, especially in the context of TVET, it underscores the crucial role of early investment in human capital development, aligning skill development with the technological advancements characterising the 4IR.

The first main theme is the lack of 21st-century skills, with the sub-themes of lack of life skills, low learning skills, and incompetent literacy skills. The life skills are leadership quality, productivity, and social skills. Learning skills such as critical thinking, creativity, collaboration, and communication. Literacy skills include information literacy, media literacy, and technology literacy. The lack of 21st-century skills in primary school children will result in their inability to face the coming 4IR technological global community challenges and lag in adopting science and technology compared to other countries. Thus, children should be nurtured in critical thinking, problem-solving, good communication, and collaboration.

The issues and challenges regarding the degree of inclusion, preparation, and practice of TVET principles in current primary education to raise awareness of the 4IR technologies could not be identified. The existing primary curriculum structures are unsuitable and do not reflect features of the 4IR technologies, which are embedded and seen as unprepared for the 4IR. The

curriculum structures should be updated to embrace technological advancement. The active learning model should be emphasised, as well as project-based learning and problem-based learning, HOTS, ICT, and literacy in the learning process. Thus, from the practical point of view, when the issues and challenges presented in this study are addressed systematically by all the stakeholders, primary education will be developed. Malaysia will be one country that embraces 4IR changes quickly and effectively.

The lack of integration of 21st-century competencies in curriculum and assessment and inadequate teacher preparation to implement new teaching and learning practices should also be addressed. With strong critical thinking, problem-solving, creativity, communication, and cooperation capabilities, teachers could provide primary school children with a learning environment that is more open to inquiry to develop positive student attitudes. Additionally, by introducing 21st-century skills into the curriculum more, instructors can foster a pleasant learning environment that supports the development of the skills and attitudes of primary school students. Accordingly, 21st-century learning requires children to be creative and have the ability to solve problems systematically. As a result, computer literacy and software education are crucial for fostering computational thinking as well as for enhancing creative and problem-solving abilities. They could be used in RBT courses and are relevant to STEM and computer science education.

RBT subjects aim to stimulate and create creative, critical, and innovative human capital by emphasising the thinking skills of primary school children. Teachers' skills, knowledge, and pedagogical skills in RBT and STEM education should also be developed to meet the aim. Due to the technology changes, dynamics, and skills needed in the 21st century to embrace the 4IR, the curriculum should also be updated to include subjects that introduce the internet, artificial intelligence, digital textbooks, virtual reality, robots, 3D printers, drone technology and machine learning in primary schools. In addition, programming, coding, and media literacy are fundamental skills children need in the 4IR.

The second main theme is the lack of support, which includes sub-themes of inadequate funding, insufficient training, and lack of collaboration among the stakeholders. A limited allocation of funding by the government could steer to ineffectiveness and slow progress in attaining knowledge or skills among primary school children. Thus, partnership with parents, teachers, head teachers, and society will make a difference in the school. Sponsoring devices, facilities, and tools for teaching and learning purposes could ease teachers' burdens and solve various student issues in school. Furthermore, training and support are needed for teachers to gain more advanced technical skills, thus attracting students to be active during the lesson.

In addition, the findings can also be considered to have instrumental impacts that influence the development of the policy,

practice, or shape legislation. Therefore, policymakers such as MoE officers, school administrators, and other stakeholders have roles to play in ensuring ample preparation at the primary education level to raise awareness of the future 4IR technologies through TVET preliminary subjects such as RBT and other relevant subjects. MoE might scrutinise ways to enhance the delivery of STEM education, RBT, and other primary school subjects to expose the students to 4IR technologies and increase their understanding of productive and skilled human capital. In addition, MoE should develop policies to educate and comprehend the stakeholders involved by providing proper facilities, materials, good internet connection in schools, and teacher training. It motivates the stakeholders involved and enables the teaching and learning process to be executed as planned. In addition, by enhancing the top and bottom managerial positions in education, programme execution planning, and facility needs, MoE, senior education managers, and other related stakeholders should work together to fill the gaps and shortcomings.

Limitations and Recommendations for Future Studies

The issues and challenges that the primary schools confront in raising awareness of the future 4IR through TVET preliminary courses in Malaysia must be examined further and supported by further evidence. In Malaysia, research on TVET challenges and concerns has focused on secondary schools, polytechnics, technical schools, and

other institutions, but none has addressed the country's elementary schools. As a result, this study provides a new perspective on the topic from the perspective of elementary education, which enriches the research community. With relevance to TVET and 4IR, it can also be said that there has not been much research done on the problems and difficulties concerning primary school. By using a qualitative method and focusing on the experiences and viewpoints of various TVET stakeholders, mainly from the education line, a more distinctive contribution to the field of primary education to meet the 4IR demands could be made. Indeed, the richness of the data allows for detailed data analysis and allows researchers to delve deeply into the social and subjective lives of the participants. Additionally, interviews with all the relevant stakeholders should be conducted to enable them to express their insights and experiences on TVET, the school administration, and the overall education system. In doing so, changes can be made to the strategic actions to ensure that teachers and students in primary education are exposed to TVET and know future job market demands.

This study offers suggestions for implementors and policymakers to increase awareness of the function of primary schools. Doing so would achieve one of the country's goals: meeting the national TVET agendas in line with the 4IR needs. In addition, by enhancing the top and bottom managerial in education, program execution planning, and facility needs, TVET stakeholders should work together to

fill the gaps and shortcomings, especially in primary schools. Moreover, the MoE might scrutinise ways to enhance the delivery of TVET-related courses such as STEM, RBT, and other primary school elective subjects to better expose the students to occupational terms and increase their understanding of productive and skilled human capital.

Future studies may also focus on various educational levels nationwide to take a more in-depth look at the issue. Fortunately, this study offers a foundation to guide the study's future information by gathering data specifically from the primary education level. The study creates several paths for more research. The findings of this study need to be refined and further elaborated on through more research. First, many problems still need to be addressed or improved upon, despite the main themes of primary schools' concerns and challenges faced by assisting TVET in Malaysia and how improvisation can be made to overcome the obstacles. Information from upcoming studies and research will highlight issues with the complexity of the educational system, management's failure to address issues, teachers' attitudes and workload in schools, infrastructure, and facilities issues. It will also draw attention to the difficulties in implementing some policies, like introducing RBT courses, STEM thinking, and altered curricula from upper to lower school levels. They are vital in priming elementary school students for early education to help TVET in Malaysia become cognizant of 4IR technologies.

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