

# Model of the Relationship between Knowledge, Skills and Disposition of Alternative Assessment and Higher Order Thinking Skills among Educators

Tajularipin Sulaiman<sup>a</sup>, Amalina Ibrahim<sup>b</sup>, Suzieleez Syrene Abdul Rahim<sup>c</sup>, Muhammad Nazrul Hakim<sup>d</sup>, Rosmaria Omar<sup>e</sup>, <sup>a</sup>Faculty of Educational Studies & Sport Academy, Universiti Putra Malaysia, <sup>b,c</sup>Faculty of Educational Studies, Universiti Putra Malaysia, <sup>e</sup>Faculty of Education, University Malaya, <sup>d</sup>Faculty of Medicine And Health Sciences, Universiti Putra Malaysia,

Higher Order Thinking Skills (HOTS) play an important role in the learning and teaching process. Educators also play an important role in the development and implementation of HOTS. In addition, the implementation of alternative assessment methods as a new form of assessment in the teaching and learning process is also emphasised. The goal of this study is to identify the relationship between educators' knowledge, skills and disposition of alternative assessment and HOTS in Selangor, and also to determine the coherence of the structural equation model between Knowledge, Skills and Disposition constructs on HOTS. A total of 232 educators were selected as respondents. The questionnaire used was validated and demonstrated high reliability. In addition, data was analysed using SPSS to determine correlation and regression, while AMOS software was used to determine structural model correspondence. The results show that the relationship between knowledge construct and HOTS is moderate with  $r = 0.561$ . The skills construct with HOTS also shows a moderate correlation of  $r = 0.628$ . The study also shows that the relationship between the disposition construct with HOTS is moderate with  $r = 0.653$ . The structural model between the Knowledge, Skills and Disposition constructs on HOTS have achieved a good model compatibility of  $RMSEA = 0.08$ ,  $CFI = 0.936$ ,  $NFI = 0.901$ ,  $ChiSq / df = 2.560$  and  $p = 0.000$ . In addition, the Knowledge, Skills and Disposition constructs contribute 62% towards HOTS based on the data. To implement HOTS, teachers need to have

sound knowledge, skills and positive attitudes towards alternative assessments.

**Keywords:** *Alternative assessment, knowledge, skills, disposition, higher order thinking skills.*

## **Introduction**

The Ministry of Education (MOE) has transformed and enhanced the quality of the national education system through the Malaysia Education Blueprint 2013-2025 (KPM, 2013). Chew and Hamad (2018) have identified one of the objectives of this transformation as the provision of equal access to quality education of international standards. Thus, prior modes of examinations and assessments were overhauled, and focus was placed on forming higher order thinking skills (HOTS). As Rajendran (2010) explains, a country's progress stems from the nation's education system through the mastery of knowledge and skills among members of society.

Therefore, education serves not only to train the memory but also to shape the mind (Cowan, 2014, Ibrahim, 2019). Through the process of education, educators not only fulfil the function of transferring knowledge but also play the role of continuously instilling values and building character in students. However, Petko (2012) maintains that universities generally do not teach the thinking skills required to improve global human relations that are becoming increasingly complex today. In fact, Ganapathy et al. (2017) point out that the gap between lecturers' intentions and their reliance on assessment strategies that are focused on the creation of knowledge instead of the transformation of knowledge has given rise to challenges in the way higher order teaching and learning should be assessed. Hence, alternative assessment aspects used by educators such as skill, knowledge, and disposition are important and should be analysed in order to assist educators in implementing HOTS and achieve national education goals.

### ***Higher Order Thinking Skills (HOTS)***

The Ministry of Education (MOE) defines HOTS in the education curriculum as the student's ability to apply knowledge, skills, and values in reasoning and reflecting in order to solve problems, make decisions, innovate, and create. The purpose is to create students who are able to think outside the box in order to produce new ideas or creations. Brookhart (2010) characterised HOTS by three categories, namely transferring, critical thinking, and problem-solving. Furthermore, thinking skills are not only dependent on the level of intelligence but also involve time and self-motivation. Tajularipin, Ahmad Fauzi and Suriati (2015) describe HOTS as skills involving high intellect requiring an individual to think before explaining

through analysis, evaluation, idea generation, decision-making, problem-solving and planning.

Badrul Hisham, Alang Osman and Mohd Nasruddin (2016) have conducted a study on HOTS among lecturers in the Institute of Teacher Education and found that the application of HOTS is still low with a mean value of 3.32. As a result, the study recommends that the use of HOTS should be increased in the teaching and learning practices of 21st century lecturers. In fact, Zoller (2001) postulates that the inculcation of HOTS will ease the transfer of knowledge and skills to society in the future. Similarly, Boaler and Staples (2008) found that teaching which develops HOTS can improve student achievements. Moreover, in a study conducted amongst lecturers at a Malaysian public university, Ganapathy et al. (2017) found that the use of ICT improves HOTS. Nevertheless, in the same study, Ganapathy et al. (2017) state that ESL lecturers in public Universities are faced with challenges in instilling and encouraging HOTS.

Abdul Halim et al. (2017) investigated the level of knowledge and the practice of HOTS amongst Mathematics teachers in Terengganu. 196 respondents were studied using quantitative methods and descriptive surveys. The findings show low levels of knowledge and application of assessment. Additionally, the study found a significant correlation between levels of knowledge and the utilisation of HOTS amongst school teachers ( $r=0.68$ ,  $p<0.01$ ). This finding connotes that the teachers' level of knowledge determines the teaching methods based on student needs. Indeed, Cope (2014) proposes that knowledgeable educators encourage thinking activities and often give opportunities for students to challenge their abilities. Anthony and Walshaw (2009) argue that teachers who are knowledgeable about pedagogy are able to develop better skills to promote and encourage the generation of ideas amongst students.

### ***Alternative Assessments***

Puhl (1997) asserts that alternative assessments allow students to demonstrate their understanding about the lessons learned in the classroom. Gronlund (1998) defines alternative assessments as methods of assessment that provide alternatives to traditional pencil-and-paper tests. Besides, Suzieleez Syrene and Tajularipin (2006) claim that alternative assessment techniques bolster higher order critical and creative thinking that enable students to have greater control over their learning. Dietel et al. (1991) list several alternative assessment strategies, including open-ended questions, exhibitions, demonstrations, experiments, computer simulation and portfolios. Alternative assessment techniques suggested by Knight and Mantz (2003) include field studies, posters, presentations, article reviews, concept maps, role-play, projects and portfolios.



Law and Eckes (1995) explain that alternative assessments are well-suited for evaluating HOTS. This is due to the fact that students are given the opportunity to show or present what they have learned. In fact, this assessment focuses on the growth and performance of students. For example, if the student fails to present a task at a given time, he or she still has the opportunity to present it again at a later time. Apart from that, teachers also have the opportunity to measure students' strengths and weaknesses in various situations at different times (Law & Eckes, 1995; Semire Dikli, 2003; Ezeanyej Clement, 2016).

In a study on the impact of using Wiki technology to encourage HOTS, Razak and Lee (2012) have found that the use of technology results in more effective pedagogy that involves educator guidance in the process of peer collaboration. Nonetheless, Choy and Cheah (2009) observe that lecturers lack understanding about the need to teach critical thinking skills. Therefore, their study advises the use of structured teaching methods to assimilate thinking skills with education content and highlight the need to obtain lecturers' perceptions about the main challenges they face in encouraging HOTS through their teaching.

Rajendran (2001) has found that aspects of knowledge, pedagogical skill, and attitude cause teachers to be ill-prepared for teaching HOTS. This is supported by Ball and Garton (2005) who expound that the majority of teachers or educators do not know the methods of teaching HOTS to students and some are not prepared to apply the skill in their own teaching. Nonetheless, the study by Sukiman et al (2012) reveal that teachers are sufficiently skilled to develop students' thinking skills. This attests to the fact that educators have a positive perception towards the value and importance of thinking skills (Rosnani & Suhailah, 2003; Sukiman et al. 2012; Mohamad Nurul Azmi & Nurzatulshima, 2017).

The study by Abdul Halim et al. (2017) finds a moderately strong and significant correlation between levels of knowledge and the application of HOTS amongst Mathematics teachers ( $r=0.54$ ,  $p<0.01$ ). Anuar and Nelson (2015) contend that competent teachers should have high levels of pedagogical knowledge as it helps teachers to choose and determine effective teaching strategies. The National Council for Accreditation of Teacher Education (NCATE) (2001) defines disposition as the values, commitments, and professional ethics that influence behaviours towards students, families, colleagues, and communities and affect student learning, motivation, and development, as well as the educator's own professional growth. NCATE (2001) also elaborates that disposition is the combination of attitudes and beliefs relating to values such as caring, honesty, fairness, empathy, respectfulness, responsibility, and thoughtfulness. Notar et al. (2009) state that there is a strong correlation between disposition and the quality of student learning. Teachers or educators who care about students' academic achievements are individuals who are willing to make the necessary efforts to ensure a conducive learning environment in the classroom and lecture hall and have intrinsic characteristics such as pedagogical knowledge and skills.



### ***Research Objective and Hypotheses***

This study was conducted with the aim of identifying the relationship between constructs involved in alternative assessment methods, namely knowledge, skill, and disposition, with HOTS amongst educators. Thus, it focuses on the following hypotheses:

H<sub>1</sub>: There is a significant correlation between Knowledge construct and HOTS amongst teachers who use Alternative Instruments.

H<sub>2</sub>: There is a significant correlation between Skill construct and HOTS among teachers who use Alternative Instruments.

H<sub>3</sub>: There is a significant correlation between Disposition construct and HOTS among teachers who use Alternative Instruments.

H<sub>4</sub>: There is a structural model correspondence between the Knowledge, Skill, and Disposition constructs and HOTS in the research data.

### **Methodology**

This study uses a quantitative approach to achieve the research objectives. In addition, it utilises the cross-sectional method. According to Noraini (2010), cross-sectional studies are used to collect information from a sample population that has been pre-determined at a specific time. The Alternative Instruments survey was distributed among educators at pre-University and University levels. A total of 232 questionnaires were received and could be used for the purposes of data analysis. Respondents were selected using the simple random sampling method and are considered sufficiently mature and well-adjusted to their work environment to be sampled for this study.

This study uses SPSS for descriptive and inference analysis such as correlation and regression. Furthermore, it also utilises the AMOS software for data analysis through the Structural Equation Model (SEM). To that end, the sample size must be suited to the chosen analytical method (Baleghi- Zadeh, 2017; Daneji, et. al, 2019; Isiyaku et. al, 2018). Kline (2011) states that the most suitable sample size is 200 respondents. On the other hand, Hair et al. (2010) suggest that a minimum sample size of 100 to 150 respondents is suitable. In addition, Table 1 shows the correspondence value proposed by Zainudin Awang (2016).

**Table 1:** Model correspondence value

Category	Correspondence index	Acceptable value	Remark
Absolute fit	Chisq	$P > 0.05$	Sensitive to sample size $> 200$
	RMSEA*	$RMSEA < 0.08$	Values 0.05 to 1.00 are acceptable
Incremental fit	GFI*	$GFI > 0.90$	0.95 denotes good correspondence
	AGFI	$AGFI > 0.90$	0.95 denotes good correspondence
	CFI*	$CFI > 0.90$	0.95 denotes good correspondence
	TLI	$TLI > 0.90$	0.95 denotes good correspondence
	NFI	$NFI > 0.90$	0.95 denotes good correspondence
Parsimony Fit Indices	Chisq/df*	$< 5.0$	Value must be less than 5.0

Source: Zainudin Awang (2016)

This study uses the Alternative Instruments survey developed by researchers. This instrument has undergone a validation process and pilot study before being distributed for the actual study. It contains four parts: Part A Demographics, Part B Knowledge construct, Part C Skill construct, and Part D Disposition construct. Parts B, C, and D use a 5-point Likert scale with values from 1 (strongly disagree) to 5 (strongly agree). Furthermore, Parts B, C, and D each contain 8 items and a breakdown of the assessment method measured with a 3-point Likert scale with the values 0 (never), 1 (sometimes), and 2 (always). Moreover, the reliability of this instrument is indicated with high Cronbach's alpha values for the Knowledge (0.847), Skill (0.887), and Disposition (0.933) constructs. Table 2 specifies the interpretation of the correlation coefficient values.

**Table 2:** Correlation coefficient values

<i>r value</i>	Correlation
.86 – 1.00	Very strong
.70 – .85	Strong
.51 – .69	Moderate
.20 – .49	Weak
.00 – .19	Very weak

Source: Ary, Jacobs & Razavieh (1996)

## Research Findings and Discussion

Table 3 shows the results of Pearson's correlation analysis for this study. The analysis has found that there is a significant correlation between the Knowledge, Skill, and Disposition constructs and HOTS amongst teachers who use Alternative Instruments.

**Table 3:** Results of Pearson's Correlation Analysis

		<b>Knowledge</b>	<b>Skill</b>	<b>Disposition</b>	<b>HOTS</b>
Knowledge	Pearson Correlation	1	.656**	.585**	.561**
	Sig. (2-tailed)		.000	.000	.000
	N	232	232	232	232
Skill	Pearson Correlation	.656**	1	.707**	.628**
	Sig. (2-tailed)	.000		.000	.000
	N	232	232	232	232
Disposition	Pearson Correlation	.585**	.707**	1	.653**
	Sig. (2-tailed)	.000	.000		.000
	N	232	232	232	232
HOTS	Pearson Correlation	.561**	.628**	.653**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	232	232	232	232

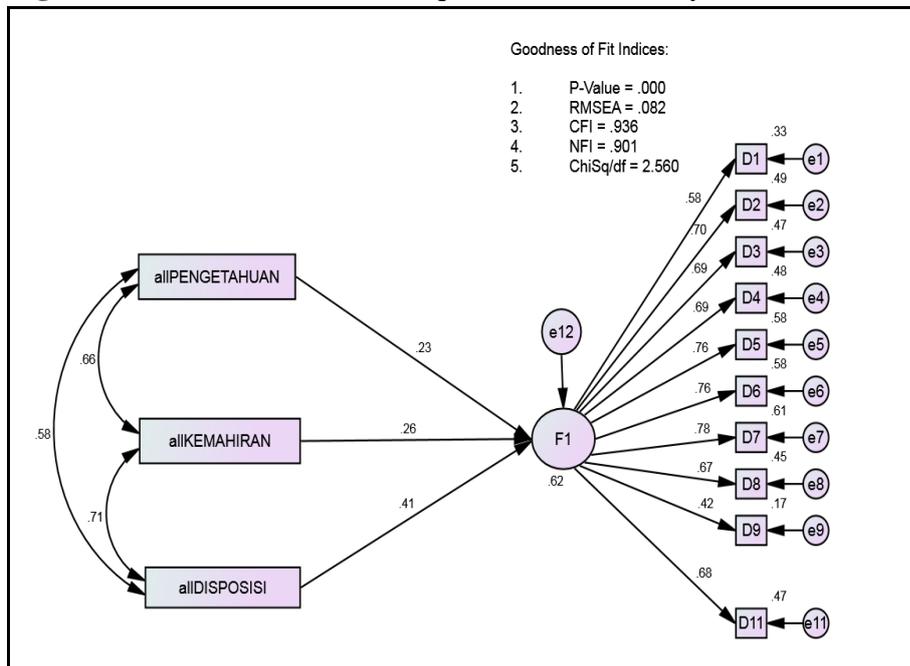
\*\*.

Correlation is significant at the 0.01 level (2-tailed).

Based on Table 3, the analysis indicates that there is a significant correlation between the Knowledge construct and HOTS among teachers who use Alternative Instruments ( $r= 0.561$ ,  $p<0.01$ ). This demonstrates that Hypothesis 1 is accepted. Hypothesis 2 is also accepted based on the significant correlation between the Skill construct and HOTS among teachers who use Alternative Instruments ( $r=0.628$ ,  $p<0.01$ ). Likewise, Hypothesis 3 is accepted as there is a significant correlation between the Disposition construct and HOTS among teachers who use Alternative Instruments ( $r=0.653$ ,  $p<0.01$ ). Overall, the results of the Pearson's correlation analysis illustrate that Knowledge, Skill, and Disposition constructs have significant correlation with HOTS amongst teachers. The results also establish that, among the three constructs, Disposition construct holds the highest correlation with HOTS amongst school teachers.

Figure 1 shows the results of the structural equation model analysis. The results have found that the model specification for the Knowledge, Skill, and Disposition constructs as well as HOTS manage to achieve the required model correspondence of  $RMSEA=0.08$ ,  $CFI=0.936$ ,  $NFI=0.901$ ,  $ChiSq/df=2.560$ , and  $p\text{ value}=0.000$ . In addition, the Knowledge, Skill, and Disposition constructs contribute up to 62% to HOTS ( $F1$ ). Overall, the Disposition construct has a greater direct effect on HOTS at 0.41 compared to Knowledge construct (0.23) and Skill construct (0.26). As such, Hypothesis 5 is accepted.

**Figure 1.** Results of Structural Equation Model Analysis



## Discussion

The results of the analysis reveal a significant correlation between Knowledge construct and HOTS amongst teachers who use Alternative Instruments ( $r= 0.561, p<0.01$ ). The findings show that educators have moderate knowledge about HOTS. Knowledgeable educators are crucial in applying HOTS. This is reflected through the efforts made by MOE (2013) to invest in training for teaching staff to gain knowledge in employing HOTS. Studies by Yee et al. (2015) have found that the majority of teachers do not know the methods to effectively teach HOTS. Indeed, Abdul Halim and Siti Muhibah (2015) contend that educators still lack knowledge and understanding in HOTS teaching techniques. Yet, a study by Abdul Halim et al. (2017) shows a significant correlation between levels of knowledge with the application of HOTS amongst teachers ( $r=0.68, p<0.01$ ). These findings are in agreement with the results of this study. Consequently, this research concludes that knowledge is an essential construct that must be firmly grasped by educators. This is due to the fact that knowledge can indirectly improve teachers' confidence in implementing HOTS as advised by MOE.

Furthermore, this study also reveals a significant correlation between the Skill construct with HOTS amongst teachers who use Alternative Instruments ( $r=0.628, p<0.01$ ). The findings demonstrate that teachers have moderate skill in executing HOTS through alternative assessment methods. This finding is in line with the study by Abdul Halim et al. (2017) which found a moderately significant correlation between the level of knowledge and the application of HOTS amongst teachers. The deficiency of adequate skills among educators



can indirect adverse effects on teaching and learning in the classroom especially in attaining HOTS. Accordingly, skills in alternative assessment methods are also key in order to carry out HOTS.

Moreover, Hypothesis 3 is also accepted as there is a significant correlation between the Disposition construct and HOTS amongst educators who use Alternative Instruments ( $r=0.653$ ,  $p<0.01$ ). This finding shows that pre-University and University educators still hold positive attitudes and beliefs relating to the use of Alternative Instruments for HOTS. In comparison with Knowledge and Skill constructs, the Disposition construct has a stronger correlation with HOTS. Educator sentiments such as responsibility, empathy, and thoughtfulness spur them to apply HOTS in the teaching and learning process, which indirectly contributes to student achievements. A parallel can be seen in the study by Notar et al. (2009) who discovered a strong correlation between disposition and the quality of student learning.

Finally, the analysis demonstrates structural model correspondence between Knowledge, Skill, and Disposition constructs and HOTS in the research data. This shows that the structural model between the Knowledge, Skill, and Disposition constructs and HOTS using Alternative Instruments is suited for implementation and usage by educators in the classroom.

## **Conclusion**

The alternative assessment approach can support educators in achieving MOE's advice to apply HOTS. Through alternative assessments, educators are not only able create effective teaching and learning but also increase motivation in both teachers and students. Additionally, this method of assessment opens up opportunities and time for students, which can encourage them to work harder, be more confident, and engage in higher thinking when interacting and giving ideas that will enable educators to implement HOTS in the classroom more effectively.



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