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READINESS IN IMPLEMENTING TEACHER TRAINING PROGRAMMES BASED ON INDUSTRIAL REVOLUTION 4.0: EVIDENCE FROM MALAYSIAN PUBLIC UNIVERSITIES

[1]MUHAMMAD SUKRI SAUD, [1]MOHD RUSTAM MOHD RAMELI*, [1]AZLINA MOHD KOSNIN, [1]NORAFFANDY YAHAYA, [1]YUSRI KAMIN, [1]MEGAT AMAN ZAHIRI MEGAT ZAKARIA, [1]MAHANI MOKHTAR, [1]ABDUL HALIM ABDULLAH, [1]NORNAZIRA SUHAIROM, [2]ARASINAH KAMIS, [3]FAIZAHANI AB RAHMAN, [1]ASNUL DAHAR MINGHAT, [1]ZAIRES MD DARIS, [1]NAJUA SYUHADA AHMAD ALHASSORA, [1]MARLISSA OMAR

[1]Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor
[2]Universiti Perguruan Sultan Idris, 35900, Tanjong Malim, Perak
[3]Universiti Utara Malaysia, 06010, Sintok, Kedah
*Corresponding Author: mrustam2@utm.my

Abstract

Since its introduction, the concept of Industrial Revolution 4.0 has received massive intention all around the world. Subsequently, this revolution has brought changes in all fields including higher education. Various propositions have been made towards transforming educational settings parallel with the elements of industrial revolution 4.0. However, there are different reactions from educators regarding this transformation. This study aimed to identify the readiness of educators to implement the elements of industrial revolution 4.0 in Teacher Training Programs in Malaysian Public Universities. The respondents involved in this study consisted of 61 lecturers from 14 public universities in Malaysia. Logit value analysis using Rasch Measurement Analysis found that the respondents' readiness towards the implementation was at a moderate level (logit = 0.156). Specifically, respondents had a higher level of readiness to implement the constructs related to teaching methods as compared to the constructs related to the implementation methods. Overall, it was found that the lecturers' readiness to implement elements of IR 4.0 was still at a moderate level. Thus, there should be efforts to apply elements of industrial revolution 4.0 in higher education to equip our future teachers with the skills and knowledge for them to impart to the future generation.

Keywords: Industrial revolution 4.0, Logit, Readiness, Teacher training programme.

1. Introduction

Recently, the concept of Industrial Revolution 4.0 is being discussed thoroughly among educators and researchers. Many countries including Malaysia are moving towards implementing the elements of industrial revolution 4.0 in various sectors [1]. Subsequently, Ministry of International Trade and Industry (MITI) has organized an outreach program with educational and technical institutions as well as industries related to skills development and new technological fields, digital and engineering in order to prepare graduates for the job market in smart production.

Industrial revolution 4.0 brings human to the world of VUCA (Volatility, Uncertainty, Complexity and Ambiguity). As stated by Zikopoulos et al. [2] and McAfee and Brynjolfsson [3], volatility is referred to the drastic rapidity towards the four big data's changes known as volume, velocity, variety and value. Meanwhile, uncertainty caused by volatility will result in difficulties to expect what will happen. Next, complexity exists due to the unclear relationship between cause and effect while ambiguity causes various redundancy in the environment.

According to Kagermann et al. [4], industrial revolution 4.0 is caused by the digital revolution, which is centered on technology and automation. The transition from the third industrial revolution which focuses on digital automation towards the fourth industrial revolution, which emphasizes on cyber-physical system occurs due to the rapid advancement of technologies. This phenomenon creates huge potential for changes in lifestyle and mode of communication. Thus, educators are urged to revise current education systems to ensure its relevancy and increase its sustainability.

University students must possess amazing potentials in order to cope with challenges of the Fourth Industrial Revolution. World Economic Forum (WEF) has outlined the importance of mastering 4C elements namely; Critical Thinking and Problem Solving, Communication, Collaboration and Creativity at all levels of studies including higher institutions. As a result, the wave of industrial revolution 4.0 has an impact on curriculum, delivery and assessment methods in classrooms. Consequently, the changes will produce students who are equipped with the skills and knowledge necessary for them to face the challenges in the era of IR 4.0. However, there have been various reactions from educators on the implementation of industrial revolution 4.0 in the teaching and learning process. Hence, this study was conducted to determine the readiness of educators towards implementing elements of industrial revolution 4.0 in teacher training programs.

2. Research Objectives

This study aimed to:

- Identify the readiness in implementing seven constructs of teacher training programme based on industrial revolution 4.0 among lecturers in Malaysian Public Universities.
- Identify the readiness in implementing 13 sub-constructs of teacher training programme based on industrial revolution 4.0 among lecturers in Malaysian Public Universities.

3. Research Methodology

This survey was conducted among 61 lecturers from 12 public universities in Malaysia, which offer Bachelor of Education Programs. Respondents for this study were selected using convenient sampling and the questionnaires were distributed online. All respondents were required to respond to 92 items involving items under the construct of Teacher Training Programme 4.0 (7 items); Flexible Programme (7 items); Industrial Based Programme (2 items); Hybrid Programme (6 items); Global Mobility Programme (3 items); Organic Curriculum Structure (7 items); 21st Century Skills (24 items); Recent Learning Approach (3 items); Integration of Technology 4.0 in Teaching and Learning (10 items); Work Based Learning (3 item); Experiential Based Learning (8 items); Non-conventional Teaching and Learning (7 items) and Alternative Assessment (5 items). Respondents were required to provide their responses based on the four-point readiness scale (1: Very not ready - 4: Very ready). The pilot study proved that the items were valid and reliable as described in Table 1.

Item measure analysis was applied to determine the measure (logit value) for all constructs and sub-constructs.

Table 1. Pilot study analysis.

Aspects	Values	Implications
Item reliability coefficient	0.84	Good (Fisher, 2007)
Person reliability coefficient	0.94	Very good (Fisher, 2007)
Item separation	2.29	Fair (Fisher, 2007)
Person separation	3.26	Good (Fisher, 2007) -The item is adequate
Variance explained by measure	52.1	Fair (Fisher, 2007) -The item is measuring specific objective
Unexplained variance for 1st contrast	7.3	Good (Fisher, 2007)

4. Results

Based on the mean logit value, each of the constructs and sub-constructs was then ranked to illustrate the readiness of respondents in detail. In the context of this study, high logit value indicated that the constructs or sub-constructs were considered as less ready to be implemented in teacher training programs while low logit value indicated that constructs or sub-constructs were considered as more ready to be implemented in teacher training programs. The corresponding findings are shown in Table 2 and Fig. 1. Teacher Training Programme 4.0 (7 items); Flexible Programme (7 items); Industrial Based Programme (2 items); Hybrid Programme (6 items); Global Mobility Programme (3 items); Organic Curriculum Structure (7 items); 21st Century Skills (24 items); Recent Learning Approach (3 items); Integration of Technology 4.0 in Teaching and Learning (10 items); Work Based Learning (3 item); Experiential Based Learning (8 items); Non-conventional Teaching and Learning (7 items) and Alternative Assessment (5 items).

Based on Table 2, six sub-constructs had negative measure values (sequence 1 to 6) while seven sub-constructs with positive measure values (sequence 7 to 13). Specifically, non-conventional teaching and learning sub construct (measure value = -0.683) was in the first sequence (most ready) followed by experiential based

learning (measure value = -0.646). Meanwhile, the industrially based programme (measure value = -1.110) was in the 12th sequence followed by the sub-construct of global mobility programme (measure value = 1.443), which was in the 13th order (not ready). The findings of this study are aligned with the findings regarding the relevance of implementing Industrial Revolution 4.0 for teacher training programmes where the respondents showed readiness on the construct related to learning methods as compared to the constructs of implementation method.

Table 2. Logit order analysis for constructs and sub-constructs of readiness.

Order	Values	Implications	Sub-constructs
1	-0.683	Learning method	Non-conventional teaching and learning
2	-0.646	Learning method	Experiential-based learning
3	-0.580	Learning method	Work-based learning
4	-0.304	21st Century skills	21st Century skills
5	-0.221	Curriculum contents	Organic curriculum structure
6	-0.153	Learning method	Recent learning approach
7	0.313	Learning method	Integration of technology 4.0 in teaching and learning
8	0.401	Implementation method	Hybrid programme
9	0.420	Assessment method	Alternative assessment
10	0.433	Implementation method	Flexible programme
11	0.489	Learning outcome	Teacher training programme 4.0
12	1.110	Implementation method	Industrial based programme
13	1.443	Implementation method	Global mobility programme

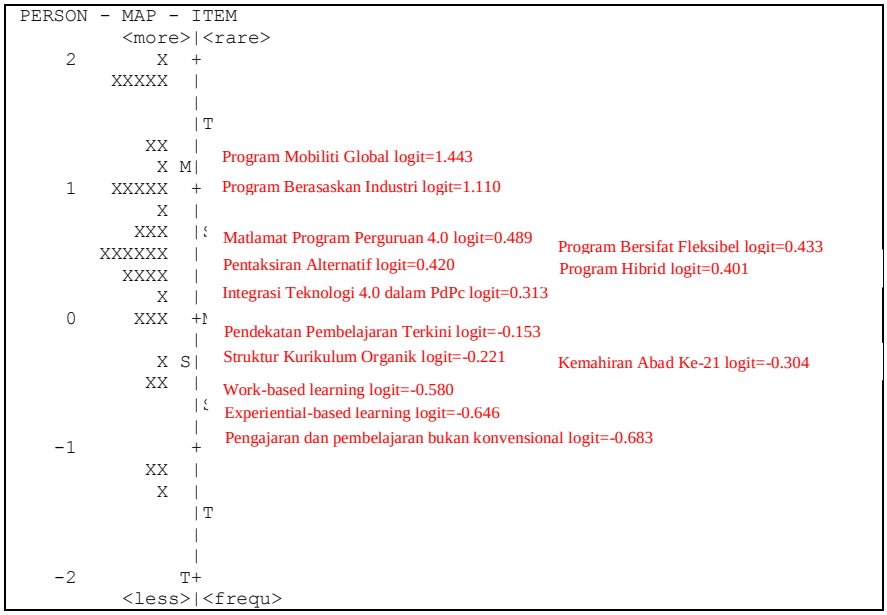

Fig. 1. Subconstruct distribution on item-person map.

5. Discussions

This study investigated the readiness lecturers at public universities in implementing teacher training programs based on industrial revolution 4.0. The findings indicated that the respondents' level of readiness was high in terms of implementing the constructs/elements regarding the learning methods for teacher training program. The learning methods include non-conventional teaching and learning such as experiential-based learning and work-based learning. Meanwhile, the respondents had a low level of readiness in implementing the constructs/elements regarding the implementation methods related to hybrid program, flexible program, industry-based program and global mobility program.

The findings of this study showed that the respondents possessed a high level of readiness in constructs related to learning methods. This is because the learning methods available in the constructs have already been implemented in current educational systems. Among them are problem posing-based learning [5], problem-based learning [6-8], scenario-based learning [9], case-based learning [10, 11], situated-based learning [12], technology-based learning in educational context [13-15] and teaching research nexus [16, 17]. One practical example is the implementation of the Harvard Business School Case Study at Universiti Teknologi Malaysia and lecturers are encouraged to use the case study as one of the teaching and learning approaches. This effort is an initiative to enhance the students understanding of the real work aspects of their studies and to develop their generic skills. However, the approaches listed in this study have the integration of elements of industrial revolution 4.0. The respondents were ready to implement this construct due to their familiarity with the knowledge and they possessed prior experiences regarding these learning methods.

In addition, the findings related to 21st century skills construct also showed a high level of readiness among respondents. According to Ah-Nam and Osman [18], one of the factors, which contributed towards the high-level readiness was due to the current teaching and learning practices, which support the improvement of 21st century skills [18]. The 21st century teaching and learning skills have been implemented widely at Malaysian schools and also being emphasized at Teacher Education Institutes (TEI) and other Higher Education Institutes (HEI).

In addition, the findings showed that the lack of readiness among the respondents for certain constructs was due to limited internet access factors. This result was reflected in the low readiness level of elements such as Industrial Training (IT) and Teaching Practice (TP) to overseas through Industrial Revolution 4.0 technology. This is because the process of monitoring teaching practice in the era of Industrial Revolution 4.0 requires virtual communication between universities and schools where trainee teachers are being placed. The virtual communication requires good internet access at both settings to ensure the monitoring process of teacher trainees can be implemented smoothly. Based on research by Mustapha and Abdullah [19] there are schools in Malaysia, which still do not have internet access, especially in rural areas. However, the lack of internet access affects the monitoring process involving such as the use of video conferencing, which requires high-speed internet access.

It can be observed that the respondents' readiness in this study varied according to the constructs/elements included in the research instrument. This is because industrial revolution 4.0 has just been introduced in 2016 and the exposure to the concept is still limited. Since the Industrial Revolution 4.0 is a technology-based

revolution, many educators are still not aware and confused about the technology, the actual terms and concepts of Industrial Revolution 4.0. Therefore, there should be more exposure among educators through courses, workshops or seminars on Industrial Revolution 4.0 technology. This proposition is aligned with the findings regarding the items on the use of IoT technology, the integration of Big Data, Artificial Intelligence and Augmented Reality elements in the process of teaching and learning whereby the respondents' levels of readiness were low.

6. Conclusion

In order to make a difference or transformation, it is important for enforcers to test the levels of readiness among the population especially when involving the implementation of new technology. Based on the findings, implementation of elements IR 4need to be improved in teacher education programs have been identified and efforts need to be done to rectify the issues. This is to ensure that Malaysian trainee teachers will be equipped with the skills and knowledge related to IR 4.0 in order to be better teachers after they have graduated.

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