



Observation on Teachers' Readiness for Implementation of Higher Order Thinking Skills (HOTS) in Technical and Vocational Education and Training (TVET)

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Abstract: Higher order Thinking Skills (HOTS) is an important element in achieving the nation's objective of developing people with creative and analytical minds. However, there have been issues that impede teachers from implementing HOTS where certain teachers are not ready to implement HOTS knowledge to students, as well as insufficient training or HOTS related courses when they endure teaching training or have been employed as teachers. The purpose of this study was to determine the teachers' level of readiness to face the changes in curriculum, pedagogy and assessment to implement HOTS in teaching. A validated questionnaire with an Alpha Cronbach's value of 0.874 was used as an instrument for this quantitative study. The research sample for this study consisted of 40 teachers with TVET background in Batu Pahat, Johor. The collected data were analyzed using the Statistical Package for Social Science version 21.0 in which the descriptive statistical method was used to determine the mean value and standard deviation. Based on the analysis, the results showed that the teachers had a high level of readiness to face the changes in curriculum aspect (mean=4.10, SD=0.39), the pedagogical aspect (M=4.00, SD=0.48) and the assessment aspect (M=4.08, SD=0.45). In addition, the relationships between curriculum, pedagogy and assessment of TVET teachers' readiness on HOTS implementation were not statistically significant. In conclusion, it is hoped that this study could be used to serve as a guide for teachers to imply HOTS in their teaching and learning process in order to enhance students interested in TVET subject. Teachers therefore need to equip themselves with HOTS knowledge and skills so that they can facilitate learning, improve skills and increase student engagement in class.

Keywords: Higher Order Thinking Skills, level of readiness, curriculum, pedagogy and assessment

1. Introduction

Malaysia is currently facing a major challenge in its efforts and initiatives to provide people with quality education. The education system in Malaysia has changed with a great deal to provide people with the best education so that they been able to compete and succeed globally. Consequently, with the existence of the *Malaysia Education Blueprint* (PPPM) 2013-2025, certain parties will have an opportunity to improve for better education as this PPPM has identified six characteristics for the development of educated people in the 21st century. The characteristics emphasized by

Ministry of Education Malaysia are leadership skills, bilingual skills, ethics and spirituality, social identity, knowledge and thinking skills (Yasin et al., 2021). Hence, in order to train people with thinking skills, it is important to integrate higher order thinking skills (HOTS) into the education system (Chun & Abdullah, 2019).

Thinking skills have been applied to all schools in Malaysia since 1994, even prior to the introduction of HOTS as it have been existed for a long time in terms of creative and critical thinking skills (Rahman & Manaf, 2017). HOTS was introduced in Malaysia as a result of the force exerted by the contention among Malaysian students at the global level result that is far behind other countries (Azid & Md Ali, 2020). Simultaneously, Malaysia's ranking in PISA also reveals substantial gaps in comparison with other more advanced countries such as Korea, Finland, New Zealand, Singapore etc. This happens because there is HOTS element in the PISA questions that requires students to think and gives out in-depth arguments. According to Hassan, Mohamad and Azuddin (2020), there is an urge for HOTS to be implemented in their specific subjects based on Malaysia standard syllabus. This is intended to render the education system in Malaysia to be competitive and at par with other advanced countries. However, Kong and Yee (2019) state that it is not suitable to apply HOTS for vocational subjects, as the technical teachers lack knowledge of HOTS and also lack the training needed to be able to apply HOTS in vocational subjects.

Nonetheless, the PISA ranking in Malaysia is relatively low compared to other developed countries like Finland and Korea. This is because the Malaysian people are still not ready to face the transformation that is taking over the country's education system (Shaari et. al, 2020). Furthermore, Malaysia's education aims to generate comprehensive individuals who are also physically, emotionally, spiritually and intellectually balanced. In addition, there is also a need for more learning approach towards the 21st century, project-based learning and the Science, Technology, Engineering and Mathematics (STEM) assessment in Malaysia. Therefore, HOTS needs to be introduced to teachers and students in order to achieve the country's aspirations to produce holistic citizens in various aspects (Meng, Jia & Zhang, 2020).

Furthermore, a study showed that there were still weaknesses in meeting assessment standards in schools, as evidenced by the formative evaluation instruments that teachers used in schools were at low order thinking skills (Walid *et. al*, 2019). Beside, teachers' incompetence in planning and executing suitable techniques, strategies and approaches for teaching higher order thinking impede the implementation of HOTS in the classroom context (Singh *et. al*, 2017). For example, a research show that the HOTS of pre-service physics teachers are still low, so that lecturers need to follow up to improve the pre-service physics teachers HOTS knowledge (Fariyani & Kusuma, 2021). Whalen and Paez, (2020) state that student perspectives on reflection show that this practice contributes to the acquisition of HOTS which required to address the complex challenges of sustainability. Thus, there is a need for a smart pedagogy to facilitate the HOTS of students and to provide the design suggestion of curriculum and intelligent tutoring systems in smart education (Meng, Jia & Zhang, 2020).

Therefore, the Technical and Vocational Education (TVET) curricula should consider integrating these STEM skills that integrate HOTS and accomplished in several ways such as by engagements in several classes and across different technical and academic courses by enriching the curriculum with these skills (Said, Pavlova & Wheeler, 2020). A study shows that there needs to be a lesson where the HOTS can be developed to prepare the students in entering the working world as HOTS is related to psychological, physical, and experiential factors (Hasan & Pardjono, 2019). Thus, a continuous professional development of TVET teachers is needed to enable them to improve in their use of the guiding pedagogical principles in practice to facilitate quality learning and graduate outcomes (Okolie et. al, 2021).

The transformation that has taken place in the country's educational structure in practicing HOTS has made the teachers aware of the importance of such thinking skills to students and has further thriving to achieve the goal. However, to what extent are teachers able to incorporate HOTS into the learning process that takes place in the classroom? According to Tambunan and Naibaho (2019), teachers are a key factor in determining HOTS success because there is a few teachers who are more focused on discussing thinking skills rather than on implementing the skills in the classroom. Therefore, teachers needed to find myriads references or other information related to HOTS in order to achieve optimal mastery in the field before applying it to students Retnawati et al., (2018). This clearly shows that teachers' readiness is very pivotal in the implementation of HOTS to produce students with high-quality thinking especially in TVET area.

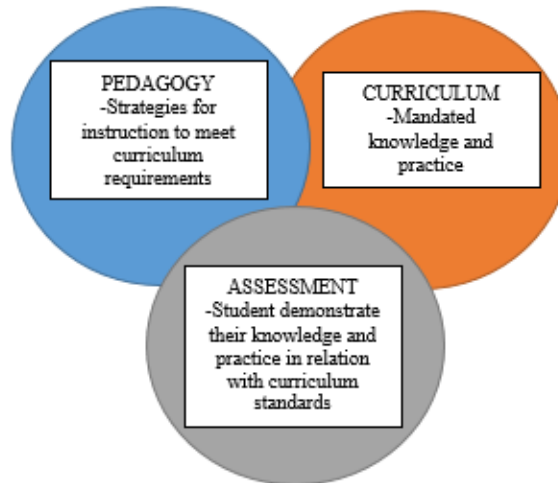


Fig. 1 - Key features of curriculum, pedagogy and assessment (O'Sullivan, 2013)

Based on the Key Features of Curriculum, Pedagogy and Assessment (O'Sullivan, 2013) in figure 1, in order to define the goals or learning outcomes for the course, we need to formulate a clear idea of what students should know, understand and capable of doing *through* teachers' readiness in curriculum to face changes in implementation of HOTS. Thus, the three phase is essentially a way of helping the structure evaluative strategies into the course design so that teacher will be able to gauge students' progress towards the desired learning outcomes through their readiness in assessment and face changes in curriculum of HOTS implementation. Teacher also need to clearly define and prioritized their goals for the course and have decided on how they will evaluate students' progress toward achieving them. Then, the final step is to plan the instructional strategies and methodologies that need to be use in the course through teachers' readiness in pedagogy in order to face changes in curriculum of HOTS implementation. Therefore, this study was conducted to:

- i. Identify the TVET teachers' level of readiness to face changes in curriculum of HOTS implementation.
- ii. Identify the TVET teachers' level of readiness to face changes in pedagogy of HOTS implementation.
- iii. Identify the TVET teachers' level of readiness to face changes in assessment of HOTS implementation.
- iv. Identify the relationship level between curriculum, pedagogy and assessment of TVET teachers' readiness on HOTS implementation.

2. Methodology

In this study, a quantitative research method approach through survey design using questionnaire were used. The questionnaire have been distributed to respondents who have been selected based on certain criteria. The use of questionnaire seems to be suitable for this research, since it is cost-saving and the researcher can also facilitate respondents to answer the questions. The researcher chose random sampling technique because this sampling technique uses randomization that allows each individual in the populations to have an equal chance to be part of the selected sample. Therefore, the populations that been involved in this study was TVET teacher from five secondary schools in Batu Pahat, Johor as these schools have been randomly selected based on their complete set of infrastructure which is important to support HOTS teaching and learning process. Thus, the total population involved in this study was 45 teachers with TVET background. Based on Krejcie & Morgan (1970), this research focuses on 40 TVET teachers of whom taught *Reka Bentuk dan Teknologi* (RBT) subjects from five secondary schools in Batu Pahat. The total number of sample selected is well-suited to evaluate the level of readiness of the teachers to face changes in curriculum, pedagogy and assessment.

Table 1 - Table of sample selection

School	Sample
A	8
B	8
C	8
D	8
E	8
Total	40

The questionnaire is the main instrument for data collection in this study because it is practical, easy to do, cost-effective, and requires less energy and time consuming to gather the data (Nayak & Narayan, 2019). The questionnaire consists of four parts, which are part A (demographic information), part B (RBT teachers' level of readiness to face changes in the curriculum on implementation of HOTS), part C (RBT teachers' level of readiness to face changes in the pedagogy on the implementation of HOTS) and part D (RBT teachers' level of readiness to face changes in the assessment on the implementation of HOTS). Part A up to part D consisted 30 items. Respondents were asked to state their level of agreements on the five-point Likert scale.

Table 2 - Table of likert scale agreement

Score	Indicator
1	Strongly disagree
2	Disagree
3	Slightly agree
4	Agree
5	Strongly agree

This instrument has been validated by three experts which are one language expert and two content experts. According to Mohajan (2017), the validity of an instrument refers to the extent to which the instrument can test the required aspects needed by the researcher to obtain the data. In addition, the researcher carried out a pilot study, which was not intended to be used for actual study to test the instrument reliability. The Alpha Cronbach showed a value of 0.874, indicating that the instrument used was deemed acceptable and sufficient to assess the teachers' readiness (George & Mallery, 2013). Researchers used Statistical Package for Social Science version 21.0 (SPSS V21.0) software to analyze the data. The descriptive statistical analysis method was used to analyse the data. The data from Part A was analysed using frequency and percentage, while the mean scores (M) and standard deviation (SD) were used in Part B, C, D and E. These data were analysed using SPSS V21.0. The mean score interpretations will determine the RBT teachers' level of readiness to face changes in the curriculum, pedagogy and assessment on the implementation of HOTS, whether at high, medium or low level, based on Wiersma assessment (1995).

3. Result

3.1 Respondent Demographic

A total of 40 RBT teachers from 5 secondary schools in Batu Pahat have completed the questionnaire. Findings in Part A of the questionnaire containing the information on the demographic or personal data of the respondents, such as gender, age, academic qualification, teaching experience and ever attended HOTS course. The findings revealed that the respondents' gender was 11 male (27.5%) and 9 female (72.5%). Next, the number of respondents with the age that below 30 years old was 2 (2.5%), the number of respondents with the age of 30-39 years old was 15 (12.5%), the number of respondents with the age of 40-49 years olds was 15 (22.5%) and the number of respondents with the age of 50 years old and above was 8 (62.5%). Then, the findings showed that the respondents with academic qualification of PhD was 0 (0%), Master was 9 (22.5%), Degree was 30 (75%) and Diploma was 1 (2.5%) respectively. Finally, the findings indicated that the number of respondents that had ever attended HOTS course, which means by answering 'Yes' was 32 (80%) and the rest who answered 'No' was 8 (20%). The data obtained will be analysed and discussed using descriptive statistics by percentage. The percentage of demographic respondents is shown in Table 3.

Table 3 - Demographic profile of respondents

Demographic	Frequency	Percentage (%)
Gender		
Male	11	27.5
Female	29	72.5
Age (Years)		
<30	2	0
30-39	15	22.5
40-49	15	75.0
>49	8	2.5
Academic Qualification		
PhD	0	2.5
Master	9	12.5
Degree	30	22.5

Diploma	1	62.5
Teaching Experience (Years)		
<2	0	0
2-5	6	15
6-10	10	25
11-15	8	20
>15	16	40
Ever Attended HOTS Course		
Yes	32	80
No	8	20

3.2 Teachers' Level of Readiness to Face Changes in Curriculum of HOTS Implementation

Based on findings of the analysis in Part B referring to table 4, the RBT teachers' level of readiness to face changes in curriculum of HOTS implementation was high as all items have high mean scores ($M = 4.10$; $SD = 0.400$). Specifically, item no. 5 has shown the highest mean ($M = 4.20$; $SD = 0.46$). This has shown that the teachers have used good instruction in delivering the information to the students. Item no. 3 had the lowest mean value in Part B of the questionnaire ($M=4.03$; $SD = 0.28$). However, this item was still considered as a high level of mean scores. As such, changes in curriculum involve elements of creativity to be incorporated into teaching and learning process with HOTS.

Table 4 - Teachers' level of readiness to face changes in curriculum of HOTS implementation

No.	Item	Mean	SD
1.	I have competency skills that are suitable for students.	4.05	0.39
2.	I use a variety of materials for students.	4.13	0.46
3.	I have my teaching process using HOTS method.	4.03	0.28
4.	I develop questions that require students to think creatively and critically.	4.10	0.38
5.	I use a decent instructions method in my teaching process.	4.20	0.46
6.	I have an adequate soft skills in delivering information.	4.15	0.43
7.	I use technologies in my teaching process.	4.08	0.47
8.	I have applied the elements of creativity in my teaching process.	4.08	0.27
Total		4.10	0.400

3.3 Teachers' Level of Readiness to Face Changes in Pedagogy of HOTS Implementation

The findings of the analysis in Part B by referring to table 5, the RBT teachers' level of readiness to face changes in pedagogy of HOTS implementation was high as all items have high mean scores ($M = 4.00$; $SD = 0.48$). Specifically, item no. 8 has shown the highest mean ($M = 4.18$; $SD = 0.45$). This proves that these teacher have related the learning concept with things that happened in students' daily life. Item no. 3 had the lowest mean value in Part C of the questionnaire ($M=3.60$; $SD = 0.55$). However, this item was still regarded to be a moderate level of mean scores. This indicated that the teachers were lacking of using the Cognitive Research thinking tool (CoRT) because the respondents did not understand the main concept of the CoRT.

Table 5 - Teachers' level of readiness to face changes in pedagogy of HOTS implementation

No.	Item	Mean	SD
1.	I have establish effective strategies for my teaching and learning process.	4.03	0.36

2.	I have use 8 types of mind maps (i-think)	3.93	0.53
3.	I have use cognitive research thinking tools (CoRT)	3.60	0.55
4.	I have present a techniques that encourage discussion among students.	4.10	0.50
5.	I have apply project-based teaching	4.10	0.59
6.	I use thinking tools in the learning and teaching process	3.98	0.42
7.	I have provide opportunities for students to express their opinion during my teaching process.	4.15	0.43
8.	I have relate the learning concept with the issues that happened in daily life.	4.18	0.45
Total		4.00	0.48

3.4 Teachers' Level of Readiness to Face Changes in Assessment of HOTS Implementation

Based on findings of the analysis in Part B referring to table 6, the RBT teachers' level of readiness to face changes in assessment of HOTS implementation was high as all items have high mean scores ($M = 4.08$; $SD = 0.45$). Specifically, item no. 3 and no. 4 have shown the highest mean ($M = 4.20$; $SD = 0.46$), which indicated that the teachers were more likely to use formative assessment, as well as assess the students through observation, oral and written methods. Item no. 2 had the mean value of 4.08 and standard deviation of 0.45. This has clearly showed that teachers were doing systematic planning in terms of assessment.

Table 6 - Teachers' level of readiness to face changes in assessment of HOTS implementation

No.	Item	Mean	SD
1.	I have planned a self-assessment program to assess students.	3.90	0.44
2.	I have made systematic planning in terms of assessment.	4.08	0.45
3.	I have use a formative assessment.	4.20	0.46
4.	I have assessed the students through observation, oral and written methods.	4.20	0.46
5.	I have made appraisal that emphasizes individual improvements rather than comparing them.	4.10	0.500
6.	I have track students' improvement in learning	4.10	0.44
7.	I have taken action to overcome students' weaknesses in learning.	4.03	0.42
8.	I have encouraged students to make self-assessments.	4.05	0.45
Total		4.08	0.45

3.5 Relationship Between Teachers' Readiness to Face Changes in Curriculum, Pedagogy and Assessment in the Implementation of HOTS

The assumptions of the Pearson product moment correlation level of measurement noted that each variable for this data were continuous, observation data have a pair of values, there were no outliers in either variable and it form a straight line relationship between the variable pairs. Thus, Pearson's correlation analysis can be performed on this data set. Table 7 shows that there is a weak positive relationship between teachers' readiness to face changes in curriculum and pedagogy in the implementation of HOTS, $r(48) = 0.096$, $p = 0.820$. In spite of that, there is a weak positive relationship between teachers' readiness to face changes in curriculum and assessment in the implementation of HOTS, $r(48) = 0.218$, $p = 0.604$. Finally, there is a fair negative relationship between teachers' readiness to face changes in pedagogy and assessment in the implementation of HOTS, $r = -0.400$, $p = 0.326$.

Table 7 - Relationship between teachers' readiness to face changes in curriculum, pedagogy and assessment in the implementation of HOTS

		Curriculum	Pedagogy	Assessment
Curriculum	Pearson	1.000	0.096	0.218
	Correlation			
	Sig. (2-tailed)		0.82	0.604
	N	8	8	8
Pedagogy	Pearson	0.096	1.000	-.400
	Correlation			
	Sig. (2-tailed)	0.820		0.326
	N	8	8	8
Assessment	Pearson	0.218	-.400	1.000
	Correlation			
	Sig. (2-tailed)	0.604	0.326	
	N	8	8	8

*Correlation is significant at the 0.05 level (2-tailed).

Generally, this mean that if the teacher were ready to face changes in pedagogy, they have lower readiness level to face changes in assessment. Then, teachers' readiness to face changes in curriculum and their readiness to face changes in pedagogy or assessment in the implementation of HOTS did not show any statistically significance in the linear relationship as the p value was larger than 0.05. In short, it can be concluded that there were no statistically significant relationship between teachers' readiness to face changes in curriculum with their readiness to face changes in pedagogy or assessment in the implementation of HOTS. In other words, this correlation values does not mean that the changes in one variable actually cause the changes in the other variable.

4. Discussion

Based on the findings of the study, the RBT teachers' level of readiness to face changes in curriculum on the implementation of HOTS was high. This situation had clearly demonstrated that teachers had thoroughly grasped the meaning and significance of curriculum on the basis of HOTS and were ready to encounter any changes that might have taken place in education system. According to Falloon (2020), teachers need to have adequate knowledge of the subject's content before they can practice it to the students effectively. The findings were also consistent with the study conducted by Gek (2017), which reveals that teachers were prepared to incorporate HOTS in the curriculum. This is because one of the curriculum elements included the use of relevant competencies in each content to stimulate students' thinking skills during the learning process. Thus, the TVET institutes should be independent to adjust the curriculum as per the demand of the market and the trainer should be trained as per the changes that are occurred (Rijal, 2020).

Besides, the findings also indicate that the RBT teachers' level of readiness to face changes in pedagogy on the implementation of HOTS was high. The teachers have related learning concept to issues that occur in daily life throughout the learning process. This is in line with Saye et al. (2018), which reveals that authentic pedagogy, through the practice in real situations is at a high level as this explains that the teachers were very well-suited to using certain methods for students in the classroom to generate students with HOTS-minded. In spite of that, the findings showed that there was a lack of teachers' readiness to understand the Cognitive Research Trust (CoRT) thinking tools. The CoRT tool is an instrument in the form of guideline used in thinking when encountering a problem-solving process. The findings were also consistent with Shukla and Dungsungneon (2016), which shows that teachers use less CoRT thinking tools during the teaching and learning process. Besides TVET infrastructure, passionate teachers through pedagogic innovation are needed to drive the transformation in TVET teaching and learning (Tan & Seet, 2020).

Likewise, the RBT teachers' level of readiness to face changes in assessment on the implementation of HOTS was high. This indicated that most of the teachers understand the meaning and significance of the HOTS assessment and can conduct the assessment to the students in a correct way. The findings of this study also showed that teachers have prepared systematic planning for assessment by determining the instruments, recording, analysing, taking follow-up actions and reporting. This statement is in line with a study conducted by Abosalem (2016), which claims that teachers use appropriate systems to enhance students' knowledge and to be able to remember the information provided by teachers. The findings clearly demonstrated that teachers were ready to assess students by using the HOTS method to stimulate students' thinking skills. This assertion is accordance with the study by Nalova and Shalanyuy (2017), which note that teacher's willingness were at high level in making assessments by asking questions that have implemented HOTS elements to students. Apart from that, the findings also showed that teachers have prepared their own assessment in order to detect students' weaknesses in learning. However, student's perceptions of assessment practice in TVET classroom don't reflect content validity or apply real-life experience and real-life context (Ramaligela, 2021).

Lastly, curriculum, pedagogy and assessment were enacted in the holistic context of the educational experience and therefore theoretical and empirical work is required that accounts for the relationships between the three message systems (Main, Bahr & Pendergast, 2020). The study indicated that there is no statistically significant relationship level between curriculum, pedagogy and assessment of TVET teachers' readiness on HOTS implementation. Shower (2017) indicate that factors that include curriculum policy in terms of curriculum content, pedagogical and assessment orientations were significant motives behind classroom-level curriculum developments. Nevertheless, Tien, Ai and Nhu, (2020) state that transversal skills integrated in the curriculum of TVET that focusing on teaching and assessment of being imparted in TVET schools through teaching, learning and assessment activities of those skills are not really effective.

Additionally, in order to keep abreast with the fast changing technology, there is also a need to modify and develop competency-based curriculum for teacher training, enhance pedagogical education with more distinctive nature of TVET or called TVET pedagogy and develop assessment tools that help TVET teachers to do self-assessment against the professional standards (Paryono, 2015). The traditional forms of curriculum, pedagogy and assessment focus on a decontextualized individual, a sociocultural perspective pays close attention to contexts. Teachers' practices, expectations, and understandings of learning and diversity form a key part of the contexts (Morton & Guerin, 2017). Thus, it is important for teachers' to make a supplementary, substantial and extensive adjustment on the curriculum, pedagogy and assessment for different level and subject especially in TVET area.

5. Conclusion

Overall, the findings have shown that most TVET teachers were ready to face changes in curriculum, pedagogy and assessment of the implementation of HOTS. However, there were problems that arise in the curriculum aspect where there is a time constraint to finish the syllabuses that prohibits HOTS from being implemented. Despite of that, pedagogical element through the use of teaching aids also needed to be stressed, in particular. Teacher who has less pedagogical aspects awareness without the use of teaching tools or resources will not be able to stimulate students to gain HOTS in their teaching and learning process. Lastly, all parties have an important role to play in assessing HOTS, particularly for teachers. This finding can be used as references or resources related to the HOTS assessment in order to increase teachers' knowledge of HOTS assessment. Besides, there is no statistically significant relationship level between curriculum, pedagogy and assessment of TVET teachers' readiness on HOTS implementation as the main goals of HOTS teaching is to ensure students can think and solve problems critically especially related to TVET.

Henceforth, this study is intended to provide knowledge and enhancement for teachers involved in order for them to prepare required training and increase their level of readiness to implement HOTS effectively during the teaching and learning process. The discussions and conclusions stated were obviously clear and comprehensive on the basis of the study findings and the analysis process. Furthermore, this findings have answered all the research questions. The teachers need to be more creative and efficient in time managing to successfully implement HOTS. The school administration should therefore arrange or conduct courses, workshops or seminars for the teachers to help them to develop their knowledge and skills in the implementation of HOTS. To conclude, HOTS in TVET can effectively promote students' readiness in career path as HOTS can be developed and applied in workplace. Given the fact that there are teachers who are not aware of the importance of developing students' critical thinking in their lessons especially in TVET, therefore teachers' readiness in incorporating HOTS in their classrooms also plays a significant role.

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