

# **Teachers' Implementation of the i-think Program in the ESL Classroom: A Case Study**

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## **Abstract**

*The Malaysian education system has taken on a huge transformational progress with regard to the development of thinking skills in schools. The i-Think program which was introduced in schools consists of eight cognitive teaching tools that teachers can use to mediate students' thinking, learning, and promote metacognitive behaviours in their lessons. This case-study was conducted in a secondary school which was one of the pioneer schools selected by the Ministry of Education to implement the i-Think program in the teaching and learning of subjects including English language. Data were obtained through observations of the implementation of the i-Think program in a form two classroom using an observation protocol and field notes as well as through interviews with five English language teachers. The findings indicated that the teachers did implement the i-Think program in their English language lessons and they also acknowledged the importance of the i-Think program in assisting them to teach higher order thinking to their students. However, the teachers implemented the Thinking Maps only in their writing and literature classes. The teachers also stated that they required more training in using the Thinking Maps with weak students.*

**Key words:** i-Think program, Thinking skills, cognitive skills, English language, teaching tools.

## Introduction

The Malaysian education system is undergoing a transformational process in its education system by providing learning environments and opportunities that are essential in preparing all students for the challenges of work, life, and citizenship in the 21st century and beyond. Students need to employ skills and strategies that go beyond the boundaries of subject knowledge and as such teachers would have to focus on teaching cognitive skills and strategies that would allow the students to become thinking individuals. Based on a research conducted by ZabaniDarus (2012), findings showed that 60% of Malaysian students fail to reach the minimum level of competency to participate effectively and productively in life. The results also revealed that students were knowledgeable but cannot apply their knowledge. Apart from that, in a research on assessing thinking skills among secondary students conducted by UNESCO (MoE, 2011) revealed that teachers tend to teach for the exam, that is, they focus their teaching based on what their students would be tested in high stakes examination such as the Lower Secondary Assessment (PenilaianMenengahRendah) and the Secondary School Certificate (SijilPenilaianMenengah). The findings from the research (MoE, 2011) also revealed that Higher Order Thinking Skills (HOTS) among both teachers and students in Malaysia are at a low level.

The Pelan Pembangunan Pendidikan Malaysia (Malaysian Education Development Plan) 2013-2025 emphasizes the concept of high level thinking skills (HOTS) which is capable of producing the next generation to have critical and creative thinking skills. As such, one of the ways of providing opportunities for students to become thinking individuals is through the i-Think Program introduced by the Ministry of Education ((Malaysia Education Blueprint, 2013) whereby thinking maps are used as tools for learning. The i-Think Program is an effort to help create a new culture of thinking in schools by fostering HOTS, nurturing a culture of lifelong learning, skilled in solving problems and working to generate creative solutions among school children. The implementation of the i-Think program is a continuation of the efforts to realize the government's intention, as presented through the National Key Result Areas (NKRA) for education under the Government Transformation Programme (GTP). The government through the 2013 budget focuses on education for emphasis on the needs of higher-order thinking skills among school students.

The i-Think program is adopted by the Ministry of Education to produce the next generation of innovators with the ability to include some elements of thinking skills which includes critical, creative, innovative and analytical skills in preparation to adapt and cope with the challenges of the future (MuhamadSidek Said, 2011). Besides that, the Ministry of Education has also revamped the national examination's format whereby 40 per cent of HOTS questions are included in the UjianPenilaianSekolahRendah (Primary School Assessment Test) and 50 percent in the SijilPelajaran Malaysia (Malaysian Certificate Of

Education) by 2016. To ensure successful implementation, teachers were sent to attend short courses on the i-Think program conducted by the Malaysian Innovation Agency, to enable them to master the HOTS techniques (MoE, 2011). Datuk Dr Amin Senin, the Deputy Director General of Education (2013) hoped that teachers will encourage students to ask many questions and let them explore the curiosity to learn something and then relate it to their own lives. The successful implementation of the program will be assessed from the results of the students, especially how students answer the HOTS questions in the examinations. But the issue is to what extent have the English language teachers performed this task? How have the teachers implemented the HOTS in their English language lessons? Thus this study investigated the English language teachers' implementation of the i-Think program in the teaching and learning of English language in their English as a Second Language (ESL) classrooms.

### **i-THINK PROGRAM IN MALAYSIA**

The i-Think program involves teachers having to use thinking maps as a tool in their lessons which hopes to promote higher order thinking skills in their students both in Primary and Secondary schools throughout the country. The i-Think program has three main objectives:

- i. Nurture and develop innovative human capital
- ii. Increase thinking skills amongst children
- iii. Equip future generations with HOTS

The i-Think or Thinking Maps program consists of eight maps that correspond with fundamental thinking processes. The Circle Map is used for defining in context; the Bubble Map, describing with adjectives; the Flow Map, sequencing and ordering; the Brace Map, identifying part/whole relationships; the Tree Map, classifying/grouping; the Double Bubble Map, comparing and contrasting; the Multi-Flow Map, analyzing causes and effects; and the Bridge Map, seeing analogies. These maps are a common visual language for students in all subject areas (Hyerle, 2000). Hyerle (2000) believes that thinking maps are visual teaching tools that provide students with the skills to be successful thinkers, problem solvers, and decision makers.

Teachers were trained under Malaysia's National Innovation Agency, a key government agency reinventing the country's schools. The Ministry of Education hopes that all 10,000 schools would implement the i-Think program by 2014 (New Straits Times, 2012). The program is part of the national education transformation plan to create a thinking and creative younger generation with the view of the students being innovative, analytical, able to adapt to crisis, throw ideas, think out-of-the-box and able to solve problems. In accordance with this plan, the skills will be incorporated into the modules at the teacher training institutes

to prepare new teachers to handle the programme (Nooraini Othman & Khairul Azmi Mohamad, 2014).

## LITERATURE REVIEW

Thinking skills is a discipline that can be learned and practiced so that it can form a habit or experience (Maimunah, 2004). Thinking exercise allows people to be less confused or make fewer mistakes (Isaac, 2000). Mohd Azhar (2007) defines the need of thinking as to achieve something in order to produce creative thinking, critical thinking, problem solving and decision making. This means that thinking is a process of preparation and use of information and knowledge.

The process of thinking involves some thinking activities associated with the desire to achieve the goal of either problem solving or decision making. Moseley et al. (2005, p.24). define thinking skills approaches as those which focus on 'self-aware goal-directed thinking, in which there is strategic management of attention and working memory, supported by various "habits of mind", including critical reflection' Thinking wisely is the highest quality of professionalism which should be a trait in all effective teachers in order for them to regulate high level of thinking in their students.

Assignments or course work given to students should be more complex and challenging so that students would be able to solve any problems by using higher order thinking skills (Kuh, 2001). Most students do not have a high level of skills (Weimer, 2003) and as such, higher-order thinking skills must be implicated in the curriculum and syllabus so that students have the opportunity to practice higher order thinking skills and this is actually associated with the i-Think program to be implemented in the English language lessons. The i-Think program consists of eight visual tools, each surrounded by a visual frame of reference and they work in unison to enable students to communicate what and how they are thinking. Through the eight Thinking maps, students will be able to convey, negotiate, and evolve meanings with other students, and within themselves, through visual patterns of thinking (Hyerle, 1996, 2009). Hyerle (2009) further reiterates that Thinking Maps are really a meta-language for learning, that is, they are an interrelated set of thinking patterns that can be used for communicating and synthesizing students' thinking from across the curriculum. Based on the visual-spatial, non-linguistic form of the tools, the maps can be used fluidly across content areas (Hyerle & Alper, 2014) to intensify students' thinking capacity.

The ultimate goal of implementing Thinking Maps in English language teaching and learning is to engage the students as a community of learners to use the maps as a true language for communication, enhance their higher order thinking and inculcate the problem-solving capacity in their learning of the language (Hyerle & Alper, 2014). Thinking maps provide students with the common engrossment for discussion. The use of thinking maps promotes curiosity, thinking in action and collaboration. They give the students the confidence to embrace complexity and deepen their appreciation for other student's ideas and experiences as they complete the tasks. The meaning of content can emerge or develop only when learning experiences are delivered in the context of thinking (Hyerle & Alper, 2014).

Marzano (2000) explains that thinking and reasoning are essential for content to have value for example, comparing and contrasting, analysing relationships, classifying, and making inductive and deductive conclusions. These thinking processes are precisely what the Thinking Maps model which is why the i-Think program should be implemented in the teaching of English language in the country so that students are able to remember, analyse and synthesize information into meaningful understandings.

### **Theoretical Assumptions that underpin Thinking**

Bloom's Taxonomy is not the only framework for teaching thinking, it is also the most widely used. A committee under the leadership of Dr Benjamin Bloom created the Taxonomy in 1956. Bloom's aim was to promote higher forms of thinking in education, such as analysing and evaluating, rather than just teaching students to remember facts. Literature have shown that HOTS builds on and extends beyond Bloom's Taxonomy, which has resulted in discrete dimensions attributed to it, namely, critical thinking, creative thinking, problem solving, decision making and metacognition, just to name some prominent ones and all these dimensions are present in the cognitive tools of the i-Think program. Zohar (2013, pp. 235) categorised the dimensions of HOTS into four sub-categories which are present in the i-Think program and they are as follows:

- (i) Knowledge of individual thinking strategies
  - making comparisons, formulating justified arguments, drawing valid conclusions, etc.
- (ii) Knowledge of genre of thinking
  - argumentation, inquiry learning, problem solving, critical thinking, scientific thinking, creative thinking, etc.
- (iii) Knowledge of metacognition
  - thinking about own thinking
- (iv) Knowledge of additional issues
  - thinking dispositions (habits of mind), culture of thinking, etc.

Educational psychologists have long promoted the importance of metacognition for regulating and supporting student learning (Lai, 2011). As Kuhn and Dean (2004) explain, metacognition is what enables a student who has been taught a particular strategy in a particular problem context to retrieve and deploy that strategy in a similar but new context. The authors further reiterate that in cognitive psychology, metacognition is often defined as a form of executive control involving monitoring and self-regulation. Lai (2011) reveals that researchers in cognitive psychology have linked metacognition to a number of other constructs, including meta-memory, critical thinking, and motivation. Meta-memory is knowledge about memory processes and contents and is closely related to metacognition, particularly cognitive knowledge.

## Related Previous Studies

The following related studies reveal that the implementation of the Thinking Maps has brought positive transformation in the students' performances and teachers' pedagogical practices.

A study on Thinking Maps and School Effectiveness: A Study of a UK Comprehensive School Thinking Maps was conducted by the school authorities to examine the role of Thinking Maps in the transformation of teacher and pupil effectiveness at St Robert of Newminster Catholic School and Sixth Form College ([www.thinkingfoundation.org](http://www.thinkingfoundation.org)). The Thinking Maps as developed by Hyerle (1996) were introduced in September 2007 to all teachers as a key strategy to develop thinking. The purpose of this strategy was to develop learning dispositions and thinking skills through student deployment of Thinking Maps in their learning. The methodologies used to gather data for the study were classroom observations and document analysis which looked at book samples of Year 7 students' work assessing where Thinking Maps were being used. A questionnaire was also administered to every pupil in Year 7 to assess the impact the maps had on their students' learning. The findings revealed that after implementing the Thinking Maps in the classrooms, pupils spent 77% of their time engaged in higher order thinking skills. The researchers of this study surmised that the implementation of Thinking Maps had facilitated this. The teachers were also asked to compare and contrast their previous and current teaching methodologies since the implementation of Thinking Maps. Based on interviews and observations, the study showed that since the implementation of Thinking Maps, teachers have planned opportunities for pupils to visualise and share their thinking at the higher levels. Findings from the questionnaire indicated that the introduction of Thinking Maps as a tool for teaching and learning has contributed to the increased learner confidence in their own ability and motivation as learners. Furthermore, lesson observations have suggested that pupils participating in Thinking Map activities have improved on-task behaviour. As such, it can be concluded that effective pedagogical practices remain integral to the lesson. The implementation of Thinking Maps has enhanced their effectiveness by developing: a common thinking tool used for the purpose; students' access to a more effective planning tool; the sharing and visualisation of thinking, as well as facilitating higher order thinking skills.

Another study on the use of Thinking Maps was conducted at McKinley School situated in the Franklin-McKinley School District located in San Jose, California ([www.thinkingfoundation.org](http://www.thinkingfoundation.org)). The study revealed that Thinking Maps training and instruction have improved teacher effectiveness resulting in enhancing student academic results, especially English Language Learners. Standardized test scores as well as District Assessments and other qualitative measures were used in the study. Based on an initial analysis of "Classroom Walkthrough" data, it was clearly evident that the teachers in the school were only instructing at the knowledge and comprehension level of Bloom's Taxonomy. At this time, the teachers realized that different tools were needed to improve the effectiveness of their instruction. The study started with the teachers being introduced to the Thinking Maps and were given training in. Based on the training given to teachers on the

implementation of Thinking Maps, their instructions have improved. Teacher effectiveness resulted in enhancing student academic results in the standardised test, especially for the English Language Learners.

The above studies indicate that teachers should possess the necessary knowledge on Thinking Maps and how to implement them in their classrooms. The effectiveness of the implementation would demonstrate positive results in students' performance as they are able to exploit on their thinking capacity to complete the tasks given which inevitably will develop their higher order thinking skills.

## **METHODOLOGY**

The study employed a case study approach as the researcher only focused the study on five English language teachers in a school and observed one of the English language teacher and her students in real-life classroom setting. The teacher is a Teaching of English as a Second Language (TESL) trained teacher with eight years' experience in teaching English language. Data were obtained through observations and structured interviews and field notes.

### **Research Questions**

The following research questions were addressed in the study:

1. How are the thinking maps in the i-Think program implemented in the English language lessons?
2. How do English language teachers perceive the importance of implementing the i-Think program in their lessons?

### **Research Design**

This study employed a qualitative research design as the goal of the study was to explore and describe the teachers' implementation of the i-Think program in their English language lessons. Analysis of data from the observation field notes, interviews, and the researcher's personal reflections allowed for a thick description of the teachers' implementation of the i-Think program in their English language lessons.

The school chosen for the study is one of the pioneer schools selected by the Ministry of Education to implement the i-Think program in the teaching and learning, thus the English language teachers in the school were selected to take part in the study. Hence, the study involved only five English language teachers. Data were collected through the use of

observation protocols, structured interviews and field notes. Based on the six observations done on one particular English language teacher, data was analysed by identifying how the teacher implemented the i-Think program in her lessons. Based on the six observations of the teacher's lessons, a pattern of how the teacher teaches using thinking maps in her lessons is perceived and established. This pattern is presented in the form of a flow chart for discussion.

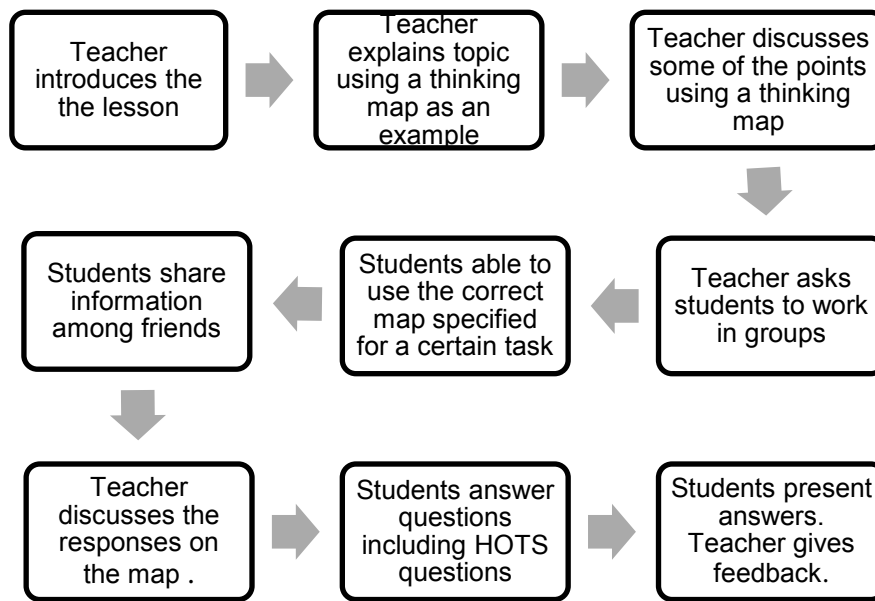
For the structured interview that was done on the five English language teachers, the interviewees' responses were recorded in writing directly on the copy of the interview guide. The important responses in the form of excerpts were extracted from the interview guide to represent the findings to the research questions.

## RESULTS AND DISCUSSION

The first research question involved exploring the utilisation of thinking maps in the i-Think program in English language lessons whereby the analysis of findings is presented in the form of a flow chart which depicted an English language teacher's implementation of the i-Think program in her English language lessons. The findings for this research question were derived from the researcher's observation of an English language teacher's implementation of the i-Think program in her English language lessons by using an observation protocol. The qualitative data based on six observations done of the teacher's implementation of the i-Think program is summarised in the chart below.

Figure 1: Flow chart of the Implementation of i-Think Thinking Map in a Form Two English language lesson.





The English languageteacher's (Teacher A) lessons took place four times a week. Teaching a form two classroom, Teacher A implements the i-Think program thinking maps in most of her English language writing and literature lessons. In all her lessons, Teacher A would start her lesson by introducing the topic for the day to her students. Then the teacher would show a thinking map to the students and explain the content of the lesson through the thinking map. This would be her input or explanation stage. During the explanation stage, the teacher would use thinking maps as an example to highlight the learning points for the day. An example would be using a circle map to describe the traits of the protagonist in the short story.

For the practice stage, teacher A divided the students into groups of five and each group were given a task of preparing a circle map on other characters in the story. After the students have completed the task, they volunteered to present their circle maps to their classmates. This was followed with a discussion between the teacher and the students. After the discussion, students were instructed to answer a few questions written on the board by the teacher. Finally, the teacher selected students randomly to answer the questions and teacher gave feedback when necessary.

During the observations, the researcher found that when the teacher used the thinking maps as a reference to explain the content of the topic with examples, students were able to understand the topic and this was evident when they used the thinking maps in presenting the task given to them. The thinking maps allowed opportunities for them to generate ideas as well as justify their answers. Although the students took some time to discuss and complete the maps they were involved in the thinking process of generating ideas.

Interview data with the teacher supported her implementation of the i-Think program thinking maps in her English language lessons. The first interview question, which was her selection of i-Think map to use with her students in her English language lessons, indicated that her choice was based on the topic and learning outcome. She stated that normally she

would ask her students to complete worksheets after teaching but currently, she decided to use the thinking maps to get students involved in the learning. She offered the following comments:

TA : ... it depends on the topic and the learning outcome. For example, the learning outcome is for them to understand characteristics of the characters in the story so I chose the circle map and also the double bubble map. Last time, I would use worksheets but after we were told to implement i-Think program in our lessons, I use it... so teach students to think.

The interview revealed the teacher's view on whether the thinking maps helped her students to learn the topics taught. The teacher was optimistic that some form of learning had taken place based on the students' presentation and responses to the questions posed to them. Her comment is as follows:

TA : Yes, I think the maps helped in some ways...they are just getting used to the maps. You can see in their presentations that they can complete the map with my help of course...they can answer the questions on the board.

Findings from both the observations and interview with the teacher revealed that the teacher saw the benefits of exploiting thinking maps in her lessons especially so in the generation of ideas in their essay writing and understanding the literary elements as well as assisted students in gaining confidence in using the language.

Pertaining to the teachers' perceptions of the implementation of i-Think program in the English language lessons, the interview data embraced the following themes:

- i. their understanding of i-Think program;
- ii. implementation of thinking maps in lessons;
- iii. effectiveness of the i-Think program in lessons

The teachers' understanding of the i-Think program was important so that they could offer their views with regard to the implementation of the i-Think program in the English language lessons. All the five teachers revealed that they had attended training on the i-Think program and have implemented the program in their English language classrooms.

TA : Yes, I do have knowledge about the eight thinking maps. I attended a course at Ministry level and school level. I think the courses are important so that I know how to teach my students using the thinking maps.

The teachers also gave their views on the regularity of utilising the thinking maps in their lessons and voiced their reservations about implementing the thinking maps in all their English language lessons. They made the following comments:

TD : It takes time for my students to complete the maps so I don't use it very often...sometimes once or twice a week. I use it mostly

for my writing lessons and sometimes for my literature lessons. They can generate ideas using the double bubble map and flow map.

Although the teachers implemented the i-Think program in their lessons and found it to be an effective tool, however, they teachers also felt that they need more courses on how to use the maps in a variety of topics and for students of different proficiency levels.

TB : Well, the thinking maps can be an effective tool to teach English to my students because the discussion helps them to generate ideas and also make them speak in the language...but I think I need more knowledge on how to use it for different topics in the syllabus and with different sets of students...that would be good...more effective.

The teachers also commented that there seemed to be a positive development in their students' English language performance after they utilised the thinking maps with their students. The students were able to generate and organise their ideas and seemed to portray more confidence in using the language.

TB : It's useful for writing essays...for example, they can write their own ideas and organise the ideas...they can use circle maps. So their essay writing has improved and they are more confident to use the language when they discuss their topic.

The findings showed that the teachers have relevant knowledge of the i-Think program and acknowledged that they do implement the i-Think program in their English language lessons. The teachers have a positive attitude towards implementing the i-Think program in their lessons as they found the use of the i-Think program or thinking maps in their English language lessons to be beneficial and effective to their students learning the language.

## CONCLUSION

Knowledge about the Thinking Maps is important as the building of thinking skills among students can be jeopardized due to the fact that the teachers are not highly skilled in transforming the skills from the classroom teaching (process) to the students (application) (Nooraini Othman & KhairulAzmiMohamad, 2014). The teachers have utilised purposeful and explicit approaches to teaching with Thinking Maps and that seemed to have a positive impact on English language development among the students. This is important as explicit instruction or teaching involves directing student's attention toward specific learning that focuses on producing specific learning outcomes and this involves explanation, demonstration and practice (Hall, 2002). The teacher's implementation of the i-Think program in her English language lessons indicated positive outcomes as findings demonstrated that the use of Thinking Maps promotes the generation of ideas, improved students' written and oral language and built their confidence in presentations. The i-Think

program was introduced as part of the national education transformation plan to create a thinking and creative younger generation in view that they will be innovative, think out-of-the-box and able to solve problems. Thus, its implementation is seen as an important and significant change needed to meet new challenges of creating a “thinking culture” in schools.

## REFERENCES

- Amin Senin (2013). Creating knowledgeable students through critical thinking. Retrieved from [news@nst.com.my](mailto:news@nst.com.my)
- Curriculum Development.effective instruction. Alexandria, VA: Association for Supervision andfor Supervision and Curriculum Development. Retrieved from [http://aim.cast.org/learn/historyarchive/backgroundpapers/explicit\\_instruction](http://aim.cast.org/learn/historyarchive/backgroundpapers/explicit_instruction)
- Hall, T. (2002). Explicit instruction: Effective classroom practices. Retrieved on 2 December 2015 from <http://www.pearsonassessments.com/research>
- Hyerle, D. (1996). Visual tools for constructing knowledge. Alexandria, VA: Association
- Hyerle, D. (2000). A Field Guide to Using Visual Tools, ASCD, Association for Supervision and Curriculum Development.
- Hyerle, D. (2004). Student successes with thinking maps. Thousand Oaks, CA: Corwin
- Hyerle, D. (2009). Visual tools for transforming information into knowledge (2nd ed.).
- Hyerle, D., Alper, L., & Wolfe, P. (2011). Students’ successes with thinking maps: School-based research, results, and models for achievement using visual tools. Thousand Oaks, CA: Corwin
- Kuhn, D., & Dean, D. (2004).A bridge between cognitive psychology and educational practice. *Theory into Practice*, 43(4), 268–273.
- Lai, E.R. (2011). Critical Thinking: A Literature Review. Retrieved on 23 October 2015 from 2015 from <http://www.pearsonassessments.com/research>.
- Marzano, R. J. (2007). The art and science of teaching: A comprehensive framework forfor effective instruction. Alexandria, VA: Association for Supervision and Curriculum Development
- Maimunah Osman. (2004). *Kemahiranberfikir*. Kuala Lumpur: InstitutTadbiranAwam Negara (INTAN).
- Ministry of Education, Malaysia.(2011). Kurikulum Standard PrasekolahKebangsaan, Dokumen Standard KurikulumPrasekolah 2011. Retrieved February 10, 2014, from <http://www.moe.gov.my/>
- Ministry of Education, Malaysia. (2013). Malaysia Education Blue-print 2013: Preliminary Report 2013-2025. Retrieved December 10, 2013, from <http://www.moe.gov.my/en/pelan-pembangunan-pendidikan-malaysia-2013-2025>

- MohdAzharAbdul Hamid. (2007), MeningkatkanDayaFikir.BatuCaves : PTS Profesional Publishing SdnBhd
- Moseley, D., V. Baumfield, J. Elliott, M. Gregson, S. Higgins, M. Lin, J. Miller, D. Newton, and S.Robson. (2005). Thinking skill frameworks for post-16 learners: an evaluation. Learning and Skills Development Agency (LSDA). Retrieved on 12 September 2015 from <http://www.lsda.org.uk/files/pdf/1541.pdf>
- NoorainiOthman &KhairulAzmiMohamad (2014). Thinking Skill Education and Transformational Progress in Malaysia. Journal of International Education Studies; Vol. 7, No. 4. Published by Canadian Center of Science and Education Press.Thousand Oaks, CA: Corwin Press.
- Weimer, M. (2003, September-October). "Focus on learning, transform teaching". Change 35 (5), 48 (7).Retrieved December 4, 2015, from Expanded Academic database.
- Zabani, D. (n.d.). *Status Pencapaian Malaysia Dalam TIMSS Dan PISA: SatuRefleksi* Dr Zabani Bin Darus KPM 2012.Retrieved December 4, 2015, from [http://education.um.edu.m...201/\(1\) Dr Zabani.pdf](http://education.um.edu.m...201/(1) Dr Zabani.pdf)
- Zohar, A. (2005). Assessing teachers' pedagogical knowledge in the context of teaching higher order thinking. International Journal of Science Education, 27(13): 1595-1620.
- Zohar, A. (2013). Challenges in wide scale implementation efforts to foster higher order thinking (HOT) in science education across a whole wide system.*Thinking Skills and Creativity*, 10, 233-249. Retrieved from [http://ac.elscdn.com/S1871187113000412/1-s2.0-S1871187113000412-main.pdf?\\_tid=398e5254-ae4e-11e3-aa09-00000aab0f01&acdnat=1395113854\\_90f0990b5be25a0843cfaa13c6ce62ae](http://ac.elscdn.com/S1871187113000412/1-s2.0-S1871187113000412-main.pdf?_tid=398e5254-ae4e-11e3-aa09-00000aab0f01&acdnat=1395113854_90f0990b5be25a0843cfaa13c6ce62ae)