

THE INCORPORATION OF THINKING SKILLS IN THE SCHOOL CURRICULUM*

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The focus of current classroom teaching in Malaysia is the utilization of metacognitive strategies especially thinking skills. In fact many educational psychologists argued that thinking skills are important aspects in education (Sternberg, 1990a, 1990b). In Malaysia, it is realized that many teachers are not fully capable of incorporating thinking skills in their teaching strategies. Therefore it is the objectives of this study to find out how far students are inculcated with: a) critical thinking; b) creative thinking; and c) divergent/convergent thinking. A research survey was carried out on 387 secondary school students aged between 15–16 years. Results showed that teachers incorporated critical thinking skills, creative thinking skills as well as convergent/divergent thinking skills in their teaching of their subjects. Though this study showed that there is a new trend in teaching and learning where students are actively involved in the learning process, there is plenty of room for improvement in incorporating the thinking skills. The implications of this study on education and teacher training are discussed in this paper.

INTRODUCTION

The focus of current classroom teaching in Malaysia is the utilization of metacognitive strategies especially the thinking skills. In fact many educational psychologists argued that thinking skills are important aspects in education (Sternberg, 1990a, 1990b). In Malaysia, where rapid changes are taking place particularly in the technical and industrial sectors, it is imperative that thinking skills should be made the

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educational goals where students can be trained to make sense of new information and not just acquisition of knowledge. The responsibility therefore lies in education where it is important that students be trained to think critically and creatively.

To ensure that the educational goals can be met, teacher training as the key factor seems to be logical. It is within this teacher training context that in Malaysia, it is realized that many teachers are not fully capable of incorporating thinking skills in their teaching strategies. Consequently, it had been recommended that Teacher Training Programmes should prepare prospective teachers capable of utilizing thinking skills in their teaching. To meet this challenge, the Malaysian Ministry of Education (1996), through their Teacher Training Programmes, implemented the incorporation of thinking skills across the curriculum for schools.

In general the objective of incorporating thinking skills is to direct all school students to master thinking skills. Consequently, the students should be: a) capable to think critically and creatively in order to achieve the goals of the Malaysian vision 2020; b) capable of decision making and solving problems; c) able to use their thinking skills, and able to understand language or its contents; d) able to treat thinking skills as lifelong learning; and finally e) well-balanced in terms of their intellectual, physical, emotional and spiritual development.

Hence, in order to produce students who can think critically and creatively, firstly, teachers should be trained to understand the meaning of thinking skills itself and its categories such as high level (explain, analysis, opinion, decision making, solving problems, and planning) and low level thinking that does not require wide and deep thinking. Secondly, teachers should understand creative and critical thinking, vertical and lateral thinking as well as convergent and divergent thinking. Thirdly, teachers should be given guide books on the thinking skills that students should acquire. However, when presenting information to students during teaching, teachers should not be constrained by the thinking skills categories. Among the skills that teachers should focus on are forming relationships, compare and contrast, classify, evaluate, rank, identifying right from wrong, facts from opinion, cause and effect, bias, to give reasons for causes, to foresee consequences, making inferences and summary, generalizations, interpret, identifying main, supporting and detailed ideas as well as

making decisions and solving problems. Method of teaching is indirect, that is, teachers have to inculcate these skills while teaching their individual subjects.

Having said all that, it is therefore the aim of this study, to survey from students' perspectives, the ability of teachers incorporating thinking skills in their teaching. Consequently the objectives of this study are to find out how far secondary school students are inculcated with: a) critical thinking; b) creative thinking; and c) divergent/convergent thinking. Lastly, it is also the aim of this study to find out the differences in perceptions between groups of students based on the inculcation of thinking skills according to subjects taught.

METHODOLOGY

This research utilized the survey method using questionnaire designed by the researchers. The study utilized the cluster sampling method where 387 upper secondary school students aged between 15 to 16 years became the respondents. This study is based on the students' perceptions on 26 teachers who were teaching the Vocational/Technical subjects (Home Economics and Agricultural Science), English as a Second Language (TESL), Malay Language teaching as well as Science and Mathematics. The seven secondary schools and their 26 teachers selected were all in the Klang Valley area. These 26 teachers had undergone teaching practice during their pre-service, attended in-service courses and had been teaching in schools for at least 3 years.

This study utilized a self-designed inventory based on the model developed by the Ministry of Education Malaysia (MOE) on thinking skills (KBKK i.e., *The Critical and Creative Thinking Skills*, 1996). Each item was a construct according to the definitions of thinking skills by MOE. The scaling technique of 1–9 was utilized to measure the students' perceptions of the incorporation of thinking skills by the teachers. Data were analyzed by utilizing the statistical mean, standard deviations and ANOVA.

FINDINGS

The findings are based on the objectives stated above. Table 1 shows the findings on how far students are trained in creative, critical and divergent/convergent thinking.

By using the Likert Scale of 1–9, score 5.0 was taken as the middle score. Therefore, from Table 1 it can be seen that students' perceptions of teachers' incorporation of thinking skills was average that means much more is desired from the teachers. Comparing the categories of thinking skills, creative thinking (mean = 5.56) needs more attention and focus.

Subsequently by using ANOVA, it was found that there were significant differences in the students' perceptions of their teachers' incorporation of specific thinking skills. It can be seen from Table 2 that there were significant differences in the various groups of students on the incorporation of thinking skills especially in classifying ($F = 14.6$, $p < 0.01$); ranking ($F = 17.9$, $p < 0.01$); comparisons ($F = 12.2$, $p < 0.01$); contrast ($F = 8.8$, $p < 0.01$); identifying important points ($F = 8.4$, $p < 0.01$); choosing priority points ($F = 4.4$, $p < 0.05$), and cause and effect ($F = 3.9$, $p < 0.0$).

Table 1: Students' Perceptions on The Incorporation of Thinking Skills

Creative Thinking	Mean	s.d	Critical Thinking	Mean	s.d.	Divergent/ Convergent Thinking	Mean	s.d
Classily	4.96	2.57	Comparisons	6.09	2.15	Widen & develop imagination	6.41	2.08
Ranking	5.18	2.41	Contrast	6.07	2.11	Finding various answers	6.72	1.89
Innovation	5.86	2.09	Choosing priority points	6.62	2.20	Identifying main points	6.66	2.10
Seeing relationship	6.24	2.10	Cause and effect	6.90	2.02			
Average mean	5.56			6.42			6.59	

To determine the variations in perceptions between groups, the Bonferroni post hoc test was utilized (Table 3). However, it is shown that teachers teaching the vocational/technical, science and mathematics subjects were perceived as incorporating more of the thinking skills (identifying, ranking, comparisons, contrast, identifying main points and

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choosing priority points) than those teaching English Language and Malay Language ($p < 0.05$). There were no significant differences in the perceptions of students of the incorporation of these skills of the language teachers (Table 3).

Table 2: Students' Perceptions of The Incorporation of Specific Thinking Skills According to Subjects

Thinking Skills		Mean Squares	F	p
Classify	Between Groups	88.063	14.619	0.000
	Within Groups	6.024		
Ranking	Between Groups	92.254	17.875	0.000
	Within Groups	5.167		
Comparisons	Between Groups	50.127	12.222	0.0000
	Within Groups	4.101		
Contrast	Between Groups	37.265	8.790	0.000
	Within Groups	4.239		
Identifying	Between Group	34.854	8.350	0.000
	Within Groups	4.174		
Choosing priority points	Between Groups	20.911	4.408	0.005
	Within Groups	4.744		
Cause and effect	Between groups	15.398	3.925	0.009
	Within Groups	3.925		

Table 3: Bonferroni Post Hoc Test on Students' Perceptions of the Incorporation of Thinking Skills Based on the Subjects Taught

Thinking Skills	Groups	Groups	X difference	Std error	p
Identify	1	3	-1.63*	.38	0.000
		4	-2.59*	.46	0.000
	2	3	-1.10*	.32	0.003
		4	-2.06*	.41	0.000
	3	1	1.63*	.38	0.000
		2	1.10*	.32	0.003
	4	1	2.59*	.46	0.000
		2	2.06*	.41	0.000
Ranking	1	3	-1.89*	.35	0.000
		4	-2.60*	.42	0.000
	2	3	-1.16*	.29	0.001
		4	-1.87*	.38	0.000
	3	1	-1.89*	.35	0.000
		2	1.16*	.29	0.000
	4	1	2.60*	.42	0.000
		2	1.87*	.38	0.000
Comparison	1	4	-1.82*	.38	0.000
		3	-.75*	.26	0.027
	2	4	-1.94*	.34	0.000
		2	.75*	.26	0.027
	3	4	1.94*	.34	0.000
		1	1.82*	.38	0.000
	4	2	1.94*	.34	0.000
		3	1.19*	.36	0.006
Contrast	1	4	-.79*	.39	0.000
	2	4	-1.58*	.35	0.000
	3	4	-1.10*	.36	0.016
	4	1	1.79*	.39	0.000
		2	1.58*	.35	0.000
Identifying main points	1	3	1.58*	.35	0.000
		4	-1.15*	.31	0.002
	3	4	-1.70*	.39	0.000
		1	1.16*	.35	0.005
	4	1	1.15*	.31	0.002
		2	1.70*	.39	0.000
		2	1.16*	.35	0.005

* 1-English Language; 2-Malay Language; 3-Vocational; 4-Science & Mathematics

IMPLICATIONS AND SUGGESTIONS

From the results of the study, it can be derived that teachers did incorporate thinking skills in their teaching. However, based on the perceptions of their students, it was just about average which implies that there are ample room for improvement. The approach utilized in the Malaysian classrooms is inferential. In other words, thinking skills are incorporated indirectly. The assumption is that students are encouraged to seek and figure out answers and to apply to situations with guidance from the teachers. The students would eventually acquire higher level thinking processes. It is also argued that thinking cannot be separated from its context and its transfer is likely to happen if thinking is embedded in all teaching and learning. Content and process are both important (Nisbet, 1990). However within the context of this study's findings, it is therefore suggested that educators and curriculum planners should give a thought on teaching thinking skills explicitly as a subject on its own. This is because studies have shown that teachers teaching thinking skills explicitly to students were found to produce students who exhibited increased critical thinking behavior after the teachers received training (Hudgins & Edelman, 1986). In yet another study (Robinson, 1987), it was found that there were significant improvement in higher thinking skills according to Bloom Taxonomy (analysis, synthesis and evaluation) when teachers, after undergoing in-service sessions, provided thinking skills activities for the students.

It also implies here that for the educational objectives on thinking skills to be met, there should be a strong teacher training component on these skills. The training should be considered as important as the teacher training program content whether it is in-service or pre-service. In another study (Whimbey, 1985), it was found that teaching skills instructions enabled students to become better problem solvers in other situations both in and outside of schools. Wong (1985) also stated that instructions in self-questioning are effective when they are direct and explicit. As Freseman (1990) had said, "Thinking skills need to be taught directly before they are applied to the content area". Students have been found not able to apply higher thinking skills in work situations when taught inferentially (Freseman, 1990; Hernstein et al., 1980; Pearson, 1982; Wong, 1985). In supporting Freseman, Echevarris and Leat (2007) said direct teaching of thinking skills will enable students to think about learning and themselves as learners. It

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will also encourage them to be metacognitive (thinking about thinking) and self-regulating.

The result of this study also showed that the vocational/technical and science and mathematics students seemed to have better perceptions of the teachers incorporating the thinking skills as compared to those students who perceived their language teachers. This perhaps is due to the fact that the vocational, science and mathematics subjects have practical components involving activities that students have to execute and think by themselves. Therefore, the teacher training program also has to focus on the training of language teachers in the thinking skills. This is not to say that in the Malaysian classrooms, thinking skills are not incorporated by the language teachers but as Pearson (1982) had stated in his study, in reading comprehension, direct teaching of thinking skills have been overlooked. Therefore it was suggested that skills such as drawing inferences, making predictions, monitoring one's own understanding of written materials should be included in reading comprehension. As Cotton (1991) had said, students in general, do not have well-developed thinking skills, therefore the skills should be taught directly because creative and critical thinking skills are teachable.

In the case of vocational/technical and science and mathematics students, teachers should introduce Computer Aided Instructions (CAI) program to enhance the students thinking skills. This, as Sadowski (1984–85) had shown the effect of using CAI programs among science and mathematics students, critical thinking was improved. The CAI program focused on skills such as verbal analogies, logical reasoning and inductive/deductive thinking, all of that are higher level thinking processes.

Lastly, since the findings showed that the incorporation of creative thinking comparatively to the other thinking skills was lower, due attention should be given to creative thinking. Even in problem solving, students should be exposed on how to solve the problems creatively. As the six step model suggested by Parnes, Noller and Biondi (1977), students should follow a systematic procedure like mass finding, data finding, problem finding, idea finding, solution finding and acceptance finding.

CONCLUSION

It can be said that even though this study suggests that the teaching of thinking skills in the Malaysian classroom should be explicit, it is not to say that inferential teaching is not relevant. In fact the result of the study did show that teachers do incorporate thinking skills in the teaching and learning process that means inferential teaching to some extent is effective. Therefore it is further suggested that both approaches should be supported, for given the right program appropriate for the students, both approaches would be equally effective. Just as Bass and Perkins (1984) wrote, "Like so much educational research, our final results were not supportive of just one instructional technique" (pp 32–34).

In conclusion, in facing the new millennium, Malaysia has to prepare herself to face the challenge of the advent of information and communication technology and globalization. In order to do that, individuals have to be proficient in thinking and that involves mental operations, knowing when to employ these operations and having to use them when appropriate (Adreani, 1990). Therefore it is crucial that students be equipped with thinking skills in order to function and cope successfully in a highly technical society that is undergoing rapid changes.

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