

Relationship Between Higher Order Thinking Skills (KBAT) and Creative Thinking Skill (KBKRE) Among Form 1 Students

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Abstract

Higher Order Thinking Skills (KBAT) is no longer considered to be foreign in the educational sector in Malaysia. KBAT is one of the main branches in transforming the educational curriculum through PPPM 2013-2025, in order to produce generations that are creative and critical in competing alongside the global market. The fast-growing field of science and technology leads to the emphasis of the Higher Order Thinking Skills (KBAT) to produce students that are capable of mastering the 21st century thinking skills. KBAT requires a higher ability level such as creative thinking skill. In truth, KBAT demands students to memorise, comprehend, apply, analyse, assess and create in order to reach the level of excellent thinking skill. To reach this stage, the creative thinking ability relates closely to the students' command. Therefore, the objective of this paper is to determine the relationship of KBAT and KBKRE among students. Survey data were collected from Form 1 students of a daily secondary school in Selangor and analysed using the partial least-squares structural equations modeling (PLS-SEM) technique. The key results found that KBAT has a direct positive relationship with KBKRE.

Keywords: Higher order thinking skill, creative thinking skill, students, education

Introduction

The advancement in the science and technology field allows humans from all walks of life to get access to information quickly without limits. This situation does not only positively impact the lifestyle of students but also contributes to the enhancement of the country's education system. This advancement put emphasis on the higher order thinking skills (KBAT) to produce a generation that is competitive in all aspects of life. It is undeniable that the increasing progress of science and technology demands new approaches and strategies in teaching to enable every student to conquer the 21st century

thinking skills. One of the main objectives of the 2006-2010 Malaysia Education Blueprint is to generate students that are capable of thinking creatively and critically in order to produce first class human capital in Malaysia. Moreover, the Malaysia Education Malaysia Education Blueprint 2013-2025 (2013) also emphasises on creative and critical thinking skills. Thus, every student should master KBAT in order to produce a generation that is able to practice the knowledge and skills in certain situations (Ministry of Education Malaysia, 2014). The higher order thinking skills will turn the learning session into something more meaningful. Therefore, KBAT is highly

important among students so that they can compete at a global stage.

According to Dahalan (2020), KBAT requires a higher ability level such as creative and critical thinking skills. In reality, KBAT requires students to memorise, comprehend, apply, analyse, assess and create in order to reach an excellent thinking level. To reach this level, the ability of creative thinking is closely linked to the students' mastery. Thinking skill is not a foreign idea in the education world, Weiner (1985) stated that thinking is not a spontaneous act but this process is sparked due to problems and questions, chaos or doubts. The KBAT practise is also studied through the Piaget Theory, Bruner Theory, Bloom Theory (Bloom, 1956; Kauchak & Eggen, 1998), Gagne Theory (Gagne, 1985; Briggs & Wager, 1981) and Marzano Theory (Marzano et al., 1988). The findings from the studies showed results related to the implementation of KBAT in learning.

Nevertheless, this matter depends on the preparedness of the teachers as the executioner in realizing the wish of the government. The question now is, are the teachers ready to produce students that possess KBAT in the teaching process? Previous studies found that most teachers were still not ready due to the lack of exposure in implementing KBAT in PdP, not well-acquainted in the application of KBAT in PdP and also being burdened by other tasks that hinder the implementation of KBAT-focused PdP (Farah Aziana & Fadzilah, 2018). According to Ramli et al. (2019), a small number of teachers are still influenced by teacher-focused teaching, therefore students are seldom given the chance to practice KBAT in their assignments.

Additionally, the average of students' thinking level in Malaysia is still low, and

this fact is proven through the achievement of Program for International Student Assessment (PISA) in 2010, which is the assessment for the critical thinking skill and literacy level of students worldwide. The Malaysia Education Blueprint 2013-2025 (2013) reported that Malaysian students' achievement in 2010 was extremely far behind compared to students in the countries that received the same or less allocation for education per capita. Malaysia's achievement was lower compared to Thailand, Chile and Armenia. Not only that, Malaysia's achievement slumped in the international assessment of the Trend of International Mathematics and Science Study (TIMSS). Malaysia's participation in TIMSS for the years 1999, 2003, 2007, 2011 and 2015 involved Form 2 students who were randomly picked across 150 schools. Malaysia showed a significant decrease in terms of the average TIMSS score, which was lower compared to other Asian countries such as Thailand, Singapore, Hong Kong, Japan, Korea and Taiwan. Students' achievement in the Science subject in TIMSS in 1999 (Martin, Mullis, Gregory, Hoyle & Shen, 2000), 2003 (Martin, Mullis & Chrostowski, 2004), 2007 (Martin, Mullis & Foy, 2008) and 2011 (Martin, Mullis & Foy, 2012) each were 492, 510, 471 and 426. Generally, Malaysia was at the 22nd out of 38 countries in 1999; at the 20th place out of 50 countries in 2003; at the 21st place out of 60 countries in 2007; and at the 32nd place out of 45 countries in 2011. In 2015, Malaysian students achieved a score of 465 in TIMSS (Ministry of Education Malaysia, 2016). Even though Malaysia's achievement increased by 25 points in PISA in 2015, this achievement was considered as unstable and worried the KPM (Ministry of Education Malaysia, 2016). This is due to the Science score of the Malaysian

students in TIMSS 2007 (Martin et al., 2008) and TIMSS 2011 (Martin et al., 2012) were still lower than the minimum score of 500, which is categorised as “Low International Benchmark” in TIMSS (Reddy et al (2012).

KPM, through the Curriculum Development Center (2002), has developed a module to put emphasis on scientific thinking skills among students. Nevertheless, it is not easy for teachers to teach scientific thinking skills (Rosnani&Suhaila, 2003). According to Chick dan Stacey (2013), most students find it hard to solve problems that require KBAT. In fact, some students cannot answer questions related to KBAR. Therefore, to solve this problem, Science learning in the secondary level requires a more relevant approach. The study done by Abdul Halim, Nur Liyana dan Marlina (2015) found that the mistakes committed by students linked to Mathematics problems which involve KBAT are focused on coding (27.58%), followed by process skills (27.33%), transformation (24.17%) and comprehension (20.92%).

For students who fall under the weak and intermediate categories, Science is considered as a ‘hard subject’. Therefore, when the Science examination questions were enacted with KBAT applied, it was hard for these groups to understand the questions. Research in the Malaysian students’ result in TIMSS in 2007 found that Mathematics and Science teachers in this country gave minimal encouragement to students to explore and build their comprehension through perception with their own ability (Ministry of Education Malaysia, 2013). Thus, it is assumed that the influence of thinking, whether positively or negatively, plays a role in shaping the style of critical and creative thinking and also the students’ perception

towards KBAT in the Science subject. This situation influences students’ acceptance towards the Science concept in general.

The education transformation was first implemented through the Primary School Curriculum Standard (KSSR) in 2011, which put emphasis on creative and critical thinking, strategized learning and KBAT in Malaysian schools. Critical and creative thinking along with KBAT were combined in teaching so that students can increase their critical thinking skill and generate new ideas. According to Nursafra, Mohd dan Khadijah (2017), the critical thinking concept in KBAT instils cognitive skill and commendable attitudes in students. Thinking skill is applied in students through high level questions, activities that stimulate thinking and problem solvings as well as teaching that prompts one to think. Nevertheless, Abd. Rahim (2000) stated that teaching in the classroom does not strongly emphasise on strategies that encourage students to think, ask questions, discuss with teachers and inquiries regarding their findings. Thus, teachers should diversify their teaching methods so that students get interested to increase their thinking skills in the classroom. Therefore, the objective of this research is to study the relationship of KBAT towards creative thinking skills (KBKre).

Literature Review

KBAT

Western scholars defined KBAT as an expansion of a student’s thinking to interpret, analyse or manipulate an information (Holyoak& Morrison, 2012). According to the Ministry of Education Malaysia (KPM), KBAT is defined as an ability to apply knowledge, skills and values in reasoning and reflecting to solve

problems, make decisions, innovate and create. Looking at studies done abroad on the importance of KBAT, the ministry defined this development as producing a generation of students that is high quality, in line with the National Education Philosophy. Therefore, thinking skills is revered as one of the six qualities that students need to compete on a global scale, as stated in the Malaysia Education Blueprint (PPPM) (Pelan Pembangunan Pendidikan Malaysia 2013-2025). This shows the importance of thinking skills as the most basic skill that can be nurtured in the classroom and be a key for students to achieve excellent result.

Previous academics ran a number of studies regarding the importance of KBAT as a discipline in education (Ennis, 1993; Glaser & Resnick, 1991; Haladyna, 1997; Howe & Warren, 1989; Huberty & Davis, 1998; Kauchak & Eggen, 1998; Kerka, 1986; King, 1994; Marzano et al, 1988; Siowck-Lee, 1995). In 1993, Lewis and Smith who studied the concept of thinking skills, critical thinking and problem solving found the actual life problem that always demands complex solutions that could only be solved through high level thinking skills.

KBAT is one of the components of thinking skills, which refers to a student's ability to use knowledge, skills as well as values that they have gained to solve problems, make decisions and invent. KBAT plays a significant role in the effort to create creative and innovative human capital to fulfill the 21st century needs of the country. According to the Bloom Taxonomy (Revised Bloom), there are four domains of high cognitive levels which are applying, analysing, assessing and inventing (Anderson et al., 2001). KBAT originally comes from the cognitive domain of the Bloom Taxonomy that was

introduced in 1956 (Forehand, 2010). Cognitive domains involve the knowledge and development of intellectual skills, beginning from easy thinking to one that is more complex (Bloom, 1956). Bloom categorized the intellectual qualities to six levels, which are knowledge, comprehension, application, analysis, synthesis and assessment (Yahya, Toukal & Osman, 2012). Other than the Bloom Taxonomy, the KBAT approach also uses other theories. For example, Heong, Yunos, Othman, Hassan, Kiong dan Mohamad (2012) studied KBAT by using the Marzano Theory. From the perspective of Imam Ghazali, KBAT refers to leveled thinking that involves three stages which are reasoning (taakul), reflecting (tafakkur) which involves thinking and feelings and deliberating (tadabbur) that involves thinking, feelings and civilized practices (Arshad & Yasin, 2015). In reality, the awareness of the importance of thinking skills, experience and culturalization of thinking among teachers and students are highly valuable in facing the challenges in the 21st century. Therefore, thinking skills must always be combined with teaching and learning (PdP) so that the agenda devised by KPM in the Malaysia Education Blueprint 2015-2025 will be achieved.

The Theory of High Level Thinking Skills from the Perspective of Bloom Anderson Taxonomy

The Malaysian education curriculum uses the Anderson Taxonomy Theory as reference, as this theory is easy to be used across all levels of schooling and education with a wider user target. This theory takes into account the educational development such as new learning paradigm, metacognitive knowledge category as well as constructivist learning

and self-directed learning. This is supported by Clark (2010) who stated the modified Bloom Taxonomy makes it more incisive from the aspects of curriculum planning, PdP delivery and assessment implementation. Thus, the Anderson Taxonomy Theory is capable of increasing the KBAT level in students.

Therefore, the Bloom Anderson Taxonomy Theory is used as reference in the current Malaysian education curriculum, which has been modified from the original theory, which is the Bloom Taxonomy. Anderson and Krathwohl (2001) re-studied the Bloom Taxonomy and the findings showed six strategies which were modified from the Bloom Taxonomy which are memorising, comprehending, applying, analysing, assessing, and creating. The Anderson Taxonomy Theory allows this strategy to be combined in the KBAT Modul and the developed instrument in this study. The strategies are as follows:

a)Memorising

Answering facts, memorising, and acknowledging

Thinking language: I can remember information

Keywords: Recognizing, informing, relating, detecting, writing, seeking, stating, repeating, listing, visualising, identifying, naming.

b) Comprehending

Expressing again and interpreting to show comprehension.

Thinking language: I can memorise and explain an idea and a concept.

Keywords: Interpreting, explaining, giving examples, simplifying, showing comprehension, translating

c) Applying

Using the knowledge, skills and values in different situations to execute new tasks.

Thinking language: I can use the knowledge in a similar situation.

Keywords: Implementing, showing, operating, visualising, using.

d) Analysing

Breaking information to smaller components so that they can be understood in detail as well as understanding the relationship in between.

Thinking language: I can cite important ideas.

Keywords: Comparing, identifying the opposite, classifying, arranging.

e) Assessing

Making considerations and decisions based on knowledge, experience, skills and values as well as presenting arguments.

Thinking language: I can make considerations and decisions.

Keywords: Checking, considering, testing, making decisions, making hypotheses.

f) Creating

Generating ideas, products or methods creatively and innovatively.

Thinking language: I can think of ideas and new methods in information usage.

Keywords: Designing, creating, planning, developing, producing.

Originally, Bloom Taxonomy was created as a tool for educators to identify the target of a direction (Bloom et al., 1956; Anderson et al., 2001). Nevertheless, Bloom Taxonomy can also be used as a tool to enhance the self-reflection level

and learning (Crowe, Dirks & Wenderoth, 2008).

Thinking and Creative Skills (KBKRE)

According to Kamus Dewan, creative means the ability to create, produce and develop a new and original idea (Kamus Dewan, Fourth Edition). In terms of abstract, creativity means the generation of ideas. The ability to generate new ideas or combine existing ideas is known as the creative process. Creative thinking can also be defined as analysing skills and producing ideas that are original and generative. Ideas are formed from existing inspiration, which are then combined and digested. Creative thinking encompasses ten strategies which are generating ideas, relating, inferencing, foreseeing, generalising, making mental images, synthesising ideas, hypothesising, making analogies and creating. Nevertheless, if examined closely in the terms of critical thinking, there are activities that involve the creativity function (Bailin, 1993; Bailin, Case, Coombs & Daniels, 1999; Ennis, 1987; Halpern, 1998; Paul & Elder, 2012). Paul and Elder (2012) placed creativity as one of the components of critical thinking apart from analytics and evaluatives, which is creative in improving the finished assessment critically. Meanwhile according to KPM in the Form 2 Science DKSP, the creative thinking skill is one's ability to produce or create something new and meaningful by using their imagination and out-of-the-box thinking.

Creative Thinking Skill Theory

According to Yamamoto (1967), there are three perspectives for creative thinking, which are natural power, rationalism and mind development. The perspective of natural power involves traditional views, that humans are born with creative

thinking and this group needs practice to be creative. Meanwhile the second perspective is rationalism, that the creative process is the product of universal principle. This view believes that all activities in the world complement each other. Human creative thinking is explained genetically, that the natural ability of humans is inherited once they are born (Simon, 1983). The third perspective is the mind development Gowan (1979) studied the development theories of Piaget and Freud, and he found that an individual's creative thinking develops simultaneously with maturity. This view is supported by Torrance (1987), who visualised creative thinking as one of the "peaks" of an individual's development. Creative thinking skill is defined as one's ability to use their mind to produce new ideas in their own ways. These new creative ideas are produced through inspirations or combinations of existing ideas. This skill is crucial in teaching and learning (PdP) as it can help students to digest and produce original ideas that are generative. The ability to solidify thinking can help students to understand and particularize a learned concept.

a. Generating Ideas

The process of generating ideas, views or opinions spontaneously. This skill is used when students want to seek for new and alternative ideas.

b. Inferencing

The behaviour of the mind in making early conclusions or assumptions from signal- or sign-based resources to gain implied information. These early conclusions can be true or false, as the ultimate conclusions can only be known based on observed information. This skill is used when students want to plan to act or make

decisions, as well as analysing reasons and causes of a decision.

c. Foreseeing

This skill allows students to make predictions towards matters or events that will happen based on certain information. The foreseeing activities happen when students want to take suitable actions on future events and seek solutions for problems.

d. Hypothesising

A process to produce statements that are considered true in general based on inferences that explain an event.

e. Synthesising

A process of synthesis, integrating, combining and uniting ideas.

f. Generalizing

Making general statements based on gained information based on observations towards the group.

g. Making analogies

Making statements, figuratives or similarities to visualize a matter by comparing it with others.

This element of creative thinking skill has to be nurtured in each student to form and spark creative ideas.

Hypotheses Development

Relationship between KBAT and KBKRE

According to McMillan (2015), creative thinking encompasses the ability of being sensitive to problems, able to generate original ideas and redefine them. Therefore, the essence of teaching has to involve problem solving, making decisions, creative thinking and critical thinking to nurture the thinking skills (Baysal, Arkanb& Yildirim, 2010). The

creative nature is a component in the development of science and technology (Sullivan, 2017). Thus, the skills of thinking and taking action creatively are vital for people nowadays. It is hoped that the future generation can practise the knowledge learned creatively so that they can maintain their productivity and are able to fit into the ever challenging world (Ott & Pozzi, 2010). This shows that an individual should think creatively and critically when faced with problems.

Nevertheless, the PdP process of the Science subject in Malaysia focuses more on memorising the facts by practice (Rashimah, 2012). This has caused a majority of students to do less critical and creative thinking during PdP, as they are busier in finding the correct answers. Teachers have to take over the task of thinking, a number of teachers are prone to give out answers without showing the ways to solve the problems (Cai & Lester, 2010). The thinking creatively and critically practice is considered as extra activities during learning (Henriksen, Richardson & Mehta, 2017) and teachers are more focused on finishing the education syllabus dan encouraging students to achieve excellent results in tests (Rashimah, 2012), simultaneously contributing to the lack of creativity in PdP. The examination-oriented education system in Malaysia requires teachers to finish the education syllabus within certain timeframes (Rashimah, 2012). Teachers prioritise finishing off the syllabus, causing the students' creativity during learning the Science subject remains low (Siti Hajar, 2008). Nonetheless, the application of higher level thinking skills, critically and creatively need to be instilled during learning. A study done by Sperry (1970) found that the left brain stimulates an individual to think critically while the right brain stimulates creative thinking. In

truth, the potential of both sides of the brain needs to be developed equally through activities that stimulate thinking skills critically and creatively (KBKK) (Anuar, Hassan & Abiddin, 2012). This shows the connectivity of critical and creative thinking in increasing one's KBAT level.

H1: There is a significant relationship between KBAT and KBKRE

Methodology

A purposive sample of data was obtained from Form 1 students at a daily secondary school in Selangor after receiving cooperation from the school administration. Moreover, this school has the quality prescribed which is most students have intermediate academic achievement in general. The selection of respondents are based on; 1) students who are in Form 1, fit the mid-teenager category, 2) respondents come from families with middle level of socioeconomic background, 3) academic achievement of respondents are at the intermediate level, in the 2.41-3.60 level and the mean score in the pre-tests ran based on five questionnaires.

In this study, Partial Least Square-Structural Equation Modelling (PLS-SEM) was used for data analysis. The PLS-SEM is a second-generation multivariate data analysis technique that examines the structural model with the primary goal of explaining variance in dependent variables and is thus primarily used in exploratory research. The Smart PLS 3.3 application of PLS-SEM was used in this study to evaluate the hypothesised relationships among the latent constructs within the structural model and to assess the measurement model in terms of reliability and validity (Hair et al., 2017).

Instrument

The IKBAT-SAINS inventory was developed based on the six cognitive domains of the Bloom Anderson Taxonomy theory, to measure the KBAT level of the Science subject. Anderson and Krathwohl (2001) showed six strategies which were modified from the Bloom Taxonomy which are memorising, comprehending, applying, analysing, assessing and creating. Based on the elements contained in the Anderson Taxonomy, thus IKBAT-SAINS was developed to measure the KBAT level of respondents. IKBAT-SAINS contains 36 items to measure six subscales which are memorising (6 items), applying (6 items), analysing (6 items), assessing (6 items) and creating (6 items). Every item was measured using the 5-point Likert scale (highly agree to highly disagree). Respondents are required to answer all of the questionnaires and respond by marking the scale that is accurate to their views. Respondents will mark the number 5 scale if they highly agree with the statement. Every item is measured using the 5-point Likert scale (highly agree to highly disagree). The credibility scale shows that IKBAT-SAINS has a great inner consistency. This is due to the credibility scale of each subscale is; Memorising $\alpha = .863$, Comprehending $\alpha = .741$, Applying $\alpha = .820$, Analysing $\alpha = .816$, Assessing $\alpha = .870$ and Creating $\alpha = .789$. Generally, the value of $\alpha = .943$ proves that IKBAT-SAINS is acceptable and trusted to be used in the study.

On the other hand, IKBKre uses the theory framework introduced by the **Center of Curriculum Development (2001)**. The subscales selected were generating ideas, foreseeing and hypothesising. The function of IKBKre is to measure the level of KBKre in students for the Science subject.

A total of 18 items were divided equally between the three subscales. Every item is measured by using the 5-point Likert scale (highly agree to highly disagree). The result of the credibility test shows that IKBKre has an excellent inner consistency. This is due to the credibility value for each subscales is; Generating Ideas (ME) $\alpha = .834$, Foreseeing (MR) $\alpha = .841$ and Hypothesising (MH) $\alpha = .820$. In general, the value of $\alpha = .917$ proves that IKBKre can be accepted and trusted to be used in the study.

Findings

Measurement and Structural Model Assessment

Convergent and discriminant validity, as well as composite reliability, were used to evaluate the measurement model. All of the quality criteria were met for this measurement model, as shown in Table 1,

because all factor loadings (> 0.60), Cronbach's alpha (> 0.70), composite reliability (CR) (0.70), and average variance extracted (AVE) values (0.50) were above the recommended threshold (Hair et al., 2017). The outer loading matrix was examined and the discriminant validity was tested using Fornell and Larcker's (1981) criterion. All square roots of AVE had greater values than the inter-construct correlations for the examined constructs, and all indicators loaded higher on their construct than all others, ensuring the model's external coherence, as shown in Table 2. The structural model was analysed in terms of the collinearity diagnostic, coefficients of determination (R^2), effect size (f^2), and relevance and importance of the model paths after the basic quality criteria for the measurement model were met. Figure 1 displays the appropriate outcomes.

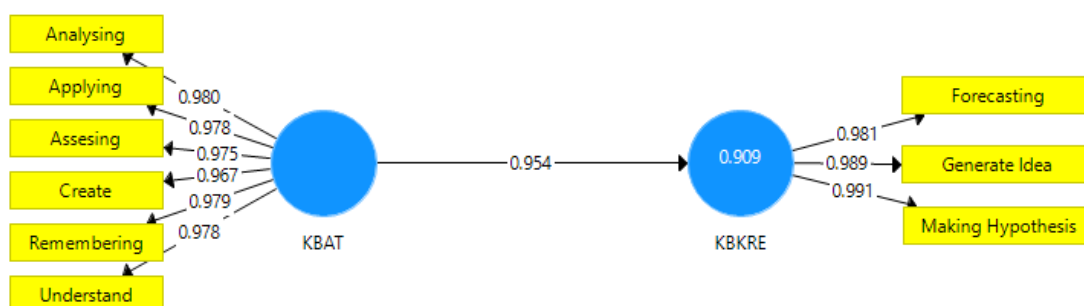


Figure 1. Measurement Model

Table 1. Internal Consistency, Convergent Validity, Composite Reliability, and AVE

Latent Variable	Indicator	Convergent Validity		Internal Consistency	
		Loading (> 0.60)	AVE (> 0.50)	Composite Reliability (> 0.70)	Cronbach's Alpha (> 0.70)
KBAT	Analysing	0.980	0.953	0.992	0.990
	Applying	0.978			
	Assessing	0.975			
	Create	0.967			
	Remembering	0.979			
	Understand	0.978			
KBKRE	Forecasting	0.981	0.974	0.991	0.987
	Generate Idea	0.989			
	Making Hypothesis	0.991			

The R squared (R^2) coefficients of endogenous constructs were assessed to determine the structural model's predictive value. As can be seen in Figure 1, all the considered KBKRE was able to explain of the variance in the KBAT ($R^2 = 0.909$). In terms of effect size (f^2), the difference in the R^2 of the interest variable related to endogenous constructs when it is removed from the model (Hair et al., 2017) was found to represent a large effect of the KBAT on KBKRE.

Table 2. Discriminant Validity

	KBAT	KBKRE
KBAT	0.976	
KBKRE	0.954	0.987

Testing Research Hypotheses

The path coefficients, t-statistics, and their bias-corrected confidence intervals, computed by a bootstrapping process with 5000 resamples, were examined within the structural model to assess the relevance and significance of the interest direct effects. The results of the SEM as shown in Table 3 provide support for Hypotheses 1. According to Hair et al (2017), the significant level is when the p value is below 0.05 and t value of more than 1.64. From the result, it was found that KBAT has a significant influence on the KBKRE (t value = 89.666, p = 0.00). Thus, H1, hypothesis was supported.

Table 3. Structural Model Assessment (Direct Effect Result)

	Beta	S.D	T Value	P Values	Result
H1: KBAT → KBKRE	0.954	0.011	89.666	0.00	Supported

Discussion

The skills of thinking and taking action creatively are very vital among people nowadays. The teaching nature has to include problem solving, making decisions, creative thinking and critical thinking to nurture the thinking skills. (Baysal, Arkanb& Yildirim, 2010). This shows that an individual should think creatively and critically when faced with problems. The examination-oriented education system in Malaysia requires teachers to finish the education syllabus within certain timeframes (Rashimah, 2012). Teachers prioritise finishing off the syllabus, causing the students' creativity

during learning the Science subject remains low (Siti Hajar, 2008). Nonetheless, the application of higher level of thinking skills, critically and creatively have to be instilled during the learning process. A study done by Sperry (1970) found that the left brain stimulates an individual to think critically while the right brain stimulates creative thinking. In truth, the potential of both sides of the brain needs to be developed equally through activities that stimulate KBKK (Sang, 2004). This shows the connectivity of critical and creative thinking in increasing one's KBAT level. It is hoped that the future generation can practise the

knowledge learned creatively so that they can maintain their productivity and are able to fit into the ever-challenging world (Ott & Pozzi, 2010).

Conclusions

This study focuses on thinking skills and creativity. Solid thinking skills and creativity play an active role in producing innovative students. The importance of transformation in the education system is undeniable. Therefore, many efforts have been planned and implemented so that the country can produce a generation that is skilled, educated and competitive at a global level. KBAT is emphasised as the current education development demands the ability. In truth, KBAT encourages one to solidify the skills of thinking critically, creatively and remain positive. To assess the KBAT level of students, the researcher has developed 2 inventories which are KBAT-SAINS Inventory (IKBAT-SAINS), and Creative Thinking Skills Inventory (IKBKre) to assess the KBAT level and the creative thinking skills. These two inventories contribute to the benchmark in counseling, which is useful for counselors to identify the students' thinking levels, subsequently solving the youths' academic problems at the root level. This is due to the study being focused on Form 1 students. Next, the study tries to shape students that are not only memorising but are able to understand the subjects learned by assessing, applying, analysing and creating. This module tries to shape students' characteristics as people that are noble, possess high personality and contribute to their families, the public and the country.

This research studies the relationship between KBAT and KBKRE. The respondents were selected among the Form 1 students from schools in a district

located in Selangor. All of the schools possess the same qualities such as school environment, with middle family income or socioeconomic (SES) and intermediate academic achievement in the Primary School Achievement Test (UPSR). Next, the selected respondents were students who achieved middle to low scores based on the higher-level thinking skills (KBAT) and KBKRE mean. The selected schools were normal daily schools with middle to low achievement levels. The validity and credibility of the research depends on the honesty level of the respondents in answering the questionnaire, to receive accurate and precise results. The validity and credibility are crucial to gain a very solid result that cannot be contested. Besides that, respondents are given a guarantee that all responses given during the study are confidential and will not be revealed to the public. Therefore, an "informed consent" form is prepared for them as soon as the first session is held. The purpose of it is to convince the respondents of the seriousness of the researcher in keeping and protecting the privacy of the respondents. This causes the study of respondents to be limited as all of the information received will not be revealed to anyone.

Therefore, for the next research, respondents should be selected from the younger group (aged 10 until 13) and older group (aged 18 until 20) to compare on the effects of intervention on students based on their age. Additionally, the scope of respondent selection needs to be expanded by selecting students that have high academic achievement level and come from families with high socioeconomic background. The future researchers are recommended to use different approaches to improve the KBAT and KBKRE aspects by focusing on the relationship of self-concept such as centralized capital,

transactional analysis therapy and gestalt. Other than that, the future research needs to include feedback from students and facilitators, apart from taking respondents' ideas into consideration. This is important as the perspective of the ones teaching, and the ones learning can be analysed so that a two-way communication can be practiced.

References

- Abd Rahim, R. A. (2000). The Conflict of Traditionalism and Reformism in Malaya (1900-1940): A Study of Socio-Political Impact. *Jurnal Syariah*, 8(2), 75-88.
- Abdul Halim Abdullah, Nur Liyana Zainal Abidin & Marlina Ali (2015). Analysis of Students' Errors in Solving Higher Order Thinking Skills (HOTS) Problems for the Topic of Fraction. *Asian Social Science*, 11(21), 133-142.
- Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman,.
- Anuar, N. A. A. K., Hassan, A., & Abiddin, N. Z. (2012). The Philosophy across Disciplines based on the Nature of Specific Knowledge. *Philosophy*, 2(1).
- Arshad, A. Y. M., & Yasin, R. M. (2015). Higher-Order Thinking Skills Among Students in Solving Problem for Science Subject (81-96). *Evaluation Studies in Social Sciences*, 4(1), 81-96.
- Bailin, S. (1993). Drama as experience: A critical view. *Canadian Journal of Education/Revue canadienne de l'éducation*, 95-105.
- Bailin, S., Case, R., Coombs, J. R., & Daniels, L. B. (1999). Conceptualizing critical thinking. *Journal of curriculum studies*, 31(3), 285-302.
- Baysal, Z. N., Arkan, K., & Yıldırım, A. (2010). Preservice elementary teachers' perceptions of their self-efficacy in teaching thinking skills. *Procedia-Social and Behavioral Sciences*, 2(2), 4250-4254.
- Bloom, B. S. (1956). Taxonomy of educational objectives. Vol. 1: Cognitive domain. *New York: McKay*, 20(24), 1.
- Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). Handbook I: cognitive domain. *New York: David McKay*.
- Briggs, L. J., & Wager, W. W. (1981). *Handbook of procedures for the design of instruction*. Educational Technology.
- Cai, J., & Lester, F. (2010). Why is teaching with problem solving important to student learning. *National council of teachers of mathematics*, 13(12), 1-6.
- Chick, H., & Stacey, K. (2013). Teachers of Mathematics As Problem Solving Applied Mathematicians. *Canadian Journal of Science, Mathematics and Technology Education*, 122-135.
- Crowe, A., Dirks, C., & Wenderoth, M. P. (2008). Biology in bloom: implementing Bloom's taxonomy to enhance student learning in biology. *CBE—Life Sciences Education*, 7(4), 368-381.
- Dahalan, S. C., Ahmad, A. R., & Awang, M. M. (2020). The effectiveness of the 21st century teaching history module (21-Cthm) towards high order thinking skills. *International Journal of Innovation, Creativity and Change*, 12(11), 106-120.
- Ennis, R. H. (1987). Critical thinking and the curriculum. *Thinking skills instruction: Concepts and techniques*, 40-48.

- Ennis, R. H. (1993). Critical thinking assessment. *Theory into practice*, 32(3), 179-186.
- Farah Aziana Abdul Aziz &Fadzilah Abd Rahman. (2018). Sorotankajiankesediaan dan keperluan guru Bahasa MelayudalampelaksanaankemahiranBerfikirarastinggi (KBAT) di bilikdarjah. *PENDETA Journal of Malay Language, Education and Literature*, 9, 80-101
- Forehand, M. (2010). Bloom's taxonomy. *Emerging perspectives on learning, teaching, and technology*, 41(4), 47-56.
- Gagné, F. (1985). Giftedness and talent: Reexamining a reexamination of the definitions. *Gifted child quarterly*, 29(3), 103-112.
- Glaser, R., & Resnick, L. (1991). *National research center on student learning*. ERIC Clearinghouse.
- Gowan, J. C. (1979). The production of creativity through right hemisphere imagery. *The Journal of Creative Behavior*.
- Hair Jr, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2017). *Advanced issues in partial least squares structural equation modeling*. saGe publications.
- Haladyna, T. M. (1997). *Writing Test Items to Evaluate Higher Order Thinking*. Allyn& Bacon, 160 Gould Street, Needham Heights, MA 02194-2310.
- Halpern, D. F. (1998). Teaching critical thinking for transfer across domains: Disposition, skills, structure training, and metacognitive monitoring. *American psychologist*, 53(4), 449.
- Henriksen, D., Richardson, C., & Mehta, R. (2017). Design thinking: A creative approach to educational problems of practice. *Thinking skills and Creativity*, 26, 140-153.
- Heong, Y.M., Yunos, J.M., Othman, W., Hassan, R., Kiong, T.T., & Mohamad, M.M. (2012). the needs analysis of learning higher order thinking skills for generating ideas. *Procedia-Social and Behavioral Sciences* Holyoak, K. J., & Morrison, R. G. (Eds.). (2012). *The Oxford handbook of thinking and reasoning*. Oxford University Press.
- Howe, R. W., & Warren, C. R. (1989). *Teaching critical thinking through environmental education*. ERIC Clearinghouse.
- Huberty, C. J., & Davis, E. J. (1998). Evaluation of a State Critical Thinking Skills Training Program. *Studies in Educational Evaluation*, 24(1), 45-69.
- Kauchak, D. P., & Eggen, P. D. (1998). *Learning and teaching: Research-based methods*
- Kerka, S. (1986). Interactive Video in Vocational Education. Overview. ERIC Digest No. 51.
- King, A. (1994). Guiding knowledge construction in the classroom: Effects of teaching children how to question and how to explain. *American educational research journal*, 31(2), 338-368.
- Malaysian Ministry of Education (MOE). (2013). *Pelan Pembangunan Pendidikan Malaysia 2013-2025 (Pendidikan Prasekolah hingga Lepas Menengah)*. Putrajaya: Kementerian Pendidikan Malaysia
- Malaysian Ministry of Education (MOE). (2018). *Kad Pelaporan Pencapaian Malaysia dalam PISA*
- Malaysian Ministry of Education (MOE) (2014). *Kemahiran Berfikir Aras Tinggi Aplikasi Di Sekolah. Bahagian Pembangunan Kurikulum*.

Malaysian Ministry of Education (MOE) (2016). Laporan TIMSS 2015. Putrajaya: Bahagian Perancangan dan Penyelidikan Dasar Pendidikan, Kementerian Pendidikan Malaysia.

Martin, M. O., Mullis, I. V., & Chrostowski, S. J. (2004). *TIMSS 2003 Technical Report: Findings from IEA's Trends in International Mathematics and Science Study at the Fourth and Eighth Grades*. International Association for the Evaluation of Educational Achievement. Herengracht 487, Amsterdam, 1017 BT, The Netherlands.

Martin, M. O., Mullis, I. V., Gregory, K. D., Hoyle, C., & Shen, C. (2000). *Effective schools in science and mathematics: IEA's Third International Mathematics and Science Study*. TIMSS International Study Center, Boston College.

Martin, M., Mullis, I., & Foy, P. (2008). TIMSS 2007. *International Science Report. TIMSS&PIRLS International Study Center, Boston College*.

Marzano, R. J. (1988). *Dimensions of thinking: A framework for curriculum and instruction*. The Association for Supervision and Curriculum Development, 125 N. West St., Alexandria, VA 22314-2798.

McMillan, J. (2015). Creative thinking and teaching. *Musicworks: Journal of the Australian Council of Orff Schulwerk*, 20, 11-20.

Mullis, I. V., Martin, M. O., Foy, P., & Arora, A. (2012). *TIMSS 2011 international results in mathematics*. International Association for the Evaluation of Educational Achievement. Herengracht 487, Amsterdam, 1017 BT, The Netherlands.

Nursafra Mohd Zhaffar, Mohd Isa Hamzah & Khadijah Abdul Razak.

(2017).

Elemen pemikiran kritis dalam konteks skema hiran berfikir arastinggi. ASEAN Comparative Education Research Journal on Islam and Civilization (ACER-J), 1(2), 92-101

Ott, M. and Pozzi, F., 2010. Towards a model to evaluate creativity-oriented learning activities.

Paul, R., & Elder, L. (2012). Critical Thinking: Competency Standards Essential to the Cultivation of Intellectual Skills, Part 5. *Journal of Developmental Education*, 36(1), 30-31.

Procedia – Social and Behavioral Sciences, 2 (2), 3532–3536

Ramli, S., Ghani, M. T. A., Atoh, N., & Romli, T. R. M. (2019). Integrasi elemen kemahiran berfikir arastinggi (KBAT) berasaskan kit media dalam amalan pembelajaran dan pemudahcaraan guru pelatih bahasa arab. *International Journal of Language Education and Applied Linguistics*, 33-44.

Rashimah, A. K. (2012). Tahap Kreativiti dan Penyelesaian Masalah Fizik Pelajar Tingkatan Empat di Daerah Johor Bahru.

Reddy, V., Janse van Rensburg, D., Van der Berg, S., & Taylor, S. (2012). Educational outcomes: Pathways and performance in South African high schools. *South African Journal of Science*, 108(3), 1-8.

Rosnani, H., & Suhaila, H. (2003). Implication for educational theory and practice. *The Teaching of Thinking in Malaysia*. Kuala Lumpur: Research Centre International Islamic University Malaysia.

Simon, H. A. (1983). Discovery, invention, and development: human creative thinking. *Proceedings of the*

National Academy of Sciences of the United States of America, 80(14), 4569.

Siowck-Lee, G. (1995). Multimedia environmental education courseware for promoting cooperative learning and higher-order thinking skills. In *National Curriculum Seminar, Port Dickson, Malaysia*.

Siti Hajar (2008). *Students' production of English sibilant phonemes (a case study of Fakultas Keguruan dan Ilmu Pendidikan of Universitas Muhammadiyah Parepare)* (Doctoral dissertation, Universitas Hasanuddin).

Sperry, R. W. (1970). Perception in the absence of the neocortical commissures. *Perception and its Disorders*, 48, 123-138.

Sullivan, F. R. (2017). The creative nature of robotics activity: Design and problem solving. In *Robotics in STEM Education* (pp. 213-230). Springer, Cham.

Torrance, E. P. (1987). Teaching for creativity. *Frontiers of creativity research: Beyond the basics*, 189, 215.

Weiner, B. (1985). "Spontaneous" causal thinking. *Psychological bulletin*, 97(1), 74.

Yahya, A. A., Toukal, Z., & Osman, A. (2012). Bloom's Taxonomy-based classification for item bank questions using support vector machines. In *Modern advances in intelligent systems and tools* (pp. 135-140). Springer, Berlin, Heidelberg.

Yamamoto, K. (1967). Creativity and unpredictability in school achievement. *The Journal of Educational Research*, 60(7), 321-325.