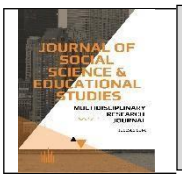

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An examination of needs analysis research in implementing innovative pedagogy among trainee teachers

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ABSTRACT

This study examines the needs analysis in implementing innovative pedagogy among trainee teachers. This study is pivotal to be carried out as it is timely to know the strategies trainees acquire in the teaching college as they will be going out for practicum and later posted at schools. Moreover, the importance of innovative pedagogy was highlighted in the national education blueprint by the Ministry of Education, and it is imperative to be embodied by teachers. This study collected data from a cross-sectional survey answered by 232 semester 6 students from the Northern zone of the Institute of Teacher Education (ITE). The findings revealed that 6 out of 8 constructs received high mean scores. The constructs were "Application of pedagogical knowledge; Application of innovative pedagogical skills; The need in the implementation of pedagogical innovation; Importance in implementing innovation; Implication of pedagogical innovation on teachers and Implication of pedagogical innovation on students". Meanwhile, the other two constructs namely "Teachers' readiness in implementing innovation and Organisational readiness" showed average mean scores. In the light of the findings of the research and the results, suggestions were made regarding the importance of trainees possessing relevant skills, knowledge and values of the use of innovative pedagogy learnt from the course taught in the teacher training institutes.

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INTRODUCTION

Education is a beacon that points humanity in the correct direction. It develops rational thinking, knowledge, self-reliance and integrity in students. Learning does not only impart knowledge, skills, and values, but it also enables learners to instil them in their life. As for teaching, it is paramount that teachers use the best pedagogical practices in their classrooms. From traditional teaching to student-centred learning, there is a myriad of strategies that can be exercised in our respective classrooms. In order to understand the best practices that can be used for learners, a needs assessment needs to be carried out on the pedagogy best suited to the needs of the students in the class. Needs assessment is a systematic approach to assessing the knowledge, abilities, interests, or early behaviour of learners or groups of learners before they are registered in a learning programme. When learners engage in a learning programme, a needs assessment is required so that they may evaluate their level of knowledge and skills, define their views and values, and recognise their learning habits and choices. Additionally needs assessment is essential for learning programme creators or curriculum developers to identify and characterise the competency gap that the learners already possess or master in terms of what will be anticipated when they follow the language programme (Nugraha et al., 2017).

In the 9th Malaysia Plan, it is recommended that human capital development be the main thrust in character building for the new generation. Therefore, every public higher education institution must integrate the pedagogical innovation module program to produce first-class-minded graduates (Ministry of Education Malaysia, 2013). The current challenge is to ensure that new employees in the Industrial Revolution 4.0 acquire skills in automation and digital and information technology without forgetting the pedagogical innovation module in order to be able to manage the needs of intelligent systems. There are various intelligent systems, including organisational strategies and investments in simulation and virtual reality, systems integration, Internet of Things (IoT) industry, cybersecurity, cloud computing, supply chain, extensive data analysis and robot automation. It will take the organisation to a different level in business competition in the future (Petrillo et al., 2018).

This pedagogical innovation module is also a solution to the problem of unemployment in the Industrial Revolution 4.0 in Malaysia. Creativity skills are among the elements of the pedagogical innovation module that can solve the unemployment problem in the Industrial Revolution 4.0 in Malaysia. Hossain et al. (2018) stated that graduates fail in interview sessions because they fail to convince employers of their respective self-advantages. According to Bloom and VanSlyke-Briggs (2019), human personal and professional life requires the ability to think creatively and critically to enjoy the work environment while getting the best and most effective results. Critical thinking and problem-solving skills are critical skills in all areas of the profession (Khoiri et al., 2021).

The Malaysian Ministry of Education (MoE) encouraged teachers to embed innovation in their teaching and learning activities to enhance student's ability to face current educational challenges. However, Yahya Othman and Dayang Raini Pakar (2011) highlighted that such pedagogical innovation is challenging to implement in classroom practices. In addition, several past studies have shown that there are obstacles for teachers to implement pedagogical innovation in teaching and to learn in schools. To worsen the scenario, implementing innovative pedagogy in classrooms is relatively poor (Taylor & Parsons, 2011), and the effectiveness of using innovative pedagogy in the classroom has not been proven (Groh et al., 2016).

Moreover, knowledge and skills in implementing pedagogical innovation are of utmost importance in influencing the quality of effective teaching and learning (Ngang et al., 2015). However, according to Taylor and Parsons (2011), generally, it is challenging to implement the training of pedagogical innovation module development in the light of tailoring to the needs of the classroom practices. Similarly, Robles (2012) noted that it is an even more significant challenge than teaching subject-based or complex skills.

LITERATURE REVIEW

Information technology and communications have seen rapid development and changes over the last decade. In a constantly changing world in information and communication technology, educational innovation must keep up with the changes and prepare for the future to effectively tackle educational problems and integrate them into

teaching and learning (Seechaliao, 2017). Furthermore, a quality innovation in education allows students to learn more in less time and promotes efficiency in learning. Therefore, it is crucial and necessary to establish quality innovation in today's education in educational institutions.

There have been debates among scholars when trying to distinguish between classical and conventional approaches such as online, blended, distance learning and widespread use of machines (Bergmann & Sams, 2012). The use of machines can enhance collaboration, and peer instruction in line with the digital age, increasing collaboration with peers in the digital era, and enhancing innovative pedagogy modules (Papadopoulos & Roman, 2010). However, the widespread use of digital tools does not guarantee that any difference will occur during class (Baepler & Walker, 2014). Nevertheless, because the emphasis is on students as agents of change and not merely as teachers' instructional objects, the pedagogical modules can assist teachers in shifting from teacher-centred learning to student-centred learning.

Therefore, the innovative pedagogy module is vital to reducing unemployment in Malaysia in the face of industry 4.0 challenges. According to Rahmat et al. (2016), this can encourage workers to transfer substantial knowledge, recent skills, new abilities and positive attitudes when working in their organisation. The infrastructure and education in Malaysia are unique. Not all schools or educational institutions have internet access or a wide range of Wi-Fi coverage through the enablers of 21st-century education is primarily determined by the internet (Gholizadeh et al., 2014). Innovation reform is required in all fields, including in education, specifically in knowledge and teaching. Schools that are active, communicative, innovative, practical and pleasant consider making educational changes appropriate to the system (Othman & Suzanawaty, 2014). School curriculums combine the educational goals being achieved. Schools with good planning will also have a well-balanced program and well-planned organisation to meet students' needs.

The knowledge and skills in implementing educators' innovative teaching and learning are essential in influencing the quality of effective teaching and learning. The quality of teaching is essential in promoting effective teaching in educational institutions (Ngang et al., 2015). The need to provide training for innovative pedagogy module development is crucial but implementing the teaching of the module itself is a challenge (Mynbayeva et al., 2018). It is thought to be much more challenging than teaching academic subjects and hard skills (Robles, 2012). Furthermore, the implementation of innovative pedagogy in classes is still weak (Foster & Yaoyuneyong, 2016), and the teaching effectiveness of innovative pedagogy is unclear (Groh et al., 2016).

The Ministry of Education Malaysia (KPM) recommends that school teachers implement innovative approaches in their teaching and learning to enhance students' ability to face the increasingly challenging education system. Nevertheless, the innovative teaching and learning recommended are still difficult to implement in schools (Yahya Othman & Dayang Raini Pakar, 2011). Previous studies have found barriers for teachers to implement innovative teaching and to learn in schools. Hence researchers suggest a need to explore in detail the need for innovative pedagogy to be implemented as per the expectation of the Ministry of Education Malaysia. Advancement in the use of technology in teaching and learning can make the school environment more advanced, futuristic and in line with the era of information and technology (Mustapa, 2010). As a result, teaching will be more exciting and effective (Huang et al., 2018), students will find it easier to understand the concepts being taught (Serdyukov, 2017), the surrounding environment will improve (Wang et al., 2021), and students' achievement will advance (Edeh et al., 2021). The Ministry of Education Malaysia has also introduced various technological innovations in schools where each technology has different characteristics in meeting the needs and improving the quality of teaching and learning in schools.

To achieve this, there needs to be a favourable ecosystem that supports teachers, students and the environment. As for the environment, Malaysia's infrastructure and education system can be described as unique. Therefore, Pedagogical innovation modules that have been successfully adapted in the west should be able to be emulated in Malaysia so that students will not be reliant on the internet in teaching and learning.
The Pedagogical innovation module has exposed students to a more active, attractive, simple and fast session and achieves objectives as a whole. This pedagogical approach serves as an intermediary between teachers, students and parents in every session, allows students to learn independently and can help students develop holistically.

This study was carried out with the sole intention of analysing the needs in constructing the Innovative Pedagogy Model (Ino-Ped) for Education IR 4.0 in the Malaysian education system focusing on teacher training. It is the initial stage before the innovative pedagogy model is developed (Saedah et al., 2013). Based on the above research objective, a guiding question is formed to navigate the study: What are the main components in developing the IR 4.0 Educational Innovative Pedagogy (Ino-Ped) model in the education system in Malaysia?

METHODOLOGY

The focus of this study was to carry out the needs analysis in determining the fundamental elements needed in the design and construction phase of the Innovative Pedagogy Model (Ino-Ped) for Education IR 4.0 in the Malaysian education system focusing on teacher training. The needs analysis used a cross-sectional survey method, and data were analysed through a quantitative approach. The Northern Institute of Teacher Education (ITE) students participated in the study. They are from semester 6, comprising a total of 232 respondents.

The five-point Likert scale was used in each instrument, ranging from Strongly Disagree (SD) with a value of 1 to Strongly Agree (SA) with a value of 5. The back-to-back translation process was employed in this study (Behr, 2017). The research items were adapted from Schumpeter's Theory of Innovation (1943) and a study by Mustapa (2010). The instrument contained two parts; Part A consisted of the respondents' demographic details such as gender, institution, and the frequency of technology use. Part B dealt with the level of agreement on the key constructs in the model, which include Innovative pedagogy knowledge; Application of innovative pedagogy knowledge; Teacher's needs in implementing innovation; Teacher's readiness; Organisational readiness; Importance in implementing innovation; Implication of pedagogical innovation on teachers and implication of pedagogical innovation on students. The items in the instrument used were reviewed by seven experts in the field of curriculum and teaching as well as educational technology. The expert approval rate method used Content Validity Index (CVI). Items identified with a CVI value of less than 0.86 were dropped (Lynn, 1986).

A pilot study was carried out to ensure the reliability of the instrument. The reliability of the study refers to the consistency of the instrument used in the research (Cohen et al., 2007). Cronbach Alpha value generated from SPSS Version 24 was used to determine the instrument's item reliability. The value of Cronbach Alpha in this context was $\alpha = 0.984$. Cavana et al. (2001) claimed that the alpha coefficient value greater than 0.80 is reliable and can be accepted. Table 1 displays the co-efficient index of the reliability classification of the instrument:

Table 1
Summary of Cronbach Alpha pilot study according to the constructs

No	Construct	Cronbach Alpha Value
1	Innovative pedagogy knowledge	0.98
2	Application of innovative pedagogy knowledge	0.98
3	Teacher’s needs in implementing innovation	0.99
4	Teacher’s readiness	0.99
5	Organisational readiness	0.98
6	Importance of implementing innovation	0.99
7	The implication of pedagogical innovation on teachers	0.97
8	The implication of pedagogical innovation on students	0.99

A survey was distributed via a google form to all the respondents in the class Whatsapp group. A total of 232 students answered the survey, which indicated a 100 percent of response rate. A total of 66 items were analysed using the SPSS Version 24. Descriptive statistics were used in reporting the findings. The data was analysed descriptively concerning frequency, percentages, mean scores and standard deviation. The score interpretation was based on Nik Mohd Rahimi (2004), as presented in Table 2.

Table 2
7 Likert-scale interpretation

Mean score	Interpretation
5.84 - 7.00	Very high
4.63 - 5.83	High
3.42 - 4.62	Average
2.21 - 3.41	Low
1.00 - 2.20	Very low

To validate the instrument, a panel of three experts examined it for its face, construct and content validity purposes. They are educational experts in language, psychometrics and innovation. The instrument items used were reviewed by seven experts in the field of curriculum and teaching as well as educational technology. The expert approval rate method used Content Validity Index (CVI). Items identified with a CVI value of less than 0.86 were dropped (Lynn, 1986).

RESEARCH FINDINGS

The study is intended to examine the fundamental elements needed in the design and construction phase of the Innovative Pedagogy Model (Ino-Ped) for Education IR 4.0 in the Malaysian education system, particularly on teacher training development. It reports findings from 232 respondents who answered an online questionnaire of 66 items. A total of 6 constructs were measured to elicit information regarding the need for developing an innovative pedagogy model. Table 3 displays the demographic profiles of the respondents. 33.2% of the respondents were male students, while the remainder were female. Among the respondents' primary specialisations, History students formed 34.9%, followed by Islamic studies 30.6%. Arabic Knowledge and Guidance and Counselling formed 20.7% and 13.8 respectively.

Table 3
Respondents' demographic profile

Gender	**Frequency**	**Percentage**
Male	77	33.2
Female	155	66.8
Total	232	100.0
Specialisation		
History	81	34.9
Arabic knowledge	48	20.7

Islamic studies	71	30.6
Counselling and Guidance	32	13.8
Total	232	100.0

Tables 4 to 11 show the analysis of items based on the six constructs. Again, the findings are reported based on the highest and lowest mean scores. Based on Table 4, the average mean score for innovative pedagogy knowledge is high (mean = 5.56, SD =1.09). The highest mean score is 6.07 (SD= 1.00) for the item "Maintaining students' interest in studies''. The lowest mean score is 3.39 (SD= 1.45) for the item "Exploring learning activities through innovative approaches''.

Table 4
Mean scores and standard deviation for Innovative Pedagogy Knowledge

Item	N	Mean score	Standard deviation	Interpretation
1. Conducting teaching and learning interactively	232	6.03	1.02	Very high
2. Increasing students' creativity	232	6.01	1.00	Very high
3. Maintaining students' interest in studies	232	6.07	1.00	Very high
4. Strengthening collaborative processes amongst students	232	5.98	1.03	Very high
5. Conducting dynamic assessment on self-learning improvement	232	5.89	1.02	Very high
6. Exploring learning activities through innovative approaches	232	3.39	1.45	Low
		5.56	1.09	High

Based on Table 5, the average mean score for Application of Innovative Pedagogy Knowledge is high (mean score = 5.23, SD =1.09). The highest mean score is 6.06 (SD= 0.96) for the "Using various teaching and learning approaches". The lowest mean score is 3.31 (SD= 1.30) for "Modifying existing teaching and learning aids."

Table 5
Mean scores and standard deviation for Application of Innovative Pedagogy Knowledge

Item	N	Mean score	Standard deviation	Interpretation
1. Producing new teaching and learning aids	232	3.43	1.41	Average
2. Modifying existing teaching and learning aids	232	3.31	1.30	Low
3. Modifying existing teaching and learning techniques	232	5.91	0.99	Very high

4. Developing creative induction sets for teaching and learning	232	6.03	1.00	Very high
5. Using various teaching and learning approaches	232	6.06	0.96	Very high
6. Diversifying questioning techniques in the classroom	232	5.96	0.97	Very high
7. Evaluating the teaching aids used in the classroom	232	5.91	0.99	Very high
		5.23	1.09	High

Based on Table 6, the average mean score for “Teacher’s needs in implementing innovation” is very high (min = 6.16, SD =0.97). The highest mean score is 6.25 (SD= 1.01) for the item "Students' interest". The lowest mean score is 6.06 (SD= 0.99) for item “Students’ achievement before innovation”.

Table 6

Mean scores and standard deviation for teacher’s needs in implementing innovation

Item	**N**	**Mean score**	**Standard deviation**	**Interpretation**
1. Students’ interest	232	6.25	1.01	Very high
2. Students' involvement	232	6.17	0.96	Very high
3. Suitability of teaching and learning strategies	232	6.18	0.99	Very high
4. Students’ current knowledge	232	6.10	0.96	Very high
5. Clarity in explaining concepts to students	232	6.14	0.96	Very high
6. Suitability with students’ learning activities	232	6.18	0.97	Very high
7. Students’ achievement before innovation	232	6.06	0.99	Very high
8. Suitability with teaching content	232	6.22	0.96	Very high
9. Impact on students’ understanding	232	6.20	0.95	Very high
10. Duration of time spent to produce innovation	232	6.07	0.99	Very high
		6.16	0.97	Very high

Based on Table 7, the average mean score for *kesediaan guru* adalah average (min = 4.10 , SD =1.48). The highest mean score is 4.64 (SD= 1.61) for the item "Collaborating with teachers in school". The lowest mean score is 3.20 (SD= 0.96) for the "Attending conferences" item.

Table 7

Mean scores and standard deviation for teacher readiness

Item	Mean score	Standard deviation	Interpretation
1. Attending conferences	3.20	0.96	Average
2. Attending courses on innovation	4.21	1.58	Average
3. Attending hands-on workshops	4.60	1.55	Average
4. Referring to books related to innovation	4.19	1.58	Average
5. Collaborating with teachers in school	4.64	1.61	High
6. Joining innovation competition	3.95	1.52	Average
7. Allocating time for innovation	4.02	1.53	Average
8. Allocating funds to produce innovation	3.97	1.51	Average
	4.10	1.48	Average

Based on Table 8, the average mean score for “Organizational readiness” is low (min = 3.10, SD =1.62). The highest mean score is 4.15 (SD= 1.66) for items "Moral support from the top management of the organisation" and “Good infrastructure support for students to use technology". The lowest mean score is 3.39 (SD= 1.45) for item “Support from external agencies’’.

Table 8

Mean scores and standard deviation for organisational readiness

Items	**Mean**	**Std. Deviation**	**Interpretation**
1. Support from external agencies	3.39	1.45	Low
2. Moral support from the top management of the organisation	4.15	1.68	Average
3. Financial support to implement innovation	4.13	1.65	Average

4. Good infrastructure support for students to use technology	4.15	1.66	Average
5. Professional support from lecturers to students to integrate technology into pedagogical practices	4.11	1.65	Average
	3.98	1.62	Average

Based on Table 9, the average mean score for *"Importance in Implementing Innovation"* is very high (min = 6.11, SD =0.98). The highest mean score is 6.19 (SD= 0.98) for item "Reusable innovative output". The lowest mean score is 5.59 (SD= 1.05) for the item "Costing for producing innovative material".

Table 9
Mean score and standard deviation for Importance in Implementing Innovation

Item	Mean	Std. Deviation	Interpretation
1. Understanding multiple intelligences amongst students	6.16	0.95	Very High
2. Costing for producing innovative material	5.99	1.05	Very High
3. Stimulating students' thinking based on the innovative output	6.10	0.98	Very High
4. User-friendly innovative output	6.16	0.96	Very High
5. Reusable innovative output	6.19	0.98	Very High
6. Transdisciplinary innovative output	6.08	0.97	Very High
7. Production of innovative products that brings a return on investment (ROI)	6.06	1.03	Very High
	6.11	0.98	Very High

Based on Table 10, the average mean scores for "Implication of Pedagogical Innovation on Teachers" is very high (min = 6.12, SD =1.05). Conversely, the lowest mean score is 6.06 (SD= 1.08) for items "Increasing pedagogical knowledge of content; Diversifying teaching methods; Becoming a more effective teacher, and Encouraging collaboration amongst peers".

Table 10
Mean score and standard deviation for Implication of Pedagogical Innovation on Teachers

Item	Mean	Std. Deviation	Interpretation
1. Increasing pedagogical knowledge of the content	6.06	1.08	Very High
2. Diversifying teaching methods	6.06	1.08	Very High

3. Increasing confidence during teaching	6.19	1.01	Very High
4. Expanding reflective thinking	6.17	1.02	Very High
5. Simplifying teaching and learning delivery	6.11	1.06	Very High
6. Becoming a more effective teacher	6.06	1.08	Very High
7. Suggesting teaching and learning strategy improvement	6.19	1.01	Very High
8. Being more creative in problem-solving	6.17	1.02	Very High
9. Encouraging collaboration with school teachers	6.11	1.06	Very High
10. Encouraging collaboration amongst peers	6.06	1.08	Very High
	6.12	1.05	Very High

Table 11 displays the total mean score for "Innovative Pedagogy Implication on students", which is very high (min = 6.13, SD =1.04). The highest mean score is 6.19 (SD= 1.01) for item "Enhancing students' thinking skills''. Meanwhile, the lowest mean score is 6.06 (SD= 1.08) for item "Resolving students' learning issues''.

Table 11
Mean score and standard deviation for Innovative Pedagogy Implication on students

Item	Mean	Std. Deviation	Interpretation
1. Resolving students' learning issues	6.06	1.08	Very High
2. Enhancing students' thinking skills	6.19	1.01	Very High
3. Increasing students' engagement	6.17	1.02	Very High
4. Making the learning process more exciting	6.11	1.06	Very High
5. Enhancing students' understanding	6.06	1.08	Very High
6. Improving students' understanding	6.19	1.01	Very High
7. Stimulating students' thinking	6.12	1.02	Very High
8. Arousing students' curiosity	6.11	1.06	Very High
	6.13	1.04	Very High

DISCUSSIONS AND CONCLUSION

The researchers attempted to identify the needs in constructing the Innovative Pedagogy Model (Ino-Ped) for Education IR 4.0 in the Malaysian education system focusing on teacher training. The analysis shows that teachers' readiness to implement innovation in the classroom is at the average level. As such, there is a dire need to develop a Pedagogical Innovation Model (Ino-Ped) in IR4.0 for the Malaysian education system. Furthermore, since all the constructs have average and high mean scores, this highlights the need to develop the model.

The results of this study show that the three primary constructs, namely "Application of pedagogical knowledge; Application of innovative pedagogical skills and The need in the implementation of pedagogical innovation", achieve a high mean score level. The findings accentuate the importance of constructing the Pedagogical Innovation Model (Ino-Ped) of IR 4.0 Education. It is also in parallel with the claim by Ulucinar (2021), who elaborated that one of the critical requirements for becoming an innovative teacher in the 21st century is competence in using technology in the classroom. From the needs analysis, it is apparent that there arises the need for teachers to be technologically competent. Celik and Aytin (2014) contended that teacher candidates with a greater understanding of technology would have a broader understanding of pedagogy and content. In addition, Burden et al. (2019), in their systematic literature review, investigated 57 high-quality articles published between 2010 and 2017 that focused on innovative pedagogy. It shows that more studies are still needed in this area to strengthen the understanding and application of innovative pedagogy in education.

This study found that aspects of teacher and organisational readiness achieved a mean score at an average level. This finding does not hinder the process of constructing the Pedagogical Innovation Model (Ino-Ped) of IR 4.0 Education. However, it points out that the level of teacher and organisational readiness at the average level is quite interesting to discuss further. These constructs did not reach the high level as expected by the researchers. As teachers still in training, most respondents have an average level of involvement in items related to teacher readiness. As claimed by Avakyan and Vinogradova (2020) and Almusawi et al. (2021), self-development and readiness for wearable technology integration are factors contributing to the readiness of university teachers for innovation.

Since the findings in this study revealed that organisational readiness is at an average level, it is fair to indicate that educational organisations such as schools and teacher training institutes lack the infrastructure and funding to implement classroom innovation. A study by Konst and Kairisto-Mertanen (2020) highlighted the significance of the concept of education, which develops gradually and it is part of sustaining future teaching and learning processes. The constructs "Importance in implementing innovation; Implication of pedagogical innovation on teachers and Implication of pedagogical innovation on students" show a relatively high mean score. Thus, this finding indicates the need to develop the Pedagogical Innovation Model (Ino-Ped) of IR 4.0 Education. Furthermore, as the students are undergoing teacher training, the pedagogical innovation for both teachers and students is part of the course training and assessment, which may contribute to the high mean score. Subsequently, the construct "Implication of pedagogical innovation on students" also receives a high mean score. It may be a result of teachers using pedagogical innovation in their classroom practices to change the attitudes and behaviours of their students. The study by Walder (2014) supports the above claim.

In conclusion, 6 out of 8 constructs received high mean scores. The constructs are "Application of pedagogical knowledge; Application of innovative pedagogical skills; The need in the implementation of pedagogical innovation; Importance in implementing innovation; Implication of pedagogical innovation on teachers and Implication of pedagogical innovation on students". Meanwhile, the other two constructs namely "Teachers' readiness in implementing innovation and Organisational readiness" show average mean scores.

Based on the conclusion derived from the study, the researchers suggest that, firstly, there is a need to develop the IR 4.0 Educational Innovative Pedagogy (Ino-Ped) model. Secondly, rigorous series of training is imperative to be carried out to ensure a smooth transition from novice instructor to expert use of the model. Finally, to further sustain the innovative pedagogical knowledge and skills, continued training sessions amongst the teachers should be conducted in professional learning communities.

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