Journal of Research, Policy & Practice of Teachers &
Teacher Education
Vol. 4, No. 2, December 2014, 5-14

Teachers' perceptions and students' motivation to Thinking-based Learning (TBL) in a classroom context

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This paper will present part of a larger study on the development and implementation of a Thinking-based Learning (TBL) instructional manual for secondary science. Two of the research objectives discussed in this paper is to determine teachers' perceptions in conducting the TBL approach in the regular classroom and the students' motivation after undergoing a series of TBL activities. Four teachers from 4 different schools volunteered to conduct TBL science lessons to an intact group of 187 students. Another group of 40 MRSM science teachers were given a 2 days TBL workshop. A five point Likert scale questionnaire on teachers' perception and an intrinsic motivation inventory was used to collect data. The findings showed that despite 79% of teachers who are in favor of the TBL approach, many constrains faced by them might impede the implementation and success of the approach. 85.6% of the students were highly motivated intrinsically after undergoing the TBL lessons. It can be concluded that TBL is a potential, powerful and competent approach to instill thinking skills in the teaching and learning process. As such, its introduction and implementation in schools as an initiator to pedagogical transformation should proceed progressively so as to overcome the existing constrains in a slow and naturalistic way.

Keywords: Thinking-based learning (TBL); instruction; motivation; perception; science.

Introduction

One of the most significant current discussions in Malaysian education system is National Education Blueprint (2013 -2025) which emphasizes the aspiration to produce students with ability to generate new knowledge by mastering the range of thinking skills. Critical and creative thinking are two of the 21st century skills schools should strive to develop amongst school children as these two thinking skills are the bedrock of thinking skills needed to function succesfully in the 21st century.

One priority for 21st century education is Thinking-based Learning (TBL) that infuses the teaching of critical and creative thinking into content instruction. The goal to

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meet the standards developed for education in the 21st century is skillful thinking which is highly emphasized in TBL. Skillful thinking is where the thinker assesses what is required to accomplish a thinking task and deliberately applies with proficiency the task-appropriate tools of thinking skills and mental behaviors in a strategic combination to produce thoughtful products of high quality (Swartz, et. al., 2010:31). TBL takes into account the different important types of thinking to teach the students and to engage the teachers to infuse them into content instruction skillfully. This include the basic types of thinking such as compare and constrast, parts-whole, classifying and the complex thinking tasks of problem solving, decison making and conceptualizing.

21st century educators should infuse instruction in skillful thinking into content instruction. This means not only teaching students the thinking skill but also teaching them to use the appropriate forms of thinking skills skillfully with the content material they are learning. If this is accomplished, our educational system will be transformed into a powerful vehicle for learning that meets all the standards that have been developed to guide instruction.

Problem Statement

Even though skillful thinking can be developed through classroom instruction, however, not just any instruction will do the job. The development of skillful thinking is not a discovery activity, not a 'think-harder' activity, neither is it something aimed simply at encouraging, stimulating, or enhancing students' thinking. Teaching skillful thinking means teaching deliberately, explicitly and directly, that is, what the procedures, mental behaviors and metacognitive moves are and how to apply them. It requires effort and skill by both the learners and teachers and this can be done through repeated, conscious, effortful, continual mediated application, instruction and reflection. Thus, it is timely to develop and test run a TBL instructional manual for secondary science to obtain some preliminary feedback of its implementation in the classroom.

The current teaching practice in almost all mainstream schools in Malaysia is still based on the conventional, one-way learning pedagogical model where the students are passive recipients of knowledge and the teacher as the provider of knowledge even though calls for innovation in teaching are heard on a regular basis from many parties. The conventional approach provides an efficient way to teach a large number of students in a relatively short time. However, the conventional practice of mostly teaching by telling allows for minimal creativity and critical thinking on the part of the students. It has also been shown by numerous researches that conventional teaching does little to promote deep conceptual understanding of content knowledge despite encouraging PMR and SPM results year after year.

As an alternative, we are proposing to develop a TBL instructional manual from the feedbacks obtained from the research that incorporates creative and critical thinking skills and focuses highly on skillful thinking. The instructional manual is based on infusing instruction in skillful thinking into standard content instruction at the secondary level in science subjects which specifically focused on selected thinking skills such as compare and contrast, parts-whole relationship, classifying, problem solving and decision making. In the TBL approach, students are engaged in academic study through authentic, real-world experiences that can promote deeper understanding of content knowledge and at the same time foster creative and critical thinking skills. In addition, the instructional

manual would be tailored to fit as much as possible into the regular school time table so that busy teachers would be convinced that they would be able to implement the suggested activities with tolerable change to their routine teaching.

Numerous researches have shown that students are severely lacking in these thinking skills. A major contributor to the problem is the way students are being taught in schools. Many attempts are being made to fix this problem but none seems to have made an impact that can be sustained at scale. In-service workshops and courses usually have a short-lived impact. Some blame our practicing teachers while others blame teacher training institutions for poorly training teachers. Thus this study will explore the possibilities of implementing a TBL approach (infusing thinking skills into content instruction) to engage students to think in a regular classroom.

Research Objectives

Based on these initial findings, a Thinking-based Learning (TBL) instructional manual for secondary science will be developed. This research aims to determine teachers' perceptions and reflection of the implementation of TBL in regular classroom. It also aims to determine students' motivation after undergoing TBL process.

Research Questions

From the research objectives stated, the following research questions were asked.

1. What are the teachers' perception after being exposured to the TBL approach?
2. What are students' motivation after undergoing the TBL process?

Methodology

This project involves research and development. The research component uses survey where data is collected through the use of a questionnaire to measure the subjective experiences of the respondents after using and undergoing several TBL sessions. The development focuses on developing an educators' instructional manual to train students to inculcate thinking in learning process. The manual describes in brief the what, why and how of TBL with many suggested hands-on activities and handouts for a training session. The purposive sampling method was used to select 4 teachers who are willing to conduct TBL science lessons and a group of 40 MRSM science teachers who have undergone a 2 days TBL workshop. The student samples comprised of an intact group of 187 students from four different schools where the respective teachers were teaching. The study is both research and development-based using survey as the primary research design. Two instruments in the form of questionnaires were used to collect data. The first instrument adapted from Ryan's (1982) Intrinsic Motivation Inventory (IMI) is a multidimensional instrument to measure the subjective experience of respondents related to the learning activities in TBL. IMI is divided into seven subscales which measures seven different aspects but are related to each other. They are (i) interest/enjoyment of learning is considered to be a direct measure of intrinsic motivation, (ii) perceived competency which is theorised to be a positive predictor of both self-report and behavioural measures of intrinsic motivation, (iii) effort which is said to be related to motivation also, (iv) value/usefulness which is said to influence a person to internalise and become self-regulating with respect to activities that they experience as useful or valuable for

themselves, (v) and pressure/tension is theorised to be a negative predictor of intrinsic motivation, and (vi) relatedness subscale is used in studies having to do with interpersonal interactions, friendship formation where relatedness construct can give information on the group dynamic as they work together during the infusion lessons. The instrument has a high *Cronbach alpha* value of .943, thus suitable to be used for this research. A study conducted to examine the validity of the IMI also found strong support for its validity (McAuley, Duncan & Tammen,1987)

The second instrument is a self-constructed questionnaire that was developed by studying the literature and the design of previous instruments particularly an instrument entitled Teachers' Perceptions towards Teaching Thinking Skills (Rosnani, Hashim & Suhailah Hussein, 2003). Only certain specific items from the instrument that were suitable and relevant to this study were selected and modified accordingly and new items were introduced that relates to the research questions and objectives of this study. The instrument was divided into two parts, (i) Teacher's background (8 items) and (ii) Teacher's Perceptions Towards Thinking Based Learning (25 items). Part 1 sought the demographic information about the teachers and Part 2 measure teachers' perceptions towards teaching thinking through the infusion approach (TBL)via five constructs namely: (i) main stream curriculum; (ii) regular school time table; (iii) teachers' competence and preparation; (iv) relevance of TBL and (v) the support system. The split half method for reliability and inter-rater validity was conducted with a Cronbach alpha value of 0.85 and 0.91 respectively. Data on students' motivation and teachers' perception were analysed using SPSS by calculating the percentages, and mean for each item.

Findings

Teachers' perceptions of TBL was drawn from five constructs in the survey as follows (i) main stream curriculum, (ii) regular school time table, (iii) teacher's competence and preparation, (iv) relevance of TBL and (v) support system. Table 1 shows the findings obtained from the survey.

Table 1: Teachers' perception of implementing TBL

Construct	Average (%)
Main stream curriculum	79.1
Regular school time table	75.6
Teacher's competence and preparation	80.9
Relevance of TBL	84.4
Support system	56.1

N = 46

In terms of implementing TBL in schools, 79.1% teachers agree that it is agreeable with the main stream curriculum. 75.6% teachers agree that TBL can be implemented in the regular school timetable. 80.9% teachers say that they need to be competent and prepared before conducting TBL. 84.4% teachers agree that TBL is relevant to be implemented in the school curriculum and 56.1% teachers say that the school support system helps the implementation of TBL. Detail findings pertaining to the items of each construct is shown in Table 2.

Table 2 :Teachers' perception of implementing TBL according to the items in each contruct.

No.	Construct (Items)	% agree
1.	Main stream curriculum	
	The existing curriculum provides opportunities to teach thinking.	78.3
	*There is too much content in the syllabus to allow for teaching thinking.	93.5
	*The curriculum does not provide adequate guide as how thinking skills can be taught in a particular subject.	89.1
	*A separate subject to teach thinking skills should be introduced in schools.	58.7
	*The current structured curriculum is not flexible enough to teach thinking skill.	76.1
	Average	79.1
2.	Regular school time table	
	Is the TBL suitable to be conducted in the allocated time table for teaching science?	60.9
	*A two period class lesson is not enough to teach a thinking skill.	69.6
	*A compact school calendar prevents teacher to conduct TBL.	84.8
	*TBL takes a lot of time to teach.	76.1
	Students need more time to be familiar with TBL.	87.0
	Average	75.6
3.	Teacher's competence and preparation	
	*Focusing on developing student's thinking hinders the progress of a lesson.	58.7
	A teacher must be competent in doing TBL.	87.0
	A teacher must be able to identify the thinking skill which is suitable to the science topic.	97.8
	*There is insufficient time to prepare a TBL lesson plan.	80.4
	Average	80.9
4.	Relevance of TBL	
	TBL can enhance students' writing.	89.1
	An infusion TBL lesson improves student thinking.	93.5
	TBL opposes exam-oriented education system.	54.3
	TBL drives students to answer higher order thinking questions.	91.3
	TBL activities can be used as a formative assessment.	87.0
	An infusion TBL lesson enhances content learning	91.3
	Average	84.4
5.	Support system	
	My school principal emphasizes teaching thinking skills as an important part of the school program.	45.7
	*The normal classroom setting in schools is not conducive to conduct TBL.	60.9
	School teachers are willing to adopt the TBL approach.	76.1
	The school activities support student's thinking.	60.9
	The school support students' thinking than completing the curriculum.	37.0
	Average	56.1

Though an overall of 79.1 % teachers agreed that TBL can be introduced into the main stream curriculum, they are are also skeptical of its implementation due to various constrains. Firstly, they say that there is too much content in the syllabus to allow the teaching of thinking (93.5%); secondly, the existing curriculum does not provide adequate guide to teach the thinking skills in specific subject matter (89.1%); thirdly, the current structured curriculum is not flexible enough to teach thinking (76.1%) and 58.7% agreed that a separate subject is required to teach thinking skill instead of infusing it directly into content instruction.

The study conducted by Abdullah (2005) on the constraints and challenges faced by trainee teachers in integrating thinking skills in the classroom supported the results

obtained here. His findings strongly supported an alternative teaching strategy as this was ranked the major constraint as compared to the others (assessment, lesson pre-planning, time consumed in implementing the thinking skill and the exam-oriented education system). As such, the introduction of TBL teaching approach in the secondary school curriculum is crucial and also timely as a cascading process to the recently implemented i-Think program in the primary school.The i-Think program (NST, 2012) which is aimed to equip the next generation with innovative thinking skills uses a realistic approach to inculcate the thinking processes in the teaching and learning through the use of thinking maps as thinking tools. This is no difference from the TBL approach where graphic organizers are used as thinking tools. However, the strength of the TBL approach is that, it not only emphasizes the thinking skills but also encompasses two other equally important components namely, Habits of Mind (HOMs) and Metacognition. With these 3 elements in TBL, it is likely to be a more appropriate and highly sophisticated teaching approach to be implemented from the secondary school level onwards until tertiary education.

Similar findings were also shown in relation to the perception of teachers towards the implementation of TBL within the regular school time table. Even though an average mean percentage of 75.6% of teachers are agreeable to TBL being suitable to be conducted in the allocated time table for teaching science, about the same percentage of them also agreed that a double class period is not enough to teach a thinking skill and that TBL also takes a lot of time to teach. According to them, a compact school calendar will prevent them from conducting TBL.As we can see, this aspect of constrain is also indirectly connected to the skillful designing of a TBL curriculum. A lack of knowledge and experience in designing a good TBL curriculum may lead these constrains being in the way to implementing TBL. Similarly, another research need to be conducted to see the existence of these complains

Eighty percent of the teachers agreed that they need to be competent and prepared to conduct TBL in their classroom. Among some of the elements that they agree upon are the ability to identify suitable thinking skills to teach specific topics, more time to prepare a TBL lesson and if they focus on developing the students' thinking skills, it might hinder the progress of their lesson.The above feedback obtained from the teachers further necessitate the importance of total immersion of the TBL experience through more extensive seminars and workshops on TBL to the teachers so as to give them the confidence and competence in conducting TBL in their classroom.

The relevancy of TBL to be used as an approach in classroom instruction could be a possible reason to the high level of competence and preparation among the teachers. This is because they agree that TBL lessons can improve students' thinking, enhance their writing and content learning, and more so to enable students to answer higher order thinking questions. They also agree that the TBL activities can be used as formative assessment in addition to the summative assessment, thus not totally opposing the exam-oriented education system.

In terms of the support system to conduct TBL in schools, the results showed that not all school principals emphasized the importance of teaching thinking in their school program. The school is more incline to complete the curriculum than to support students' thinking.

Students' motivation in experiencing TBL

Students' motivation in experiencing TBL was drawn from six constructs in the survey as follows (i) interest/enjoyment, (ii) perceived competence, (iii) effort/importance, (iv) pressure/ tension, (v) value/ usefulness and (vi) relatedness. The higher the percent agree, the more they seemed to have the intrinsic motivation after experiencing TBL. In other words, the higher the percent for each construct, the more they are intrinsically motivated. Since, the pressure/tension is theorized to be a negative predictor of the intrinsic motivation; the higher the percent agree, the less pressure and tension they have during the TBL session. Table 3 shows the findings obtained from the survey.

Table 3: Intrinsic motivation Among Students during the TBL session according to construct

Construct	% Agree
Interest/Enjoyment	87.1
Perceived competence	86.7
Effort/importance	90.5
Pressure/tension	81.5
Value/usefulness	81.9
Relatedness	86.1

N = 187

In terms of motivation among students after experiencing a TBL lesson, 87.1% of the them agree that the TBL session was interesting and enjoyable. 86.7% of the students agree that TBL made them more competence compared to their peers. 90.5% agree that they feel importance during the TBL session. 81.5% of them say they are less tension during the session, 81.9% realised that TBL is useful and 86.1% say that TBL allows them to interact a lot with other members in their group.

Based on the result of the survey, we found that the TBL process able to generate interest and enjoyment among students. Students generally agree that they enjoy doing the TBL activity (85.5%), and would describe the activity as fun (89.4%), not boring (88.2%), able to hold their attention (86.8%), interesting (86.6%), and enjoyable (86.6%) as shown explicitly in Table 4.

The findings show that the students were highly motivated intrinsically after undergoing the TBL lessons. The TBL lessons were able to generate interest and enjoyment in the activities conducted and gauged their attention. The students also showed a high percentage of competence and achievement in doing the TBL activities. In addition, they were intrinsically motivated to put great effort and importance to completing the tasks and activities in the TBL lessons. In doing so, a high percentage of them (81.5%) do not feel the pressure or tension when experiencing the lessons. They further agree that the experiences gained are important, valuable and helped them get a deeper understanding of the concepts learnt. TBL also enhances their thinking skills and soft skills as well. In relation to relatedness, they agree that they experienced the closeness, friendliness, and trustworthiness of their peers when doing group activities. This in turn enhances their self-motivation to learn and succeed.

Table 4: Intrinsic motivation Among Students during the TBL session according to each item in the construct

Construct (Items)	% Agree
1. Interest/Enjoyment	87.1
I enjoyed doing this activity very much	85.5
This activity was fun to do.	89.4
I thought this was a boring activity.*	88.2
This activity did not hold my attention at all.*	86.6
I would describe this activity as very interesting.	86.6
I thought this activity was quite enjoyable.	86.6
While I was doing this activity, I was thinking about how much I enjoyed it.	85.6
2. Perceived competence	86.7
I think I am pretty good at this activity.	87.2
I think I did pretty well at this activity, compared to other students.	86.6
After working at this activity for a while, I felt pretty competent.	88.2
I am satisfied with my performance at this task.	85.6
I was pretty skilled at this activity.	84.0
This was an activity that I couldn't do very well.*	88.8
3. Effort/importance	90.5
I put a lot of effort into this.	93.0
I didn't try very hard to do well at this activity.*	87.7
I tried very hard on this activity.	91.4
It was important to me to do well at this task.	91.4
I didn't put much energy into this.*	88.8
4. Pressure/tension	81.5
I did not feel nervous at all while doing this.*	73.3
I felt very tense while doing this activity.	83.4
I was very relaxed in doing these.*	76.5
I was anxious while working on this task.	89.7
I felt pressured while doing these.	84.5
5. Value/usefulness	81.9
I believe this activity could be of some value to me.	86.0
I think that doing this activity is useful for deeper understanding.	87.7
I think this is important to do because it can enhance my thinking skills	82.9
I would be willing to do this again because it has some value to me.	77.0
I think doing this activity could help me to enhance my soft skills.	79.7
I believe doing this activity could be beneficial to me.	82.4
I think this is an important activity.	78.0
6. Relatedness	86.1
I felt really distant to this person.*	78.1
I really doubt that this person and I would ever be friends.*	92.9
I felt like I could really trust this person.	87.2
I'd like a chance to interact with this person more often.	88.2
I'd really prefer not to interact with this person in the future.*	90.4
I don't feel like I could really trust this person.*	77.0
It is likely that this person and I could become friends if we interacted a lot.	87.2
I feel close to this person.	87.7

Discussion

All the above findings have provided a lot of insights as to how to propagate the idea of infusing thinking skills into the school curriculum via TBL. Since this is a small, preliminary study to get firsthand information of teachers' and students' perceptions, an ongoing study need to be conducted to examine similar aspects after the school community (teachers, students, staff and administrators) have been exposed to the idea of TBL and the teaching staff well trained in TBL instruction.

A positive call for change in the teaching approach is apparent among the teachers with diverse teaching experiences (1-21 years) and a sound knowledge of teaching 'thinking' from the courses and seminar/conferences attended. A possible reason for the teachers' skepticism to the implementation of TBL is because they were not yet exposed to and trained in designing a TBL curriculum. It would be interesting to re-study the teachers' perception of TBL after they have been exposed and thoroughly trained in the 3 components of a TBL approach: (i) designing a TBL curriculum, (ii) conducting a TBL lesson and (iii) assessing a TBL lesson. Further research should be conducted and look into this aspect.

The study on the development and testing of a TBL teaching manual has in some ways provided substantial preliminary first-hand information in an attempt to introduce TBL within the constraints of the main stream school curriculum and regular school time. It also provided relevant information of teachers' perceptions and first time experiences of conducting TBL lessons. Empirical data of students' motivation towards TBL as an innovative approach in teaching Science is equally relevant and important to ensure its success when introduced in secondary Science curriculum.

TBL is a teaching and learning approach that emphasizes the development of thinking among school students by doing and practicing the thinking skills. The initial teachers' perception of TBL can be used as a stepping stone to further plan and design the most effective way to introduce the approach. This is necessary so as not to intimidate the teachers' positivity, interest and willingness to buy in this approach in their classroom instruction. The findings also helped the researcher to rethink of ways to accommodate some of the constraints spelled out by the teachers when conducting the TBL approach.

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