

# Developing Reflective and Thinking Skills by Means of Semantic Mapping Strategies in Kindergarten Teacher Education

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As part of the module “Further Studies in Kindergarten Curriculum” in the Certificate in Kindergarten Teacher Education Course conducted by the Hong Kong Institute of Education, teacher-educators made use of semantic webbing to help kindergarten teachers/principals develop reflective and thinking skills regarding subject matter content and teaching curriculum. *Semantic webbing/mapping* or *semantic networking* or *plot maps* may be defined as a strategy in which information is categorically structured in graphic/visual form. However, its use in teacher education is more recent. Kindergarten teachers/principals were interviewed to discern how they developed critical thinking and evaluative skills concerning subject matter content and teaching curriculum through the use of semantic webbing. Interviews of a random sample of participants and analysis of their mind-maps revealed a change in perspectives and attitudes towards subject matter content and teaching curriculum. The present paper examines some of the affective outcomes for both teacher educators and student-teachers resulting from the use of semantic webbing/mapping as a strategy for facilitating reflective and critical thinking skills in four components of the module “Further Studies in Kindergarten Curriculum”; namely, Art, Language, Mathematics/Science, as well as Social Studies. Implications for teacher education are drawn from the findings.

**Key words:** Semantic mapping; Kindergarten teacher education; Reflective thinking

## INTRODUCTION

### Definition, Features and Purposes of Semantic Maps

The terms *semantic webbing*, *semantic mapping*, *concept mapping*, *knowledge mapping*, *word webbing*, *networking*, *clustering*, *mind-maps*, *think-links*, *idea branches*, *structured overviews*, *graphic organizers*, *semantic networking* or *plot maps* (Buzan, 1974; Brooks, 1997; Clarke, 1990; Fisher, 1995; Heimlich and Pittelman, 1986; Novak, 1998; Novak and Gowin, 1984; Schwartz and Parks, 1994) have been used to refer to a variety of strategies designed to portray, graphically and visually, a relationship of concepts or ideas. Although these terms are used to refer to a similar strategy, some (for example, Fisher, 1995, p. 63) have made distinctions between *thinking maps* and *concept maps*, distinguished mainly by the level of connection. In thinking maps words/ideas are merely listed as in brainstorming, whereas in concept maps the relationships among words/ideas are shown. For the purposes of the present paper, the terms *semantic*, *concept*, *cognitive* or *mind map* are used synonymously.

There are essentially two aspects to a semantic map, namely the visual and the conceptual aspects. In visual terms, a semantic map is an arrangement of shapes such as boxes,

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rectangles, triangles, circles, and so on, connected by lines and/or arrows drawn between and among the figures. In conceptual terms, a semantic map contains “verbal information within and between the shapes which create a pattern and/or relationships of ideas” (Fisher, 1995, p. 68). As “knowledge representation tools” (Novak, 1998, p. 3), semantic maps should be read from top to bottom, starting with the higher order (more general) concepts at the top and proceeding to the lower (more specific) concepts at the bottom. They may be characterized by crosslinks that show relationships between ideas in different parts of the map.

According to Fisher (1995), learning a concept is a gradual process in which the learner builds up successive approximations. Finer and finer distinctions are made, and the learner increases understanding by developing and widening the network of related ideas while approaching closer to the common understanding of a culture and to the knowledge structure of experts. This is not an “all-or-nothing” process (Fisher, 1995). The use of semantic maps (thinking maps or concept maps) allows the learner to create an understanding of the world by making connections, by creating links, by exploring and testing links – a basic process of all creative thinking. Thus, creating a semantic map is one way of representing and communicating one’s understanding of concepts.

To this end, cognitive/semantic mapping serves many purposes. It allows us to explore our understanding of key concepts and helps us to make meaningful patterns of our knowledge and understanding by showing us the links between ideas. It is also an aid in the planning process (planning of an activity or project) since it shows how we categorize, link, and organize ideas. Moreover, it is a visual means for communication and evaluation, since it stimulates active thinking, the cognitive skills of analysis, categorization, synthesis and reflection on the key elements of what we know or have done. All these advantages make this visually oriented strategy applicable within the context of any topic in the school curriculum. Thus, mapping strategies allow teachers and teacher educators to cover topics in greater depth, where meanings can be identified and created in an organized and ongoing way as the maps provide a framework that can be viewed, elaborated on, adapted and developed over time (Fisher, 1995). Concept maps, therefore, can be highly useful to learners, teachers and administrators as an “instructional and evaluation tool” (Novak, 1998, p. 38) as they move towards an understanding of shared meanings and the creation of new knowledge. Concept maps facilitate the move from “representational meaning to richer conceptual meaning” (Fisher, 1995, p. 65). Moreover, such maps allow connections between ideas/concepts to be made explicit by means of discussion or though the words being written along the lines connecting the concept words (Fisher, 1995). Learners, teachers or even administrators not only receive information, but they also need to interpret, re-think and relate it to their own schemas of understanding (Dunne, 1997). There is information flow to, from, and among students, teachers and administrators. Thus, the strategy is a useful procedure for investigating, visualizing and organizing information (Novak, 1998).

There are a number of different map structures that can help students to represent and organize what they know and can find out. Simple concept maps create a semantic web from a simple idea or concept, while “hierarchical concept mapping” (Fisher, 1995, p. 68) is a more advanced strategy to organize concepts into a hierarchy. Information in a concept map can be organized in different forms: in a “linear” (Fisher, 1995, p. 69) arrangement, in a “geometric” (Fisher, 1995, p. 69) form, or in any other “free flowing organic” (Fisher, 1995, p. 69) structure. One of the commonly used patterns is one that looks like a web. There are several advantages of employing a form in which a pattern is worked out from a central idea. First, the central/main/key idea is clearly defined. The relative importance of ideas can be clearly highlighted, or placed in closer proximity to the central idea. Also, the links between ideas can be clearly shown. The visual/graphic structure of the semantic map provides a clear overview/review and its unique patterning makes for easy memory and recall. It is also easy

to add to or adapt the map, and its open-ended nature encourages connections between ideas. The process of semantic mapping thus facilitates learning. The more advanced strategies have all these advantages in addition to showing relationships in a hierarchical form.

### **Rationale for Using Semantic Mapping as a Strategy for Facilitating and Assessing Reflective and Critical Thinking in Skills in Student-teachers**

A traditional mode of assessing student-teachers is by means of essays. The main disadvantage of essays is that they are time-consuming to write and time-consuming for the instructor to read and evaluate. But even after expending this effort, it is still difficult to assess student-teachers' ability to see relations between ideas or to find out how they see the structure of a large topic. Concept maps, on the other hand, focus more specifically on the structure and linking that the student perceives. For this reason, this mode was selected over essays as a means of assessing student-teachers' understanding. A map can reveal very quickly a complex structure of ideas about sophisticated concepts or can show multiple links between concepts. This can be supplemented with interviews following completion of the map, in which the interviewer can elicit the constructor's opinions and tap the reflective and critical thinking processes that went into the creation of the map (Loughran, 1996).

The semantic or cognitive map is a useful artifactual tool for probing student-teachers' understanding – whether it is to explore understanding of a limited aspect of the topic, to see whether they are able to relate distinct topics, to find out whether they appreciate that concepts are the key ones, to identify changes in relations that they perceive between concepts, to promote discussion or, more fundamentally, to check whether students understand the reasons for a lesson. The assessment mode for the present study that was introduced served all of these purposes (White and Gunstone, 1992). For example, concept maps were used in this study as an assessment to probe the student-teachers' understanding of practical application of theoretical principles; to test their understanding of the relations between key terms within particular topics, even those that might otherwise be seen as distinct and unconnected. In fact, student-teachers were asked to relate different subject areas in the hope that this would awaken them to the possibility of, and the need to look for, links between topics. Initially, for some of the components of the module "Further Studies in Kindergarten Curriculum", student-teachers were asked to do a concept map before a series of lessons, and again at the end. The rationale was that concept mapping, being more open than a pre-test, would be less threatening. Moreover, a comparison of the maps before and after the series of lessons would reveal much about the developments in the student-teachers' knowledge. For the student-teachers themselves, an analysis of their own maps and reflections about these changes would provide further information about their understanding as well as a powerful learning experience. The before and after concept maps (see Figures 1 and 2) were used to identify changes as they occurred in the course of a sequence of instruction, as well as just between the beginning and the end. The concept map thus revealed student-teachers' perception of key concepts or a whole set of concepts, so that misconceptions or key problems in their understanding could be identified and their understanding of particular concepts improved. In this sense, the concept map allowed a light touch in probing student-teachers' capacity for reflection and critical thinking and the changes that might have occurred.

### **The Need to Model Reflection in Teacher Education**

Reflection may be defined as "the deliberate and purposeful act of thinking which centres on ways of responding to problem situations in teaching and learning" (Loughran, 1996, p. 14).

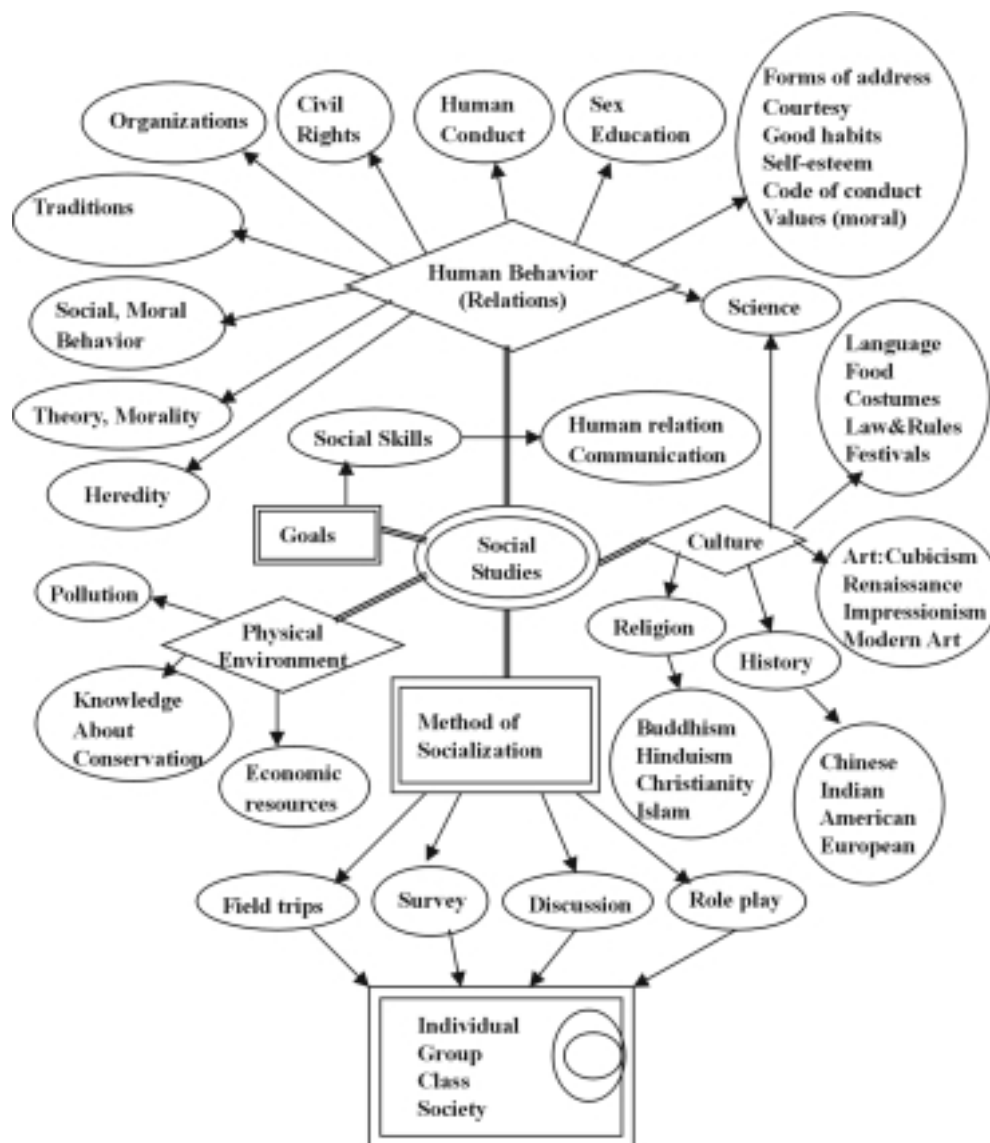


FIGURE 1 Second map drawn by a student-teacher for the Social Studies component.

The purpose of reflection is to understand a problem or situation and to solve the problem better. Steps in the reflective cycle include suggestions, problem, hypothesis, reasoning and testing (Loughran, 1996). To enhance use of reflection in teacher education, many important social and artifactual tools such as journal writing, seminars, discussions, and concept maps have been employed. However, these alone are insufficient for genuine understanding of reflective practice. Teacher-educators need to model reflection explicitly for their students, and to use reflection to guide and inform their own practice.

Loughran (1996) advocates modelling reflective practice to help student-teachers to perceive, experience, and construct an understanding of the nature of reflection from teaching and learning episodes in which they are active participants. Modelling reflective

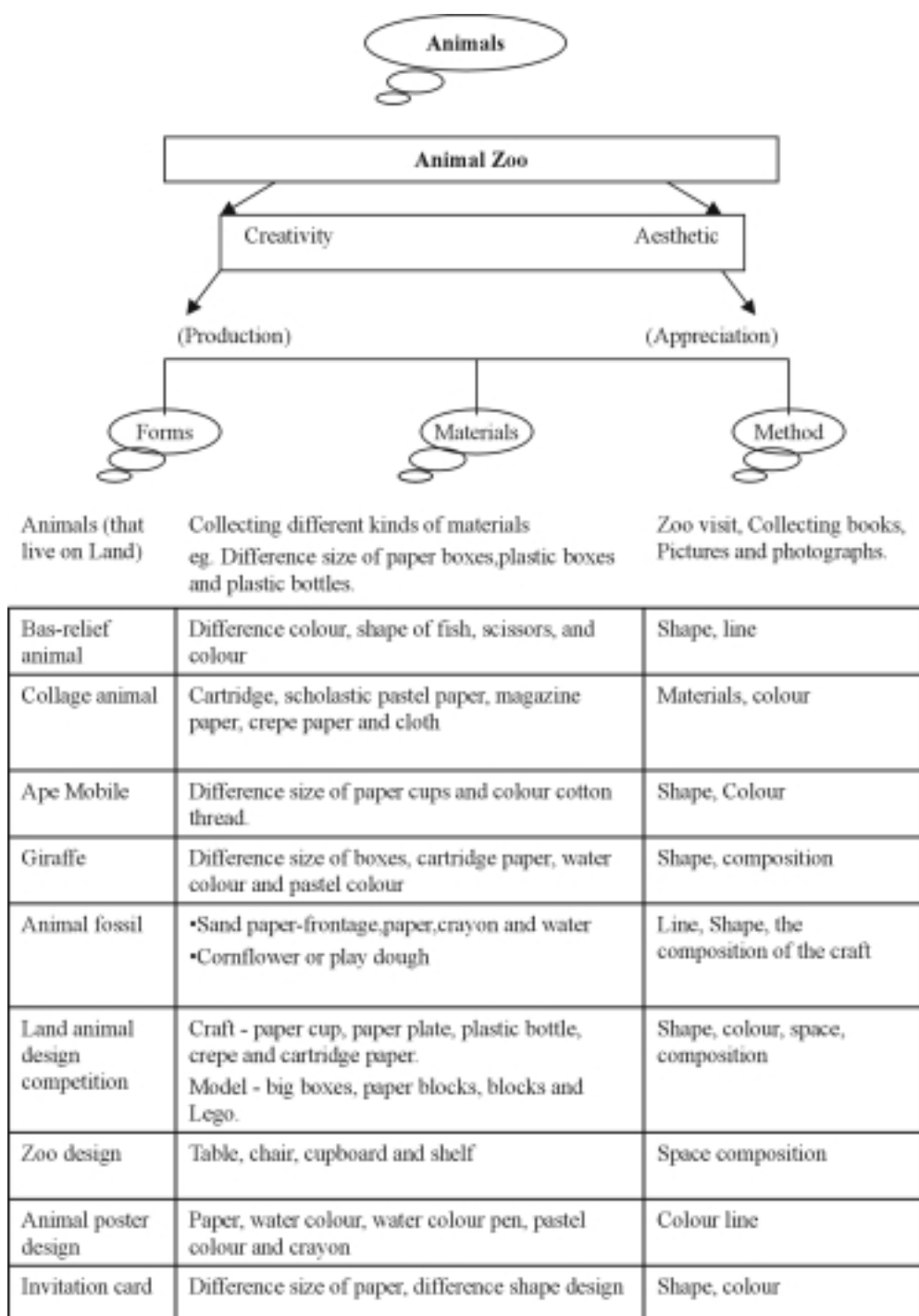


FIGURE 2 Second map drawn by a student-teacher for the Art component.

practice involves much more than displaying the skills of an expert teacher. Teacher-educators need to show student-teachers that they have to experiment. Within this exploratory context, the message to get across to student-teachers is that mistakes and confusions are inevitable, and viewed as necessary for growth. The teacher-educators' own capacity for reflection on teaching is important and must be made evident to the student-teachers since reflection resides in the individual's mind and is difficult to observe directly. Teacher-educators need to let student-teachers hear what they are thinking if they are to model reflective practice so that student-teachers can really be involved in experiencing and understanding the processes that shape the planning, implementation and reviewing of the instructional process.

How can teacher educators make modelling reflective practice evident for student-teachers? Schon (1987) describes three forms of modelling. The first model involves experienced practitioners being able to demonstrate and describe their pedagogical knowledge to their student-teachers. The student teachers then attempt to develop and imitate the use of that knowledge from these demonstrations and descriptions. In the second model, student-teachers are encouraged to take the lead in reflective inquiry. The experienced practitioner then follows the student-teacher's line of inquiry, commenting, advising, and offering alternatives as the need arises. The student-teacher is able to question the problems of practice that occur in that setting. In the third model, the experienced practitioner needs to be an example of what the student-teacher is trying to understand and develop in his/her own practice. Student-teachers need to experience what it means to be a learner in the practice situation so that they can then reflect the position of the learners when they are teaching. There are important aspects of each model that would be called upon at different times, under different circumstances, and in different situations to help student-teachers learn about reflection.

Since reflection occurs in response to apprehending and attending to a problem, difficulty or concern, contextual issues of teaching and learning should be considered, such as the content of teaching and learning, the teacher-educator's understanding of content, his/her previous experience with the same group of students, the nature of the student-teachers, their content knowledge and their experiences, and the characteristics of the physical and temporal setting.

A distinction could be drawn between planning and reflection on action (a way of apprehending and attending to a situation in anticipation of the experience). "Anticipatory reflection" (van Manen, 1991b, cited in Loughran, 1996, p. 20) is a means of accessing or framing a problem situation before it occurs. This enables us to deliberate about possible alternatives, to consciously and carefully anticipate a course of action, plan what we need to do, and anticipate the experiences we and others may have as a result of our planned actions. It helps us to approach situations and other people in an organized, decision-making, prepared way.

Although the process of reflection is important, attitudes may be even more important. The attitude of open-mindedness (being attuned to "seeing"), responsibility (seeing the problem situation in different ways) and whole-heartedness (accepting the consequences of action) may be more critical to the reflective process than the specific steps of the process itself. Enhancing these attitudes in student-teachers is an important precursor to reflection. Individual student-teacher's preparedness for reflection varies from individual to individual. Student-teachers need to be educated rather than trained in reflection so that they perceive its value as well as the value of modelling reflective practice.

When a student-teacher reflects on practice will influence the subsequent learning from that experience. Reflection can occur before, during and after an experience. Again, student-teachers need to learn through experience about these "times" of reflection.

## **A Conceptual Framework for Learning about Reflection**

Loughran (1996) makes use of a conceptual framework to represent the relationship between the teacher-educator's modelling of reflection and his/her student-teacher's learning about reflection. Both the teacher-educators' modelling of reflection and the student-teacher's learning about reflection are represented as problem situations that are overtly explained and attended to through the teaching process. These (the teacher-educator's modelling of reflection and the student-teacher's own learning) in turn have an impact on the developing pedagogy of the student-teacher. Loughran's (1996) conceptual framework is aimed at making the tacit explicit through modelling – to be done by probing, inquiring and challenging the student-teachers' attitudes and reflective processes in the context of learning about teaching.

## **METHOD**

### **Sample and Procedures**

Two cohorts of kindergarten teachers/principals (termed student-teachers in the present study) undergoing the Certificate in Kindergarten Education Course conducted at the Hong Kong Institute of Education had to complete several components of the module "Further Studies in Kindergarten Curriculum". As part of the assessment, they were required to complete mind maps before and after they completed the components: Art, Social Studies, Mathematics, and Science. The sample included 58 student-teachers, representing about 67% of the 1997–1999 cohort. An additional 29 student-teachers, representing about 25% of the 1998–2000 cohort, were also included in the sample. These student-teachers completed the component of Language that was also part of the module "Further Studies in Kindergarten Curriculum".

A sample of the students' mind maps were analysed according to several identified criteria (see Lim, Chan-Cheng, Lam and Ngan (2001) for details concerning the analysis of characteristics of the maps), and a smaller random sample of these students was also interviewed in order to gain access into their thoughts, feelings and actions in applying the strategy. This method has been recommended by Novak as the "most powerful tool for capturing the knowledge held by an individual or group of individuals" (1998, p. 101).

### **Criteria for Assessing the Semantic Maps**

The criteria for evaluating individual semantic maps were decided upon based on a review of relevant literature (Fisher, 1995; Novak, 1998). The four investigators of the present study considered the levels of explanation outlined by Fisher (1995, p. 61). These included "labelling" (where no explanation is given), "enumerating" (odd facts are given), "making a link" (contiguous ideas are paired up), "identifying common characteristics", "identifying concepts as belonging to a class", and "identifying concepts as belonging to a pattern or hierarchy of concepts as relating to other patterns of concepts". In addition to these characteristics, the investigators also considered the criteria suggested by Novak (1998, p. 192): "creativity" in the organization of the map, selecting important, relevant concepts to add to the map, and searching out "salient cross-links", indicating relationships between concepts in different sections of the map. Thus, the investigators arrived at the following criteria for assessing the semantic maps within the study: clarity, relevance, integration, organization and creativity. Each semantic map was evaluated on each of the five criteria up to a maximum score of three marks per criteria.

The criteria for assessing the semantic maps are defined as follows.

1. “Clarity” refers the clarity of the content knowledge reflected in the semantic maps drawn by the student-teachers as well as the clarity of structure of the maps for representing content knowledge.
2. “Relevance” refers to the appropriateness of the content knowledge (concepts) expressed in the map as related to the subject areas (Social Studies, Mathematics and Science, Art, Language) and the specific “theme” of the individual map.
3. Both “integration” and “organization” refer to the overall quality of the map in reflecting the complexity of relationships among the concepts/propositions portrayed in the map. Novak and Gowin (1984) refer to three features of hierarchical structure that incorporate the idea of “subsumption”, “progressive differentiation”, and “integrative reconciliation”.
4. “Creativity” refers to the extent to which the student-teacher has used creative ideas (creative structures) to represent content (subject matter knowledge/content).

A process termed “grading moderation” was carried out to ensure consistency in the scoring of the semantic maps. Before grading was carried out, the investigators selected a sample of maps representing “Excellent”, “Very good”, “Good”, and “Pass” grades. These were then scored by the investigators individually. The scores for each map for each of the five grading criteria of “clarity”, “relevance”, “integration”, “organization” and “creativity” were then compared and full agreement was obtained on the score to award for each criteria. After this process was completed, the investigators proceeded to score the semantic maps using the five criteria that had been agreed upon.

### **Personal Interviews with Student-Teachers**

Interviews (mostly one-on-one) were conducted with two to four students per component (three for the Social Studies component, two for the Art component, four for the Mathematics and Science component, and three for the Language) in which interviewers asked the following questions:

1. Do semantic maps help you to understand the specific subject?
2. How do they help you?
3. How do they help you to design the thematic map?
4. Do you think we should continue to use semantic maps as an assignment in the subject modules?

These questions probe and capture how the interviewees think, feel and act towards the experience. They are also designed to ascertain how student-teachers have benefited from utilizing the strategy.

### **Self-Reflection of Teacher-Educators**

The teacher-educators who had taught the four components (and who were also the investigators of the present study) wrote down their self-reflections after the whole process of teaching, grading and interviewing was completed. These self-reflections were analysed to cull common concerns and strategies for improvement.

## **RESULTS**

### **Affective Outcomes for Student-teachers**

Initial responses differed from final responses, which were far more positive.

#### ***Student-teacher 1***

Student-teacher 1 was very positive about using semantic maps as a tool for helping students make sense of the learning process in Social Studies component. The clear and simple presentation helped to clarify her thoughts. The map helped her to identify whether the planning was comprehensive. She treasured the experience and she has now adopted the semantic map for designing lessons with her colleagues in the kindergarten.

#### ***Student-teacher 2***

She mentioned that the semantic map helped her to think beyond her usual pattern of thinking. She found herself improving her lesson-planning skills in terms of width and depth. She elaborated by saying that the use of words in writing a lesson plan limited her to a particular sequence of thinking that could not be extended further. The use of semantic mapping in designing a lesson offered an alternative to her ordinary thinking, and that was the thing she treasured most.

#### ***Student-teacher 3***

Student-teacher 3 reported that the mastery of mind maps was very useful to her. She used this in brain-storming, thinking of other assignments, planning things in school, and even her kindergarten has adopted this as a tool for lesson planning. She found semantic maps to be simple, clear, comprehensive; it was easy to have a holistic view of the meaning between concepts from the map. "Words can be lengthy and open to interpretation, but the use of mind maps can minimize diverse interpretation." She mentioned that the linking among concepts in the semantic map helped her to identify and extend beyond the links more easily, and thus she valued highly the experience of using semantic maps.

#### ***Student-teacher 4***

She found the cognitive map useful as it helped her to think clearly and in more detail. It was easy to read the content and the main points. She mentioned that the map provided an avenue for thinking more widely about the topic. Initially, she did not know where to start when creating the map. It was also difficult to guess the criteria for assessing the map. There was also confusion among the different components (Art, Social Studies, Mathematics and Science) within the module of "Further Studies in Kindergarten Curriculum" in terms of how semantic mapping was presented.

#### ***Student-teacher 5***

She also found the map useful as it made for clearer and more detailed thinking. It was also easier to read the content and the main points. She was afraid of going on the wrong track in her thinking. She now uses the map in her daily lesson and curriculum plan. She uses it as a tool in brainstorming and then for grouping ideas and sequencing them. She hoped that the teacher-educators could introduce the map in a concrete way.

### ***Student-teachers 6, 7, 8 and 9***

Student-teacher 6 stated that creating semantic maps helped her to synthesize her understanding of a specific subject within a theme. She found she could converge on identifying the key concepts within a theme, organize them, and link them according to the relationships of the concepts in hierarchical form. Moreover, the visual and graphic presentation of the map made the concepts easy to read and remember. Thus, it was easy to check for missing concepts and more convenient to add missing concepts. In her own words: “It (the semantic map) leads me to think about the key concepts within the theme as if a map can display the key concepts clearly”.

The following are comments by student-teachers 7, 8 and 9:

Basically, understanding the subject content is not related to the semantic map. However, if I get all the concepts in mind, a semantic map can help me organise and link the key concepts into categories according to the inter-relationships of the subject contents. Putting down the key concepts in a graphical way helps me to present the outline of the subject content in a clearer way. I think it is a process of synthesizing key concepts of a specific subject. Also, it is easy for me to remember the key concepts by means of visual images. (Student-teacher 7)

When using paragraphs to present concepts, one may miss some points. But, at the same time, it is difficult to think of the content and use appropriate words to express ideas precisely and effectively. By contrast, using a semantic map is a graphical way that is easy to read and check if key points are missing. It is convenient to add missing concepts in the map. Actually, it is useful for me. (Student-teacher 8)

By drawing a semantic map, I can understand what I am thinking and know about the subject, and understand the direction of my thinking. (Student-teacher 9)

All the interviewees agreed that it was worthwhile retaining semantic maps as an assignment in these subjects. All of them expressed that the process of devising semantic maps could help them to think more comprehensively of alternative contents for the teaching of specific subjects. Also, the presentation of semantic maps in visual and graphical form could help them brainstorm and synthesize the key concepts of specific subjects in a theme.

However, one student-teacher pointed out that usefulness depended on the thinking style or learning strategy of a student. If a student liked thinking or was used to thinking, it was good for them and would not be too difficult. On the contrary, if a student was a passive thinker, he/she might feel insecure and anxious and as if they had been thrown into the deep end of the pool. It is because the student was not used to thinking in this way.

All the student-teachers pointed out that they valued and used the semantic map in their daily practice. One student even reported that the use of semantic map in daily planning of curriculum and school activities helped her communicate her planning with colleagues more effectively. Others found that they could plan and organize the teaching content for a theme more comprehensively. One reported that, since the key concepts are easy to remember, she could guide the implementation of an activity with the aims clearly in mind.

In daily practice, when designing the teaching content of a theme, I am always bound by the teaching kits. I seldom derived the teaching content from the subject itself. However, by devising the semantic map, I can derive the subject contents from the theme itself and even those omitted in the teaching kits. (Student-teacher 8)

Above all, these student-teachers provided valuable opinions for helping students pick up thinking skills in planning their teaching content. Although they had mentioned many advantages, there were some difficulties encountered in the process of making a semantic map. They remarked that they needed more input on the skills in making semantic maps, such as the skills in organizing the relationships of the concepts as well as understanding the subject knowledge.

This kind of thinking was new to students. Some of them might feel insecure when trying to devise the map such as not knowing the skills in creating the hierarchy of a map. However, the most important point was that lecturers should help students to have a clear blueprint of the key concepts of the subject knowledge. (Student-teacher 7)

### ***Student-teachers 10, 11 and 12***

These student-teachers had the following comments:

Making semantic maps was something new to us. This was an unusual way of representing our thoughts on paper. And we were unsure of how to do the map. We did not know which concepts to include. So, we had to find out what we needed to know. We had to do a lot of library research. Also, we were worried about how accurately we could portray the concepts. When we got down to doing the map, we realized that there was more to it. As the subject-matter was very wide, we had to make a decision as to what should be included.

Three of us decided to collaborate as a group. We would make use of the same theme but each of us would take a different level (choosing from K1 to K3). This worked out well because there was no repetition of learning activities across the levels. We could focus on developing the theme in terms of its width and depth. Previously, we used words to describe what we would include. We also made use of curriculum materials kits. But, these materials may not be appropriate for the kindergarten or the grade level. When we used semantic maps, it was possible to see clearly whether the content was appropriate for the kindergarten or the grade level. We were also able to work out the best schedule for teaching or introducing the activities, bearing in mind the availability of resources, and the amount of time required. In other words, we were also able to adapt the curriculum materials in the kits to gear them to the needs of the children in our kindergartens. In this way, we maximized use of the semantic maps and were also able to minimize overlap between levels. (Student-teacher 10)

At present, we are making use of concept maps in our kindergartens to plan the lessons and the curriculum. The results are satisfying because the plans are logical and systematic, as well as appropriate to the developmental level of the children. We are also able to consider aspects such as duration of time needed for each theme, whether the resources are available and so on. (Student-teacher 10)

The success of using this strategy depends on various factors such as the knowledge background of the person doing the map. If there is a knowledge gap, this needs to be filled in first. We also need to demonstrate the process of how to create the map step by step. Then we need to let the teachers try out the process and practise doing the maps. Once we can determine where the problem lies, it is much easier to tackle it. We need to pitch it at the right level. But once the teachers realize their own deficits, it is much easier to proceed from there. (Student-teacher 11)

We admit that initially we were anxious about the assignment, but now we see the value of the semantic map beyond that of being just an assignment. It is a useful tool for us in planning our lessons and curriculum. (Student-teacher 12)

## **Affective Outcomes for Teacher-educators**

### ***Teacher-educator 1***

I was responsible for the component of Social Studies in the Further Studies in Kindergarten Curriculum. I taught three classes, two of which were conducted in the first semester while the other one was in the second semester.

When designing the assignment, the module convenors in charge of other components of Mathematics and Science, Art and Language and I thought of using semantic maps as a tool to probe the understanding of the module content of the student-teachers. The premise of the assignment was the use of semantic maps to represent what the student-teachers already know about the subject content. The Social Studies teacher-educators perceived the problem of the learning and teaching to be how the student-teachers can transform the element of Social Studies into a theme which was used in the present curriculum in the preschool setting.

However, unexpectedly, the use of semantic maps created a lot of anxieties and worries for the student-teachers as it was the first time they were required in an assignment to represent their thoughts in a graphic form instead of in an essay. Besides, different teacher educators dealing with the assignment had their own interpretation of “what” and “how” to transform student-teachers’ knowledge into the maps. Thus, there was a mismatch of perceived problems between the student-teachers and myself (the teacher-educator).

My teaching strategy was influenced by my perception of the problem that the student-teachers would encounter, which was how they could devise a curriculum to promote the socialization process of young children. The pedagogy I employed was mainly aimed at making student-teachers realize the problem in their existing curriculum and the alternative measures which they could employ to improve their present strategies. The issue of using the semantic map as a tool for the assignment was left totally to the student-teachers themselves.

Student teachers therefore sought help from me as the assignment deadline came closer and closer and they thought that they were totally unprepared because they could not devise “the best way” of creating the semantic maps. Even though briefing sessions had been arranged to explain the assignment, student-teachers were still overwhelmed with anxieties and worries. I was a bit frustrated at this point of time because I did not quite see why the semantic map would cause so much worry. Discussions with the convenors of the other components went on continually and yet there was little we could do to ease student worries at that point of time.

The experience of teaching Social Studies the first round made me alter my perception of the problem and eliminate the mismatch of the perceived problem between the student-teachers and myself. In order to achieve more effective learning outcomes, adjustments needed to be made in the class taught in the second semester. I thereby tried to incorporate practices of semantic mapping in the teaching and learning process of the module, such as demonstrating how to create the semantic map in class, how to categorize concepts tapped from brainstorming, asking small groups to present their discussions by means of webs, charts, etc. By so doing, I could actually coach the student-teachers to make sense of their thoughts by means of other forms of representation appropriate to their own contexts. Besides, I also shared with the student-teachers the difficulties of semantic mapping as identified in the earlier groups. With these changes, student-teachers taught in the second round were less anxious about the use of semantic mapping and they did not find the use of graphic representation so threatening. They approached their assignment with much more confidence than the student teachers of the first round.

To conclude, though skills in creating the semantic map is one of the crucial factors, psychological preparation of the student-teachers who did not have prior experience in doing such assignments was also found to be significant in helping student teachers to meet new challenges!

## **Teacher-educator 2**

Initially, I did not perceive any problem so I did not have any negative feelings. I started to feel frustrated after the meeting with the art module team members and the unexpected mismatch among us about the content of the semantic maps. Besides this, there was also much argument about the content of the map with other teacher-educators. Furthermore, student-teachers were more and more frustrated after they had worked on the Social Studies maps and the Mathematics and Science maps. They seemed very confused about the content of the three maps. This unexpected negative reaction from students-teachers made me feel that I was engaged in battles. It was not only the battle among teacher-educators but also among student-teachers

At first I tried to create a map based on the content of the module in as creative a way as possible. My fellow teacher educators did not accept the map because they thought that it was too complicated for student-teachers to understand. The mismatch in concept about the semantic map forced me to rethink the content in terms of what student-teachers could understand. After discussion of the other module convenors (those heading the teacher educators teaching the different components of Further Studies in Kindergarten Curriculum), there emerged a consolidated picture of the semantic map for students. The many questions really pushed me to think and rethink. Finally I realized the need to understand the student-teachers’ level of thinking and to work out an appropriate semantic map for myself before I could instruct the student-teachers.

Since student-teachers were frustrated, lots of guidance about the content of the semantic map was given. Examples were provided in order to relieve their anxiety. Though this might influence their thinking about the semantic map, it seemed that this was the only way for solving the problem in a very short period of time.

The discrepancy in perceived problems among lecturers and student-teachers caused the difficulties in teaching this module. It was difficult to come to a compromise regarding the perceived problems and solve these problems together. The most difficult thing to overcome was that different teacher-educators had different concepts about semantic maps. One of my colleagues was concerned about what module content could be put in the map. Some colleagues were concerned about how to mark the semantic map. Many students kept asking: “What content can I put in the map?” and “How can I do the map?” Some students were worried about the grading criteria. My problem was how to deal with the questions and the arguments that went on. Although examples were given in the hope that this would solve the problem, it seemed that this did not work well. I finally realized that the strategies of creating a semantic map should have been introduced more clearly.

### **Teacher-educator 3**

Initially, when the module convenors of “Further Studies in Kindergarten Curriculum” agreed on the mode of assessment (devising a semantic map for each component), I did not expect that this assignment would create fear, anxiety and frustration in the student-teachers and that I would be affected by these feelings as well. During and after my first round teaching, student-teachers expressed that they were new to this mode of assessment. They did not have confidence in the technique or in their own content knowledge of Mathematics and Science required for devising the map. Also, they worried about the fairness of the marking since different module lecturers were marking the assignment. As this assessment method was new to the module teaching team (teaching the Mathematics and Science component), they had many questions regarding the method and the criteria of marking the assignment since they had different interpretations regarding the grading of the semantic maps.

As the module convenor of Mathematics and Science, I was responsible for coordinating the teaching of the module to ensure a high quality in the teaching materials, implementation of teaching strategies and assessment. Student-teachers’ anxiety and frustration and fellow team members’ questions impelled me to respond to them and look for solutions. In order to solve the problems raised by team members and encountered in teaching, I clarified my own understanding by searching for literature on semantic mapping since I was also new to use of this assessment tool. Through sharing and discussions with other module convenors who were also facing similar problems in their teaching, we provided mutual support and came to a consensus on the assignment which would be explained to student-teachers and fellow team members. In fact, both the affective support and mismatch encountered were catalysts for me to reflect on my teaching and change my teaching strategies in the second round of teaching.

During the first round of teaching, I perceived that students were experienced teachers and they were familiar with the kindergarten Mathematics and Science curriculum content, so my focus was on teaching the theoretical framework for Mathematics and Science curriculum planning and pedagogy in kindergarten practice and reflecting on their own practice. However, I discovered that students were not clear about Mathematics/Science concepts for young children. Also, students were new to this tool as a means of expressing the concepts of Mathematics and Science; they had attempted this tool only once in class group work. I gave them a reference sheet providing some examples of different forms of semantic maps. I did not perceive that techniques for devising a semantic map would present a problem for student-teachers. When they expressed their anxiety and frustration in devising the semantic map in the third component, a briefing session was organized to clarify students’ understanding of the grading criteria (namely “clarity”, “relevance”, “integration”, “organization” and “creativity”) in order to ease their anxiety and frustration.

In the second round teaching, I changed my teaching strategies, since I anticipated that students would have problems in Mathematics/Science concepts for young children as well as the techniques in devising semantic maps. In order to deal with the perceived problems, some strategies were adopted. Firstly, when preparing notes for students, I transformed some notes into a semantic map format (see Figure 3) to demonstrate how semantic maps could be used to express and categorize ideas of a theme. I did this in order to familiarize student-teachers in the use of semantic maps. Then, before they attempted to devise their semantic map in groups, I briefly introduced the Mathematics/Science concepts for young children. I also provided them with more references than I did for the first round of teaching. These were given to them before the lessons so that they could read them and think about the contents. They were then required to try out the strategies related to these concepts in small groups so that they could get peer support and first-hand experience in devising the maps. Then, analysis of their maps in class helped them clarify their concepts and skills and exposed them to the maps devised by other groups. To obtain consensus among the teacher-educators’ on the marking criteria, a discussion meeting was organized with the help of the course coordinator.

Thus, there was a change of focus between the first round and the second round of teaching. In the second round, the focus was more on the process that was made more explicit to the student-teachers. The shift of focus helped to reduce fear, frustration and anxiety in the student-teachers.

### **Teacher-educator 4**

The component I taught was last in the sequence of components to be taught in the “Further Studies in Kindergarten Curriculum”. Thus, I had the advantage of learning from the mistakes of others not to repeat them myself. My colleagues’ feedback regarding their own difficulties and the problems the student-teachers encountered were valuable in helping me design the activities I conducted to try to alleviate student-teachers’ perceived problems.

Based on these advantages and the wisdom of the past experience of my colleagues, I perceived the problem to be twofold: one was the problem of content and the other was the problem of how to create the maps to present the content as well as to integrate different components of the module. In order to address the first problem, a series of three lectures was designed to ensure that student-teachers understood the basic concepts

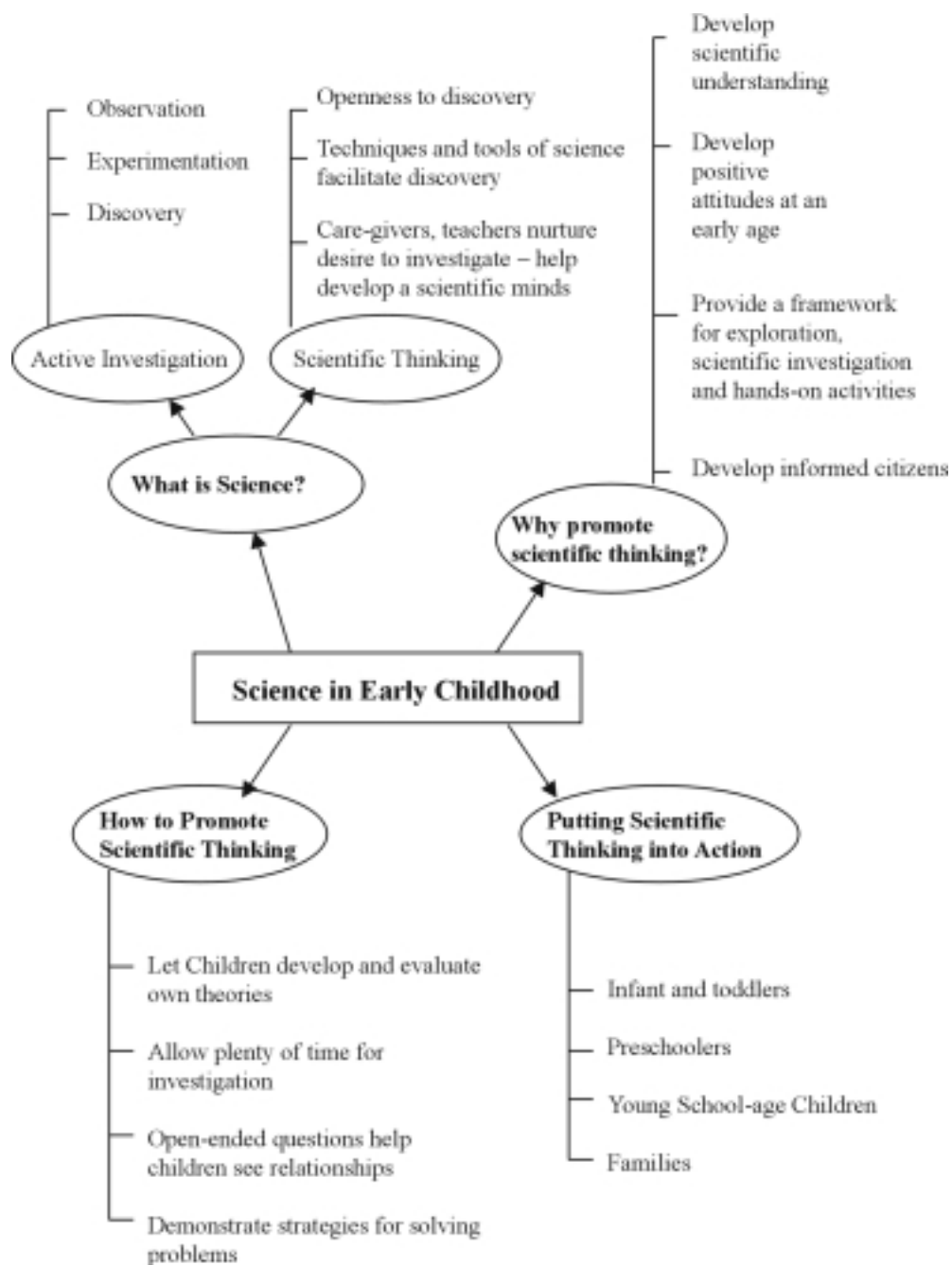


FIGURE 3 An example showing how to transform notes into a semantic map.

and strategies that they needed to present this content. The last lesson in the series was solely devoted to how to create the semantic maps. Student-teachers were provided with samples of maps that represented those that they would have to create. We highlighted the processes such as brainstorming, categorizing, and ranking. Steps in each of these processes were briefly explained with illustrations provided. Student-teachers had also gained from previous experiences when the other components were taught, in which these processes were demonstrated, and student-teachers were actually required to experience the steps/processes involved in the

strategies. Group discussions were also held in which student-teachers discussed the content of the maps and experienced the strategies for themselves. Student-teachers were asked to create the maps for the Language component based on one they had created for either Social Studies or Mathematics and Science. This helped them tremendously as the focus was on how to integrate the language content into an existing map rather than creating a completely new map from scratch. Thus, the mismatch in the perceived problems between teacher-educator and student-teachers was minimized. There was also very little disparity in terms of the content of the semantic maps among teacher-educators in the team. These differences, if any, had been ironed out during the discussions that had taken place before the team started teaching the component. There was high consensus as to what should be taught and high agreement on what should be presented in the semantic maps. Nevertheless, the team still felt that more time could be spent on teaching the strategies of creating semantic maps. I personally felt that if I had modelled reflective practice throughout the four sessions, I would have achieved better outcomes.

### **Summary of Affective Outcomes for Student-teachers and Teacher-educators**

Student-teachers' initial responses to the use of semantic maps as an assessment mode were largely negative. This was partly due to the fact that they were not familiar with this mode of assessment. They were used to essays and tests/examinations or individual/group assignments as modes of assessment. They were also not used to representing their thoughts in graphic form (in semantic maps). Consequently, their fears/apprehensions and worries/anxieties were related to how they should create the maps in order to complete the assignment, the criteria for assessing the maps, and whether steps would be taken to ensure fairness and consistency in the marking. Some of them could see no purpose in doing the cognitive maps initially. Many of them had not been trained to use the maps and might have been reluctant to do them. However, once their negative affective responses were alleviated, they did appreciate the usefulness of semantic maps as an assessment mode. They also appreciated the value of semantic maps as a tool for thinking, and reflected increasing use of this tool in their own thinking. The student-teachers expressed the feelings that the use of semantic maps enhanced their ability to think in greater detail, to integrate their thinking and to thinking holistically. In fact, many student-teachers have begun to use semantic maps as a means of planning the lessons and the kindergarten curriculum as the tool facilitated their own and staff-members' ability to perceive gaps or overlaps in content and promoted the development of a more integrated curriculum.

Initially, too, the teacher-educators encountered differences in perceptions among themselves and others who were also in the teaching team and had to contend with resistance to change. For the teacher-educators, it was a relatively new mode of assessment to which they were not accustomed. There were differing views of what constituted semantic maps, the purposes of the maps, the criteria for assessing the maps. The teacher-educators were not fully aware of the concepts of semantic mapping, although they were enthusiastic about learning additional techniques that could be used and experimented with in class. Thus, the teacher-educators who participated in this study faced varied views about what they should do and about what the student-teachers' role should be.

Some of the teacher-educators tried to "sell" the idea of semantic maps to the student-teachers. For the student-teachers, it was a change for them to be spending so much time just talking about semantic maps and mapping out their thinking. The strategy was new to the teacher-educators as well as the student-teachers. The teacher-educators found it frustrating that some student-teachers still could not understand the problem of how to create the maps.

Initially, the teacher-educators were enthusiastic about the use of semantic maps as an assessment form. Their enthusiasm might have been dampened by the negative reactions from some teacher-educators and some students. Nevertheless, they persevered until they started achieving successes. Since the beginning of the semester when they started on the second round where this assessment format was used, their optimism was justified and

rewarded. However, there were some things that were disappointing. During the year, they sometimes felt that they were fighting a losing battle. They even felt that their credibility was questioned, their motives doubted, and their patience tested. We were amazed at how difficult it was for student-teachers to understand the problem.

Teacher-educators themselves had been under the impression that it was sufficient to provide student-teachers with examples/models of semantic maps or to train them in the steps/processes of creating semantic maps. They might not have perceived the value of modelling reflective practice and this might have contributed to the apparent lack of positive outcomes initially.

From time to time, the teacher-educators worried whether what they were doing was actually going to enhance effective learning. But they decided that knowing how to make use of semantic maps was important whether it was an assignment or not. Nevertheless, as the year progressed, the teacher-educators became quite pleased with the level of thinking that went on. The student-teachers became better at devising concept maps. The main positive outcomes were that they saw the value of the maps and began using them in their own work – planning their own curriculum, using the maps, and teaching the teachers in their own preschools how to use them for planning the curriculum. The observations of student-teachers were enlightening both in their perceptions of semantic maps and in their own ideas for improvement. However, it was difficult to determine what the changes were due to. Other factors that might have influenced the positive attitudes were the opinions, support and enthusiasm of some of the other teacher educators involved in teaching the modules.

## IMPLICATIONS FOR TEACHER EDUCATION

Within the limitations of the present study, the findings do indicate that semantic mapping is a worthwhile strategy to employ in kindergarten teacher education. This corroborates Novak's (1998) finding of positive outcomes for semantic mapping in terms of comprehensiveness in evaluating learning as well as in terms of students' affective responses.

For student-teachers, semantic maps, a "highly visual and spatial activity" (Fisher, 1995, p. 68), were excellent as a medium for displaying a network of visual information. The concepts/ideas are rendered more transparent and explicit for the student-teacher, thus illuminating his/her own understanding of the key concepts/subject/curriculum. It is also a valuable tool for learning, planning and evaluation. When used as a form of assessment, the semantic map reveals to the teacher-educator not only what concepts the student-teacher clearly understands, but also the gaps in his/her knowledge or misconceptions; his/her ability to categorize, link and organize concepts. In this sense, the semantic map can serve as a mirror for the teacher-educator's own reflective practice.

Despite the usefulness of semantic maps as a useful tool for facilitating reflective and critical thinking, the difficulties of student-teachers in using semantic maps to represent their thinking needs to be overcome. There is a need to provide student-teachers with weeks of practice and constructive feedback in building smaller concept maps before they are asked to construct larger maps. It may be worthwhile at the initial stages to make use of Fisher's (1995) suggestions on how students could be provided with practice in developing thinking maps or concept maps. Practice involves asking students to choose a concept and asking them to list all the words they can think of that are connected with it. They can also be asked to compare the list with a partner to determine similarities and differences in their individual lists. Practice in developing concept maps involves linking the connected words to the central concept word with lines and writing along the lines the relationship between the concept and

connected words. In other words, the strategy needs to be taught in a well-planned and systematic way before positive learning and affective outcomes can be maintained.

Initial problems encountered by teacher-educators and student-teachers were reduced as the semester progressed and as teacher-educators gained knowledge of the value and different purposes of concept maps and additional techniques for teaching strategies for creating concept maps. The more practice they gained, the more positive were the outcomes for learning and reflection on learning.

The frustration, anxiety and worry of teacher-educators and student-teachers could be greatly alleviated if teacher educators could become more involved in reflective practice. It should be pointed out that merely providing examples of semantic maps or demonstrating strategies in creating semantic maps is not adequate. Teacher-educators need to model reflective practice so as to allow student-teachers to experience what reflective practice actually involves. To this end, the third of Schon's (1987) three models of reflective practice might be the most useful. Demonstrating and describing pedagogical knowledge to student-teachers (the first model) was helpful but it did not substantially alleviate student-teachers' anxieties about how to create the semantic maps. The second model was also not effective in alleviating student-teachers' apprehension of the assessment. Some of the teacher-educators commented, advised and offered alternatives whenever necessary. At the same time, they also encouraged student-teachers to take the lead in reflective inquiry. Still, the student-teachers had problems. The third model appears to be most practical as it allowed student-teachers to learn by example and provided them with the opportunity to experience what they were trying to understand and develop in their own practice. Although the teacher-educators who were involved in the present study did undergo the process of reflective practice for themselves, there was insufficient time within the four/five sessions allocated for the teaching of each component to provide adequate opportunities for the student-teachers to experience this practice in action.

Loughran's (1996) conceptual framework appears to be useful for helping us understand the relationship between the teacher-educator's modelling of reflection and the student-teacher's learning about reflection. The teacher educator's overt reflection on practice demonstrates how problem situations are apprehended and attended to, and this, as well as the student-teacher's own learning, affects the student-teacher's developing pedagogy. The present study has demonstrated that it is important to minimize the mismatch between the perceived problem situations of the teacher-educator and the student-teachers.

## **CONCLUSION**

The present study has provided insights into the affective outcomes resulting from the use of semantic mapping strategies as a tool for developing reflective and thinking strategies among kindergarten student-teachers. Initial responses of both teacher-educators and student-teachers were largely negative. The mode of assessment was relatively unfamiliar, and there were differences in: perceptions and understanding of basic concepts such as semantic mapping strategies and reflective practice; the purposes of these maps, and the purposes and strategies of modelling reflective practice; as well as the criteria for evaluating semantic maps. Fears, anxiety and frustration arise from a mismatch between the perceived problems of teacher-educators and those of student-teachers. Strategies applied to alleviating these worries and negative feelings included clarification of the basic concepts, assessment criteria and teaching strategies to be adopted. Most important of all was a realization that modelling reflective practice was essential if student-teachers were expected to experience reflective practice in action for themselves so that they could become reflective practitioners as well.

The affective outcomes from the application of this relatively new mode of assessment motivated teacher-educators to seek strategies for change and improvement that would otherwise not have occurred if more “traditional” means of assessment had been used.

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