Title	Teaching thinking skills to K1 and K2 children
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Teaching Thinking Skills to K1 and K2 Children

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Introduction / Rationale

The Singapore education system is experiencing a paradigm shift brought on by global competitiveness. The emphasis is now on incorporating a greater element of thinking into the school syllabus. At the present moment, interest is on students within the secondary and tertiary levels. While this emphasis is understandable from the viewpoint that the government is eager to equip students who will be entering the work-force in perhaps five years, there is little evidence that children at the kindergarten level, will benefit from the government's investment until a later age. The authors believe that if kindergarten children respond to the teaching of thinking skills, then it will be advantageous for them to be trained from an early age.

Previous work has been done on using the infusion approach to teach kindergarten children thinking skills (Swartz and Parks, 1994). However, this case study represents one of the first attempts to study the effects of teaching a thinking skill to a selected group of kindergarten children in Singapore.

Method

General

There were twenty two children involved in this study. They were divided into two groups - K1 and K2. K1 children consisted of fourteen 4 to 5 year-olds in the first year of kindergarten while K2 children consisted of eight 5 to 6 year-olds in the second year of kindergarten. The children were attending classes in the same privately-run local pre-school centre.

Procedure

The entire study was divided into three parts. Using a pre-intervention observation, the children's attitudes and ability to think about their thinking were observed as they engaged in two comparing and contrasting tasks. After being observed, they were given four lessons on how to compare and contrast with the aid of a graphic organizer. Lastly, the children were again observed during the post-intervention observation to determine if there were any gains derived from the lessons. The characteristics of intellectual growth observed for are the same for the pre-intervention and the post-intervention observations. Each session with a child was video-taped and later reviewed.

Pre-Intervention Observation

Each child was required to perform two tasks with each lasting approximately ten minutes. In Task A1, the child was presented with a toy apple and a real orange. She was then asked to compare and contrast the apple and the orange. If she was unable to understand what it meant to compare and contrast, the instructions were then given in a different form which was judged to be semantically less complex. The following are the levels of questions which were posed, with Level 1 being the most semantically complex and Level 6 the least semantically complex:

Level 1:	Can you compare and contrast the two objects?
Level 2:	What are their similarities? What are their differences?
Level 3:	What is similar about them? What is different about them?

Level 4: How are they like each other? How are they not like each other?
Level 5: How are they the same? How are they not the same?
Level 6: What can you tell me about these two objects / people?

The level at which the instructions were understood was recorded. During the course of the task, the observer posed other questions aimed at understanding the thought processes of the child. For instance, when the child was in the process of thinking about what is similar and what is different about the two objects, the observer would ask the child what she was thinking about. Some questions posed include:

Why do you say that ...?
What makes you say that ...?
Can you tell me what you are thinking about right now?
When you are thinking, what do you think about?
Are there pictures, words or sounds in your head?

In Task A2, the child was read a segment of the fairy tale classic entitled Cinderella. While the story was read aloud by the observer, the child was shown pages from the story. After the segment was read, the same procedure as the first task was applied to comparing and contrasting Cinderella and her step-sister.

For both tasks, the number of similarities and differences given by the child was recorded. Likewise, any display or lack of display of the six characteristics of intellectual growth was also noted and recorded. The characteristics that were of interest in this study included Persistence, Non-Impulsivity, Metacognition, Drawing on Past Knowledge and Experiences, Precision of Language and Thought and Use of All Senses.

Throughout both tasks, the child was videotaped and the session was later reviewed for the purpose of recording observations of behaviour and responses.

Intervention Lessons (Thinking Skills Lessons)

After all the children had been observed during the pre-intervention observation, they were introduced to a series of four lessons designed to teach them how to compare and contrast systematically and deeply. The lesson design was based on the work of Robert J. Swartz and Sandra Parks (1994). Appropriately termed the infusion approach, the direct teaching of thinking is fused with the use of methods which promote thinking in curricular contexts, and restructured for effective teaching of thinking as well as content learning. The end result is a lesson plan divided into segments, with emphasis given to the teaching of the content, thinking skills, students thinking about their own thinking and the transfer of the skills learned. Throughout the lesson, the teacher, among other effective practices, used reflective questions similar to the following, which was taken from one of the intervention lessons:

Let us stop thinking about Snuff and Sir Thomas. I would like us to think about what we were doing a while ago. To learn something important about Snuff and Sir Thomas, we needed to use a type of thinking called *Compare and Contrast*. What did we do when we compared and contrasted Snuff and Sir Thomas? Do you think that we learned a lot more about Snuff and Sir Thomas by comparing and contrasting the way we did? How? Pause for contributions. **Comparing and contrasting this way helps all of us to see the ways they are like each other and not like each other.**

Reflective questions such as the above "help students distance themselves from what they are thinking about, so that they can become aware of how they are thinking and develop a plan for doing it skillfully" (p. 10).

In this study, all lessons contained two objectives. The first was to teach a particular content matter while the other was to expose the children to the graphic organizer and the way in which comparing and contrasting could be systematically performed and applied across domains. The content matter spanned across the domains of mathematics, language arts, science and health education. For mathematics, the children engaged in comparing and contrasting a 2-dimensional square and a 3-dimensional cube. This lesson was an adaptation to the one found in Swartz and Parks. In language arts, the children examined the personalities of 2 characters from Quentin Blake's *Snuff*. In science, the children used their five senses to closely examine similarities and differences between a kiwi and an avocado. For health education, the children compared and contrasted between a healthy breakfast consisting of milk, cereal and bread with a fast-food version of a breakfast.

To illustrate, the second lesson began with a brief recapitulation of the previous lesson which was on comparing and contrasting a cube and a square. Emphasis was on recalling the content and the manner in which the thinking skill was used. The teacher then proceeded to introduce the next lesson by highlighting that the thinking skill learned last lesson could be used in other situations. In the second lesson, the children heard the story *Snuff*. Snuff is a boy who dreams about being a brave knight and so becomes the knight's servant so that the knight will teach him to be one. Children were asked to think about how Snuff and Sir Thomas were similar and different. At certain points during the story, the teacher would pause and ask the children to compare and contrast the two characters up until then. Then the teacher proceeded with the story. At the end of reading the story, the children are asked what they learned from comparing and contrasting Snuff and Sir Thomas. They were also asked to reflect on how some people were good at some things while others were good at something else.

The teacher then refocused the children from thinking about the characters to thinking about how they thought about the two characters, what they were thinking about as they were thinking about the characters, to explain what went on in their heads, and to reflect upon the way they compared and contrasted.

The lesson plans for this study differed from Swartz and Park's in one area. Due to the constraints of time and the limitation of the children's attention span, there was little or no provisions made for immediate transfer of the skill. Instead, children were informed what to expect in the next lesson that involved comparing and contrasting.

Post-Intervention Observation

At the end of the intervention lessons, each child was observed again to determine the areas of improvement. The procedure was similar to the pre-intervention observation except in two areas. Task A1 required the child to compare and contrast two types of bottled drinks, apple flavoured mineral water and apple juice. In Task A2, the child was read another fairy tale classic entitled *The Tortoise And The Hare* and asked to compare and contrast the two characters. The questions posed were mostly identical except when the child replied that she knew what it meant to compare and contrast, the observer would then ask her to explain what she would do when asked to compare and contrast.

Children's Responses

For children in K2, 75% displayed improvements in terms of being able to respond to the level of instructions. (See Table 1.) Marked improvements were also displayed in the number of similarities that the children could think off. In Task A1, slightly more than 200% more similarities were mentioned after the intervention lessons while 19.5% more differences were reported. (See Table 2.) In Task A2, 600% times more similarities were reported compared to 44% for differences. Negligible gains were noted across the six characteristics of intellectual growth. (See Tables 3 & 4.)

For children in K1, 64% showed improvements in being able to respond to the level of instructions. These children also showed improvements in the number of similarities reported after the intervention lessons. For Task A1, 61.5% more similarities were reported compared to 8.9% for differences. For Task A2, these children contributed 166.7% more similarities and 82.1% more differences. For characteristics of intellectual growth, the most gains were witnessed for Task A2 after the intervention lessons with 78.6% improvement. There was a corresponding decrease in the incidences of children not displaying the characteristics, with Task A2 reporting the largest drop of 15.7% compared to 8.8% for Task A1.

Table 1. *Increases in the level of question understood and meaningfully used after the intervention lessons.*

	Level of Questions
K1 Children	64%
K2 Children	75%

Table 2. *Increases in similarities and differences noted after the intervention lessons.*

		Similarities	Differences
K 1 Children	Task A1	61.5%	8.9%
K2 Children	Task A1	214.3%	19.5%
K1 Children	Task A2	166.7%	82.1%
K2 Children	Task A2	600%	44%

Table 3. *Increases in characteristics of intellectual growth noted after the intervention lessons.*

		Display Signs
K 1 Children	Task A1	18.5%
K2 Children	Task A1	0%
K1 Children	Task A2	78.6%
K2 Children	Task A2	0.07%

Table 4. *Decreases in the incidences of children not displaying characteristics of intellectual growth after the intervention lessons.*

		Does Not Display Signs
K 1 Children	Task A1	8.8%
K2 Children	Task A1	0%
K1 Children	Task A2	15.7%
K2 Children	Task A2	0.03%

Discussion

The results reveal immediate gains in several areas as expected by the authors. In the area of language, many children in this study have been observed to have increased their vocabulary to include words like *compare and contrast* and *similarities and differences*. While children in both groups appear to have benefitted from the lessons, K2 children exhibited the greatest gains. In addition, these children had acquired the meaningful use of the words.

During the course of the pre-intervention observations, the observer noticed that more differences were noted as compared to similarities. Little effort was spent examining the objects and characters for similarities. After the intervention lessons however, both groups of children were able to note more similarities, with children in K2 showing the greatest gains, leading the authors to believe that the intervention lessons had equipped these children with the knowledge that it was important to also examine the similarities when comparing and contrasting two items.

While children in K2 displayed most gains in the above, the authors noticed that children in K1 displayed more characteristics of intellectual growth brought about by the teaching of thinking skills, especially for listening and comprehension tasks. In particular, they showed more persistence and used more precise language to express themselves. In addition, the intervention lessons have helped some reduce the incidences in which they did not display positive signs of intellectual growth. However, the older children displayed far more signs of being able to engage in basic metacognition as expressed through sentences like "I was thinking about their similarities and their differences". None of the K1 children were observed to be able to metacognize.

There are several limitations to this study. Being a privately-run company, the authors could not deprive any child of the benefits that could be achieved from the intervention lessons. Hence, there were no control groups. In addition, the number of children studied was small and they represented only a certain cohort.

Observing children outside their natural setting also posed a limitation. During the pre-intervention and post-intervention observations, some children appeared tense, were easily distracted and displayed little desire to speak. However, this is not reflective of their language ability or disposition as these children have been observed to be articulate and vibrant in their natural setting.

The initial findings from this study have led the authors to believe that young children can be taught to be better thinkers using the infusion approach. However, more time and effort must be invested into teaching thinking skills to kindergarten children. Successful as it may be in the United States of America, it needs to be adapted specifically for children of this age and in this part of the world. For instance, it may be noted that for many children, English is not their mother tongue. Teaching thinking skills using only English does not enable them to fully reap its benefits. Hence, a possible area for future studies may seek to determine gains from infusion lessons taught in Mandarin and in English.

Only when the infusion approach is adapted to be taught in other languages like Malay and Mandarin can the approach be truly beneficial to a greater number.

Another issue that needs attention is the education of parents to the thinking movement. As the authors believe that teaching children to be better thinkers is not the sole responsibility of teachers, parents in Singapore also have the need to be taught to modify their interactive approach to include techniques that include reflective questions, praises and encouragement and increased wait time for answers.

As the nation progresses to meet the challenges of the future, teachers of pre-primary children have an important role to play in shaping our future generation's thinking and dispositions. Currently the authors have embarked on a rigorous training programme geared towards equipping the centre's own teachers with the skills necessary to nurture a thinking culture among its students and staff.

As this study is an initial attempt to study the effects of teaching thinking to kindergarten children in Singapore, the authors hope that it serves as a catalyst and springboard for more rigorous and extensive research.

References

Blake, Q. (1992). Snuff. London: Picture Lions.

Costa, A. L. & Lowery, F. L. (1989). Teachniques for teaching thinking. California: Critical Thinking Press & Software.

Gool, V. (1995). Cinderella. London: Twin Books Ltd.

Gool, V. (1995). The tortoise and the hare. London: Twin Books Ltd.

Swartz, R. J. & Parks, S. (1994). Infusing the teaching of critcial and creative thinking into content instruction: A lesson design handbook for the elementary grades. California: Critical Thinking Press & Software.