The Challenges of Industrial Revolution (IR) 4.0 towards the Teacher’s Self-Efficacy

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Abstract. The emerging of IR 4.0 has brought a massive change in the world of education. In facing IR 4.0, teachers today are urged to suit the process of teaching and learning. Hence, the teachers need to dominate the information technology because the new millennia students consist of z and alpha generation, who tend to utilize technology-based learning. Therefore, this study discusses how highly qualified teachers can cope with the current flow of revolution 4.0 according to current requirements. Findings show that high efficacy teachers in terms of student management, instructional strategies, and classroom management are willing to accept changes in teaching and learning. Besides, IR 4.0 has transformed the country's educational landscape from traditional-based learning to technology-based learning. IR 4.0 has enormous implications for the country's education system according to 21st-century learning needs.

Keywords: Industrial Revolution (IR4.0), Teacher’s Self-efficacy

1. Introduction

The emergence of the Industrial Revolution (IR) 4.0 has transformed the way of life and the work patterns of people who use the internet as an essential requirement in the economic, political, educational and social sectors. This change involves three main domains, physical, digital, and biological. It encompasses nine pillars namely simulation and virtual reality, vertical and horizontal system integrations, internet of things (IoT) industry, cybersecurity, cloud computing, additive manufacturing, supply chains, public data
analysis and robot automats [1-2]. Therefore, to challenging the modernization, 4.0 IR-based education should be adapted in all subjects [3]. Thus, teachers need to gain knowledge and skills by adapting to the latest innovations in teaching and learning proses to produce more skilled, talented, creative, innovative and successful students to produce high-quality products that can compete in the world of globalization.

2. Education of the Era Revolution 4.0
IR 4.0 is a form of progress in human civilization [4]. The transition from agricultural to industrial has made human life more complicated and full of competitive elements in modern style. IR 4.0 is closely linked to the application of advanced technology, information control, and introduction to modern-day communication as well as increased use of smart devices in most everyday affairs [5].

The advancement of science and technology has changed the world as the first generation revolution to the history of human and animal substitution with the emergence of machines and the use of water and steam technology (IR 1.0). Furthermore, IR 2.0 was marked by the development of power plants and combustion engines [6-8]. These findings lead to the development of high-tech devices such as phones, cars, aircraft and other heavy machinery that have significantly changed the world [9]. Meanwhile, the third industrial revolution marked the advent of digital technology and the internet. Furthermore, the fourth industrial revolution (IR 4.0) took place with the arrival of a supercomputer, smart robots, driverless vehicles, genetic modifications and the development of neurotechnology that enabled humans to optimize brain function [10-12].

IR 4.0 emphasizes the development of virtual reality technology without involving much use of workforce has impacted many aspects of life [13,14]. The world of education is also one of the most essential areas of development that has been affected by these developments. The impact of IR 4.0 sees education as a teaching and learning skill that can adapt to individual styles and strategies. Teachers need to see innovation as a must in the teaching and learning process because innovation can save time and increase student interest in learning. Innovation requires teachers who are knowledgeable, skilled, analytical, and willing to work on something new. Therefore, highly self-efficacy teachers are indispensable in today's educational world to produce students who are ready to confront the challenges of IR 4.0.

In the world of education, IR 4.0 revolution witnessed a very significant change from traditional learning to technology-based learning [15]. But it is in line with the trend of student learning that characterizes education today. The students tend to learn by using heutagogy, paragogy and cybergogy [16], blended learning [17,18], WhatsApp [19,20], a variety of modern functions and gadgets [21], learning through gamification [22-24], skype, face-time and hang out [19], and learning using heutagogy [25].

More clearly, 21st-century learning requires teachers to dominate IR 4.0 to make the teaching and learning process more appealing to new millennials.

3. Scholars Opinion on Self Efficacy
Self-efficacy was introduced by Bandura 1986 in his book 'Social Foundations of Thought and Action: A Social Cognitive Theory.' Bandura, 1986 describes self-efficacy refers to the extent to which people have trust and confidence in her ability to achieve the goals set. It also has to do with one's ability to formulate strategies and take actions to achieve the goals outline.

Tschannen-Moran and Hoy expanded the concept of self-efficacy by focusing on teacher self-efficacy. Tschannen-Moran and Hoy (2001) defined teacher self-efficacy as the belief and confidence of a teacher to teach and motivate students, including students who are less motivated and troubled. [26] Succeeding in proving a student's success is closely linked to the teacher's self-efficacy. If teachers had a high level of self-efficacy, the teacher could teach and influence students to succeed.
There are three factors proposed by Tschannen-Moran and Hoy to represent teacher self-efficacy, which is student engagement, impact on teaching strategies, and classroom management effectiveness. Effectiveness of student engagement refers to teachers' ability to engage students in optimal learning and facilitating activities (teaching and learning). This optimal student engagement enables teachers to give students the confidence to study hard to achieve excellence. The effect of teaching strategies is on teachers' ability to apply a variety of teaching strategies and methods in the classroom. The impact of classroom management is the ability of teachers to manage the classroom, controlling student behaviour during the teaching and learning process.

Finally, teacher self-efficacy in this paper refers to a teacher's belief in his/her ability and ability to perform teaching tasks in school. It refers to the confidence in the knowledge, skills, and skills a teacher has for achieving a goal.

4. IR 4.0 Challenges in Education

Students in today's school are of the Z and alpha age range of 0 to 24. The Z generation was born from 1995 to 2010, while the alpha generation was born from 2011 to 2025 [27]. Figure 1 shows the number of primary and secondary students of 4,734,257, each of, 2,726,761 and 2,007,496. Meanwhile, the number of teachers in primary and secondary schools was 419,904, the number of teachers in primary schools being 237,317, and in secondary schools is 182,587.

Figure 1. Numbers and Percentage of Students and Teachers at Primary and Secondary School Level by Gender (2019)

| Gender | Students | Teachers |
|--------|----------|----------|
|        | *Primary | **Secondary | Primary | Secondary |
| Male   | 1,398,201 | 999,074 | 70,025 | 53,717 |
| Female | 1,328,560 | 1,008,422 | 167,292 | 128,870 |
| TOTAL  | 2,726,761 | 2,007,496 | 237,317 | 182,587 |
| GRAND TOTAL | 4,734,257 | 419,904 |

*Note: 1. excluding pre-school enrolment 2. Including enrolment of Year 4 to Year 6 in Special Model Schools and Sports Schools
**Note: 1. including enrolment of Form 1 to 3 students in Comprehensive Special Model (K9) Schools 2. Excluding pre-schools students in secondary schools 3. Data for Form 6 Lower is not available (...) because Form 6 begins in May, except for students who are taking STAM in religious school
Source: School Management Division (APDM - Data as of 31st January 2019)

Figure 1 shows that the total number of students is 4,734,257. This large number is a challenge for teachers as today's students are increasingly inclined to learn using the sophistication of modern telecommunications. However, high of self-efficacy teachers will try our best to dominate the teaching skills by the purpose of self-efficacy of teachers' confidence in the ability of the teacher to teach students in the classroom.

5. Discussion

Education is a public interest that should be fulfilled in today's life. In fact, the role of the education system is crucial in the development of a country. Excellence and quality in the educational process are substantial as a platform to develop the new millennium generation by the times. The country's education system needs strategic planning to improve its practice to the best of its ability to meet the challenges of the 21st century. In addition to the emergence of revolution 4.0 demanded the commitment of teachers in terms of energy, effort, and sacrifice. Those elements are essential because of the realization of the
demands of the 21st century in the generation of a generation of information, creative and proactive, values, personality, entrepreneurial and entrepreneurial skills, and competencies. According to [28], IR 4.0 has changed the landscape of innovation in education.

IR 4.0 is controlled by digital tools and introduces future education models by focusing on smarter, mobile, comprehensive, and virtual education and skills development. Therefore, teachers need to be ready to accept the changes and innovations in the education system today. Teachers are thought to be more willing to do the teaching work [29] having sufficient experience in preparing for an environment that supports the teaching and learning process for all students [30]. Teachers should also be psychologically and socially prepared to face the challenges of the IR 4.0 revolution [30], this is due to the willingness of teachers is a critical element in determining the success and failure in implementing any changes [31].

Educators are a medium that can determine the human pattern for the new millennium. Teachers today also have to deal with technological changes and innovations as well as modern telecommunications. Students in this era of globalization are easy to access by directly accessing the internet. It is indeed a challenge for teachers who do not equip themselves with the technology of communication. This matter shows that there is a wide generation gap and out between students and educators.

Thus, teachers are high self-efficacy should be able to make a paradigm shift in the process of educating and teach students to be a successful student and to be of high moral character. Highly self-efficacy teachers are always prepared with a wide range of knowledge not only related to curriculum and pedagogy, but also knowledge of the application of information technology following current demands. Teachers should also be proficient in optimizing various forms of technology as one of the strategies used in the learning and facilitating process [16]. In this way, teachers and students are not left behind in the revolutionary 4.0 and accordance with the requirements of 21st-century education.

6. Conclusion
In conclusion, IR 4.0 contributes to positive developments in the new millennium education model. The use of modern telecommunications tools has helped the teaching and learning process attract students of z and alpha generation, a multi-tasking digital generation that is always ready to accept the changes in the virtual world. Therefore, teachers in Malaysia need to prepare themselves with knowledge and skills in science and technology to meet the challenges of IR 4.0. However, highly self-efficacy teachers will be better prepared for this change as the self-efficacy of a teacher will give them the confidence to try out various teaching strategies to produce students who are creative, pro-active, competitive and able to keep up with the current trends.

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