Teaching and Learning Based on IR 4.0: Readiness of Attitude among Polytechnics Lecturers

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Abstract. The Industrial Revolution 4.0 (IR 4.0) not only changed the landscape of the industry sector, but also brought significant changes to the education sector, especially for higher education. These changes include changes in pedagogy, skills, and technology related to education. However, the question arises whether the lecturers at Higher Education Institutions, such as polytechnics, are ready to apply IR 4.0 elements in their teaching process. Therefore, this study was conducted to examine the level of readiness of polytechnic lecturers towards teaching and learning process based on IR 4.0 from attitudes aspects and to study the gender differences in the measured aspect. Survey technique was used as the research design in which 222 lecturers from three polytechnics in the State of Johor were chosen as respondents for the study. A set of questionnaire was used to obtain survey data from respondents. The gathered date were analyzed by using descriptive and inferential statistics. The findings show that the readiness of lecturers in the aspect of attitudes is at a moderate level. In addition, the findings also reveal that there is a significant difference in attitude readiness between male lecturers and female lecturers. In conclusion, the responsible party should take appropriate action to improve the attitude of polytechnic lecturers so that they are better prepared to apply the IR 4.0 elements in the teaching process and subsequently produce quality graduates and meet the needs of the industry.

1. Introduction

Education plays a major role in the development of human capital in order to achieve Vision 2020. The advancement of cyber technology and easier access to the internet have brought about reformation and development in education. The Ministry of Education Malaysia (MOE) is committed to place Malaysia's education system as one of the best system in the world by improving the quality from the aspects of infrastructure, academic manpower, students’ ability as well as pedagogy and andragogy. Education transformation in terms of pedagogical aspects is needed to produce graduates who are equipped with various skills and capable of facing challenges of the 21st century and Industrial Revolution 4.0 (IR 4.0). It is imperative to reform and refine the education aligned with the needs of industrial sectors within the sphere of IR 4.0 and 21st century.

In order to realize these aspirations, lecturers, especially those in higher learning institutions, play an important role in training and producing high quality graduates and enhance graduates’ employability by improving the teaching and learning. There are many aspects influencing the quality of teaching and learning. For instance, teaching and learning cannot be efficiently conducted without appropriate teaching facilities, such as conducive classroom and projector. These basic facilities are
needed to allow lecturer and students to engage in learning activities during the teaching process. Apart from facilities, lecturers should also possess adequate content knowledge and pedagogical skills because effectiveness of learning depends largely on how lecturer delivers the learning contents [1].

Pedagogy or the teaching method is always changing due to the change of learning environment and technology. A few decades ago when computer and internet technology is not broadly accessible, teaching and learning process is done through face-to-face activities using concrete learning materials [2]. The advent of internet has changed the landscape of teaching and learning in which teaching can be facilitated through the use of online learning materials. In addition, face-to-face interaction between teacher and learner is no more required to make learning occurs as it can happen in a virtual platform [3]. In the context of IR 4.0, the pedagogy is once again in need of change because learning institutions have to produce workers who can work with technology related to IR 4.0.

Ideally, the teaching and learning process should integrate the elements of IR 4.0 such as Internet of Thing (IoT), Cloud Technology, big data and Augmented Reality [4]. However, the integration of the elements IR 4.0 into teaching and learning is dependent on the knowledge, skill and attitude of lecturer towards IR 4.0. According to Mohd Sani [5], the lecturer’s understanding on the IR 4.0 context still remain unclear. In addition, lecturers are also lacking confidence in applying the concept of IR 4.0 in their teaching and learning process and face difficulties in adapting to new education reforms. The fundamental problem is that most of the lecturers do not understand the rationale behind the changes and what role they need to play to implement the teaching and learning based on IR 4.0 [6]. This was agreed upon by Syarifuddin and Halim [7] where he said that educators are not aware of the latest changes and do not feel the need to make changes in their teaching tasks. Therefore, any changes in the curriculum and education system need to be disseminated and given a clear explanation to educators.

Although the concept of IR 4.0 has been publicly introduced in 2011 in Germany [8], this concept is still new to Malaysia industry and education sector. Therefore, it is not sure whether or not the lecturers are ready to implement the teaching and learning based on IR 4.0. Some researchers (e.g. Ornstein and Hunkins [9]) argue that when educators are satisfied with the existing working condition, they tend to avoid changes or to move out of the comfort zone. Worse still, when lecturers do not have a profound and clear understanding regarding the idea behind IR 4.0, they are most probably to refuse to apply the idea in their work. This kind of attitude might influence the readiness of lecturers towards implementation of teaching and learning based on IR 4.0.

In alignment with this argument, this study was conducted to find out readiness level from the aspect of attitude among Polytechnics lecturers to implement teaching and learning based on IR 4.0. In addition, this study also aimed to see if there is any difference between male and female lecturers in the readiness because we believe that male and female lecturers differ in several characteristics such as behavior and personality.

Polytechnic lecturers were the focus of this study mainly because there is a big number of Polytechnics in Malaysia and Malaysia Polytechnics play a significant role in producing skilled workforce to various industrial sectors in Malaysia.

2. Research Methodology

2.1 Sample
In this study, a total of 222 lecturers from three Malaysia Polytechnics were randomly selected to be the research respondents. Out of the total, 138 lecturers are male (62.2%) and 84 lecturers are female (37.8%). In addition, 166 Lecturers have more than 10 years of teaching experience, and the rest (56 lecturers) have less than 10 years of teaching experience.

2.2 Instrument
The attitude of respondents was measured with 10 items in a set of questionnaire. The five-point scale was used, ranging from 1 (very disagree), 2 (disagree), 3 (slightly disagree), 4 (agree) and 5 (very
agree). The items were checked by three experts and the items were refined according to experts’ comments and suggestions. The questionnaire yielded sufficient level of reliability, \( \alpha = 0.86 \).

2.3 Data analysis

Descriptive statistics (mean and standard deviation) was used to analyse the data in order to find out the readiness level of polytechnic lecturers in terms of attitudes toward teaching and learning based on IR 4.0.

The readiness was divided into three level, namely low, moderate, and high according to the mean score. Table 1 shows the interpretation of mean score.

| Mean score | level |
|------------|-------|
| 1.00 – 2.39 | Low   |
| 2.40 – 3.79 | Moderate |
| 3.80 – 5.00 | High  |

Apart from that, Shapiro-Wilk test was conducted to check the normality of the dataset. Shipro-Wilk test was used because the sample size was smaller than 2000 [19]. The test result revealed that the data was not normally distributed, \( W=0.94, p<0.001 \). For this reason, the assumption of normal distribution in dataset was violated. The violation of this assumption indicates that non-parametric analysis method, specifically Mann-Whitney test, has to be used to analyse the gender difference in attitude of lecturers based on teaching and learning in IR 4.0.

3. Findings

In this study, the attitude of polytechnic lecturers is very important to determine their acceptance of the concept of IR 4.0 in teaching and learning. Data were analysed using descriptive statistics to find out the readiness level of polytechnic lecturers in terms of attitudes toward teaching and learning based on IR 4.0. Table 2 illustrates the mean, standard deviation and interpretation for the readiness level.

| No. Item | Items | Mean (M) | Standard Deviation (SD) | Level |
|----------|-------|----------|-------------------------|-------|
| 1        | I feel comfortable in teaching the subject by integrating IR 4.0 elements. | 2.71 | 0.77 | Moderate |
| 2        | I feel that the use of IR 4.0 concepts will benefit my students. | 3.08 | 0.90 | Moderate |
| 3        | I feel the use of teaching aids based on IR 4.0 will be more effective in teaching process | 3.20 | 0.84 | Moderate |
| 4        | I am interested in conducting an assessment for students based on IR 4.0 | 3.24 | 0.76 | Moderate |
| 5        | I am interested in using IR 4.0 technology in my teaching and learning | 3.32 | 0.78 | Moderate |
| 6        | I am interested in enhancing my knowledge in IR 4.0 | 3.39 | 0.75 | Moderate |
| 7        | I am ready to take an IR 4.0-based learning course to improve my skills | 3.08 | 0.84 | Moderate |
8 I am interested in applying IR 4.0 elements in my teaching process 3.46 0.83 Moderate
9 I feel the implementation of IR 4.0-based teaching and learning does not burden lecturers 3.09 0.93 Moderate
10 I am interested in participating in activities (such as workshops, seminars, conferences) related to IR 4.0 4.02 0.90 High

| Aspect                                      | Gender | Mean (M) | Standard Deviation (SD) | U     | df  | Sig. (2-tailed) |
|---------------------------------------------|--------|----------|-------------------------|-------|-----|---------------- |
| Attitude                                    | Male   | 2.99     | 0.45                    |       |     |                |
|                                             | Female | 3.71     | 0.41                    | 1176  | 222 | .000           |

Based on the outcome shown in Table 2, the readiness in terms of attitude among the participating polytechnic lecturers is at a moderate level (M = 3.26, SD = 0.83). The results of the analysis show that the highest mean value is the 10th item (M= 4.02, SD = 0.90) which measured whether the lecturers are interested in participating in activities (such as workshops, seminars, conferences) related to IR 4.0 based on learning and this item shows the value of mean interpretation high compared to other items. On the contrary, the 1st item (I feel comfortable teaching the subject related to using the IR 4.0 based learning method) obtained the lowest score (M = 2.71, SD = 0.77). In short, the lecturers have moderate level of readiness towards all items, except Item 10. The mean values of all items are located between 2.71 and 4.02.

Apart from determining the readiness level, this study also aimed to find out if there is any difference in attitudes towards teaching and learning based on IR 4.0 between male and female lecturers. Mann-Whitney test was used and the results are shown in Table 3.

Based on the results shown in Table 3, the mean value for female lecturers (M= 3.71, SD = 0.41) is larger than male lecturers (M=2.99, SD=0.45). Although male lecturers and female lecturers have the same level of readiness (moderate level), the mean value for male lecturers is actually at the lower end, whereas the mean value for female lecturers is at the upper end. The Mann-Whitney test result indicated that there was a significant difference between male and female lecturers in terms of attitudes, U = 1176, p < 0.05. It means that the readiness level in attitude among female lecturers is significantly higher than male lecturers.

4. Discussion
Lecturer's role becomes more significant in the era IR 4.0. In order to realize the goal education in alignment with IR 4.0, lecturers need to play an important role by demonstrating a positive attitude towards implementing IR 4.0 elements in their teaching and learning in order to produce workforce that can meet the industry's needs.

Overall, the findings showed that the level of readiness of polytechnic lecturers in terms of attitudes toward the application of IR 4.0 elements in teaching and learning was at a moderate level which can be regarded as satisfactory. However, there are rooms for improvement. The findings showed that attitudes of lecturers was not fully ready to embed IR 4.0 elements into teaching and learning. This findings is within our expectation because whenever a new technological products and new educational concept are created, it will take some times for academicians to adopt those new things due to lack of understanding and skill in the initial phase. For example, when School Based Assessment (SBA) was first introduced to the school teachers, majority of them did not show positive attitude to the SBA implementation and their readiness level to implement SBA was not very encouraging also [10].
The present findings indicated that many lecturers are interested in participating seminars, workshops and discussion related to IR 4.0. This findings reflects the fact that those lecturers have sufficient motivation to embrace IR 4.0 in their teaching. This might help to produce high quality graduate and thereby enhancing employability because industry needs graduates who can work with technology related to IR 4.0 [11]. As a polytechnic lecturer, he/she needs exposure through courses, seminars, workshops or knowledge sharing sessions to improve his/her knowledge and skills related to IR 4.0 and then apply those knowledge and skill in the teaching process. This will benefit the students and also enhance the quality of education. As what has been mentioned by Hassan [12], an instructor can perform their duties in a focused and continuous manner to enhance their understanding and skills when they have positive attitudes towards their profession.

Apart from that, the findings also showed that lecturers were not fully comfortable with the subjects taught, the teaching techniques and the use of teaching aids based on the IR 4.0. This findings mean that those lecturers are not yet affectionately ready to integrate IR 4.0 elements into taught courses, teaching methods, and teaching aids. This result might be due to the lack of knowledge and skill related to IR 4.0 and therefore hindering them to apply IR 4.0 elements in teaching process [13]. In addition, negative or ineffective experience while trying to use the latest technologies in their teaching and learning process might discourage lecturers to use the technology innovation.

Lecturers find it difficult to try something new in their teaching and learning process. This is likely due to their low curiosity [14]. Implementation of IR 4.0 in teaching and learning requires lecturers to equip themselves with a variety of technological skills so they can carry out more professional and effective teaching. As a academician, he/she needs to be responsible, dedicated and productive. But the lack of self-confidence among lecturers might cause them not to accept reforms in the education system [15].

To a certain extent, polytechnic lecturers presume that the implementation of IR 4.0 based teaching might have an impact on their workload. In fact, the burden of lecturers’ assignments is already quite high. Apart from teaching task, the lecturers are involved in co-curriculum, research, publication, and administration work. Integrating IR 4.0 elements into teaching will be adding more load to their existing tasks. This is because, in the implementation of IR 4.0, lecturers need to attend courses, providing teaching materials in line with IR 4.0, providing evaluation materials and strategies in line with IR 4.0 and so on. Such works are very burdensome for lecturers due to administrative duties [16]. Disrespectful or negative attitudes will develop if one considers the implementation of an activity is burdensome and non-fun activities [10].

In addition, lecturers are less interested in using technology in their teaching and learning. The findings show that the level of lecturer’s interest is still at a moderate level in the use of technology in teaching and learning, where lecturers are still not yet ready to accept IR 4.0 challenges in their teaching. This may be due to the lack of technological facility and technical support which cause the lecturers to assume that the use of technology in learning is ineffective [17] and hence it causes lecturers not to be positive about the implementation of teaching and learning based on the IR 4.0 concept.

This study also aimed to find out the gender difference in terms of readiness in attitude. The findings show that there is a significant difference between male and female lecturers in terms of attitudes toward teaching and learning based on IR 4.0. Female lecturers are more ready to embed IR 4.0 into their teaching as compared to male lecturers. The possible explanation for this outcome might be that the male lecturers prefer to apply the teaching method that they used to practice in their teaching and tend to avoid multitasking job as compared to female lecturers who are more obedient and tend to follow the curriculum changes [18].

5. Conclusion
This study was conducted to obtain information on the attitude of polytechnic lecturers on the implementation of teaching and learning based on IR 4.0. The participating lecturers' readiness in attitude is at a moderate level, indicating that there are still some rooms to improve lecturers’ attitude towards the implementation of teaching and learning based on IR 4.0. It means that more works need
to be done and more efforts has to be invested in order to make lecturers ready to implement teaching and learning based on IR 4.0.

The present findings also discovered that female lecturers are more ready to integrate the elements of IR 4.0 into teaching and learning compared to male lecturers in terms of attitude. This findings seem to suggest that female lecturers are more aware of the importance of current technological development in teaching and learning in comparison with their male counterparts.

Lecturer’s attitude toward the use of IR 4.0 elements in teaching their learning is important to determine the success or failure of a new system in education. The effectiveness of reforming a system or the implementation of a program in education depends greatly on the attitudes of academicians. The attitude of polytechnic lecturers should be enhanced so that the implementation of teaching and learning based on the concept of IR 4.0 is effective and useful for students.

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