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# Use of concept maps in reforming teaching Family and Consumer Sciences in Kuwait

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## Abstract

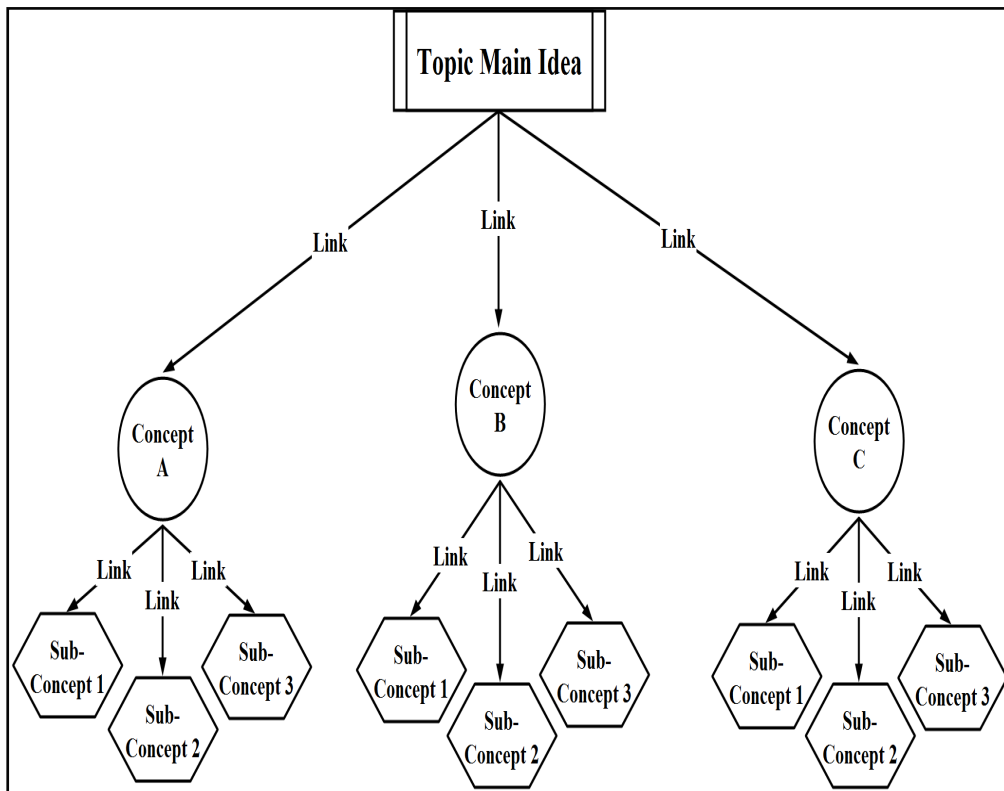
This paper addresses the professional development of Kuwaiti teachers in the use of Concept Maps to teach Family and Consumer Science. A key aim of the study was to evaluate the degree to which the use of concept maps would influence the way Kuwaiti teachers approach and teach Family and Consumer Studies (FCS) subjects and the degree to which concept maps empower students to critically identify and express their knowledge of the subject being taught. A case study methodology was adopted to follow the implementation of lessons using concept maps by four teachers of middle years. An analysis of the data revealed the positive impact that student-centred teaching tools can have on the reformation of traditional teaching environments. For all teachers, the primary strengths of using concept maps were the ability to generate student interest, to motivate student participation and to enhance student understanding of content. Although a case study design may limit the generalisation and comparative value of the study, the findings of this study remain important to the planning of future professional development programs and the use of concept maps within Kuwait's FCS curriculum area.

## Introduction

Kuwait is currently engaging in major educational reform and that new curricula demands in FCS are challenging teachers to adopt contemporary pedagogical practices, especially those guided by a constructivist approach to teaching. Alshatti (2005) observed that while current policy reforms are producing some changes in teaching strategies as evidenced by Ebrahim's (2012) comment that, 'a few schools utilising new methods of instruction such as cooperative learning strategies' (p. 294), many Kuwaiti students often remain passively involved in their lessons and teachers rarely vary from their traditional teaching strategies and skills.

Family and Consumer Sciences (FCS) is about engaging contemporary youth with the knowledge and skills to solve problems related to everyday living in a context where there is information overload through the media and internet. The ability to sift through the informational data, to identify its separate concepts and the relationships among those concepts and the ability to present those concepts in a systematic manner, has been considered 'an essential educational outcome for all students in the 21st century' (Kazakoff, 2009, p.1).

Concept maps are considered important tools capable of empowering students to individually identify and understand the concepts of a given subject, to organise their own perceptions about the relationships between each of those concepts and between each conceptual level, and to present their thinking to others in a manner that is easily taught and learned. This article reports on the findings of a study about the effectiveness of concept maps as a cognitive teaching-learning tool to support student-centred learning within the context of the Kuwaiti FCS curriculum area.



**Figure 1: Vertical concept map**

## Theoretical Framework

Concept maps (see Figure 1 for an example) demonstrate a direct link to theories of cognitive and visual learning (Vanides, Yin, Tomita, & Ruiz-Primo, 2005). Concept mapping techniques link to theories about the construction of meaning and problem solving (Hall & Strangman, 2002; Vanides et al., 2005). Moreover, they reflect the natural learning strategies exercised by people from the first time they ‘*recognise regularities in the world around them and begin to identify language labels or symbols for these regularities*’ (Macnamara, 1982, p.3).

Concept maps also cater to Bruner’s notion that instruction not only helps students to absorb information, but also teaches them ‘*to participate in the process that makes possible the establishment of knowledge*’ (Bruner, 1966, p.72) by providing a graphically organised and ordered presentation that will position all known information within the context of the students’ current knowledge, learning

and living environment. This support by concept maps, according to Novak (1990), enables students to highlight connections between previously acquired knowledge, their current learning context and the newly learned related concepts, thereby leading to meaningful learning.

That concept maps are personally structured, links them to Derry's (1996) cognitive schema theory: that students use individual, and often unique, schematic structures and functions for learning. For Jonassen, Howland, Moore and Marra (2003), it is this individual nature of learning that enables the material to be learned, to be presented in a manner and language that is clearly understood by the students individually and enables the students to relate the information presented to their personal prior knowledge and capacity for learning (Novak & Cañas, 2008).

## **Purpose of the study**

The purpose of this study was to evaluate the degree to which the use of concept maps would influence the way Kuwaiti teachers approach and teach Family and Consumer Studies (FCS) subjects and the degree to which concept maps empower students to critically identify and express their knowledge of the subject being taught.

## **Methodology**

This study adopted a case study design (Yin, 2009). All design, methods and analytical processes used in this study were specifically chosen to focus the findings on the following research questions:

1. How does professional development concerning the use of concept maps change the way teachers approach, prepare and deliver their teaching content?
2. How does the use of concept maps help teachers and students facilitate the recognition, graphic representation and linking of various concepts of a given topic?
3. What strengths and concerns do teachers experience when using concept maps in FCS teaching?

All data concerning teachers' use of concepts maps were evaluated in terms of their influence on the teachers' preparation and delivery of the lesson, the student interest and participation during the lesson and, the outcomes of the lesson. To ensure contextual relevancy, all instructions, materials, and interviews were conducted in Arabic and all observations and analyses were conducted by Kuwaiti nationals (Creswell, 2008). The case study was conducted over a four-week period commencing in November 2010.

## **Participants**

Four female Grade 6 teachers from four different Kuwaiti intermediate girls' schools and their classes participated in this research. Participants were selected by screening all teachers in the six educational districts in Kuwait to meet the following criteria: more than three years teaching experience, currently teaching Grade 6, interest to attend the PD program, and substantial knowledge

about potential reform strategies, but no prior firsthand experience with concept maps. Teacher 1, 2, 3 and 4 had three, five, five and ten years experience in teaching Grade 6 FCS respectively. Eight students aged 10–11 years old, two from each of four classes of twenty-two, were randomly selected by their teachers after each lesson to be interviewed and to have their worksheets analysed.

## **Data collection**

Semi-structured interviews and classroom observations were used to collect qualitative data, grounded in Mason's (2002) conclusion that this approach would empower participants to express their views completely and fairly, and to maximise bias-free interaction between the researcher and the participants. To ensure Creswell's (2008) expectations for frankness and therefore reliability, each questionnaire was administered once only, all questions were worded simply and clearly and questions were ordered to minimize the potential for the participants to guess or provide biased responses. This approach also ensured that participants were kept free from fatigue and stress. To further ensure truthfulness, all responses were kept anonymous. All data were audio recorded throughout the study to ensure bias-free analysis and later transcribed for accuracy. In accordance with Creswell's (2008) expectations for internal reliability, all interview responses were monitored and cross-checked against associated questions for consistency. Data were collected during each of the three phases of the study. This approach was based on Stake's (1995) findings and expectation that it would facilitate responses corresponding to the participants' immediate perceptions.

## **Phase 1: Professional Development**

The main aims of the three-day PD program were to develop the teacher's understanding of reform principles associated with concept maps, their understanding of cognitive and visual theories related to concept maps, and their competencies in planning, preparing and using concept maps in FCS lessons. By the end of the PD each teacher had generated five different types of graphic organisers.

## **Phase 2**

Data were collected at five different stages of the study.

### **Stage 1: Pre-lesson teacher interviews**

After the PD, but before the teaching event, each teacher participated in a conversational, thirty-minute, face-to-face pre-lesson interview, from which their responses were analysed to establish a base-line for their existing knowledge and skills related to the use of concept maps. During the pre-lesson interviews, the researcher used closed and open-ended questions in a semi-structured format to solicit unbiased responses relating to the teachers' existing knowledge, skills and sense of confidence and preparedness to use concept maps as a result of their participation in the PD. These interviews also provided data about each teacher's feelings, behaviour-changes and attitudes.

## Stage 2: Lesson observations

During each lesson, the researcher observed and noted the teacher's demonstrated approach, strategies and attitudes as well the students' responses to the use of concept maps in the lesson. The practice of using observation to collect data in this type of research has been supported by Stake's (1995) argument that qualitative observations form a key part of case studies and promote a more comprehensive understanding of the specific case. Areas of observations included the teacher's apparent comfort, knowledge in using concept maps and the degree to which the use of concept maps helped to identify students' existing knowledge, develop new knowledge and create discussion about the relevancy of the students' new knowledge base. The researcher also made observations of the students' demonstrated attitudes, interest and participation.

## Stage 3: Post-lesson Teacher interviews

Thirty-minute, face-to-face, post-lesson interviews were conducted with each teacher as soon as was practical after each FCS class to maximise the relevancy of the data collected to the use and effectiveness of concept maps, and to avoid the potential of including in the data any exaggeration, minimisation or bias by the interviewee. All data were analysed to establish the teachers' level of confidence and competence in using concept maps. To minimise the potential of any bias or leading by the researcher's questions, all post-lesson interviews were pre-designed to reflect and complement the ten pre-lesson interview questions. Specific attention was paid to evidence concerning each teacher's understanding, comfort and skill in using concept maps and to the way the use of concept maps had helped students build and examine new knowledge.

## Stage 4: Student interviews

Two students from each class were randomly selected for and participated in student interviews. Written consent from the selected students and their parents was obtained prior to conducting the interviews and the worksheet analysis. The interviews collected data related to the students' understanding of concept maps, their attitudes during the learning event and their opinions about the effectiveness of concept maps to their learning and conceptual understanding of the topic.

## Stage 5: Worksheets analysis

Student worksheets were jointly analysed by the teachers and the researcher following the lesson to collect data that could either confirm or challenge the legitimacy of each student's responses and provide evidence of the usefulness of concept maps from the students' perspective. Specific attention was paid to evidence of concept maps helping students identify their existing knowledge, build new knowledge, and examine it in the context of their life experiences.

## Phase 3: Debriefing

The debriefing session was used to engage participating teachers in critical reflection and discussion about their experiences, about the alignment of their pedagogical practices with the principles earlier articulated in the PD program and the accompanying constraints, affordances and perceived outcomes for deeper student learning. This approach to the debriefing phase was taken because of the findings by Ross and Bruce (2007) that such opportunities were powerful tools in the promotion and enhancement of teacher efficacy.

## Data analysis

All data were analysed for evidence related to the research questions using a constant comparative method of analysis (Corbin & Strauss, 2008; Glaser & Strauss, 1967; Merriam, 1998). The data were examined to identify and differentiate different themes and codes.

Concept maps also reflect the visual learning theories put forward by Luria (1973) and later Paivio (2007), that cognition consists of concurrently active visual, spatial and sequential processes that enable people to perceive their external world and process information. From there, they also reflect a link to Bacon, Handley, Dennis and Newstead's (2008) findings that these types of information processing harness the students' visualisation skills to enable them to recognise relationships between concepts and reorganise their mental schemata associated with the concept so that they align with their visual perceptions.

For many educational theorists including Chularut and DeBacker (2004), Doolittle, Terry and Mariano (2009) and Unsworth and Engle (2007), it is because concept maps are individually made by the students and therefore unique in their design and content, that they are able to effectively contribute to the student's ability to store and process knowledge, and further develop the student's competence in handling complex cognitive tasks. In addition, as noted by Bellanca (2007), concept maps, as student-centred tools, have the capacity to engage students to develop knowledge and produce better learning outcomes.

## Findings

### *Phase 1: Professional development*

Data from Phase 1 comprised researcher's field notes, worksheets and photographic records of board work collected during the PD program. Analysis revealed that the teachers had used concept maps to direct their own learning strategies, adjust their own understanding and to demonstrate their learning outcomes. Data showed that the teachers valued their learning experiences concerning the theoretical foundations undergirding the use of concept maps and acknowledged that their current teaching practice could be changed by adopting concept maps. Teacher 2 said, *'Although visual learning and cognitive theory were both new to me, I was able to understand their connection to the use of visual tools like concept maps and I was able to adjust my teaching strategies accordingly'*. Teacher 3 added, *'Although I have taught waste disposal and recycling many times, I found that concept maps helped me focus on the individual concepts and on specific words within the topic. Using the concept map also encouraged me to explore concepts beyond the initial content planned for the lesson'*. Teachers 1 and 4 both commented about the influence that the concept map had on the way they sequenced their discussions during the lesson. Teacher 4 commented, *'I was impressed by the ability of concept maps to not only identify the individual concepts in the topic, but also to explain the relationship of each concept to the concepts that were identified before and after it'*.

### **Phase 2: Lesson observations and interviews**

The data collected from the pre-lesson interviews showed that the participating teachers generally agreed that their learning and experiences in the professional development (PD) had increased their understanding and use of concept maps. Their responses revealed their optimism concerning the use of concept maps. Teacher 4 said, *'I think the PD has helped me to use concept maps so that I am more prepared for the lesson and more interactive in the lesson. It has also helped me to use concept maps to keep the students interests in the topic.'* All participating teachers agreed that they were now prepared to use concept maps in FCS. For example, Teacher 3 reported her expectation that her concept maps would be detailed enough to enable enquiry into the scope and depth of the various concepts expected to be discussed in the lesson.

To assess how effectively teachers could use concept maps, Teachers 2 and 3 were observed during their lessons about clothing and costumes and Teachers 1 and 4 were observed during their lessons about the colour wheel.

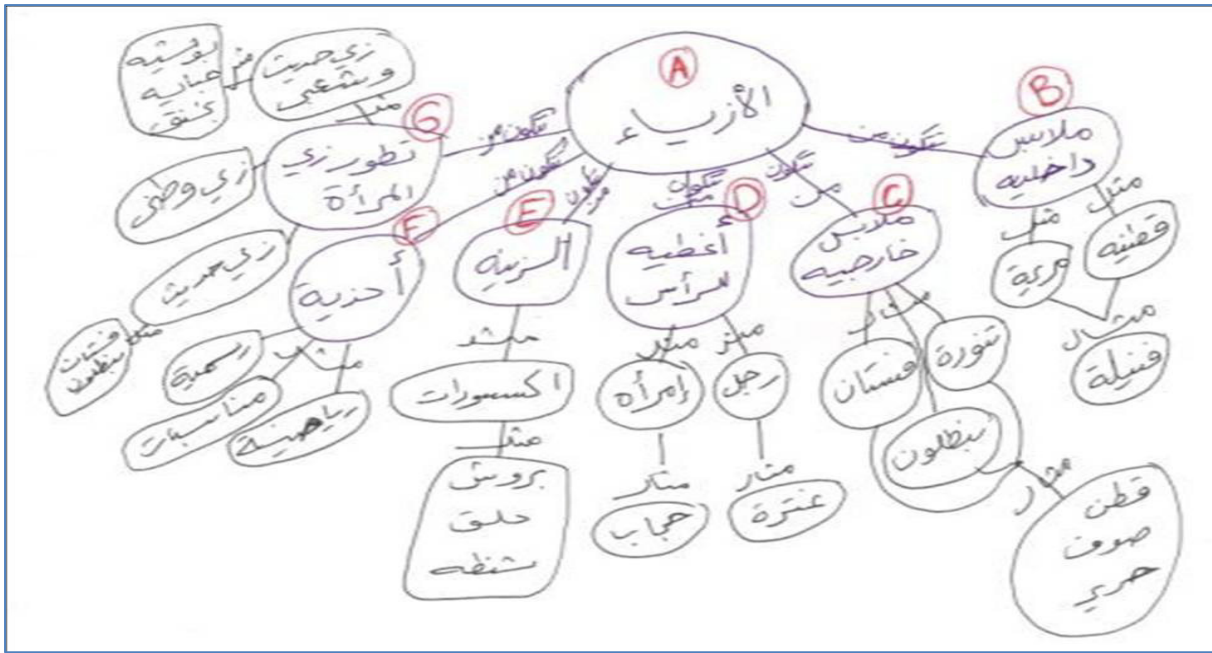
Concerning her use of the concept map during her clothing and costumes lesson, Teacher 3 said, *'The concept map enabled the students to identify the different clothing items and clothing styles as concepts related to a) clothing and costumes. They were then able to imagine and predict the outcomes of different combinations of those items and styles for example, b) underwear, c) casual wear, d) headwear, e) accessories, f) shoes, and the g) development of fashion'* (Figure 2).

In response to the question: *'If you thought that there would be potential learning issues explain why those issues did not arise?'* Teacher 2 said,

*Because of the large number of items and styles that could be included in this concept map, I thought they may have difficulty remembering all the details and all the processes. I was surprised to find that they were able to demonstrate their understanding and recall through their own worksheets, but the fact that they were so enthusiastic in their participation, I think, helped them to remember.*

The researcher noted that before using the concept map, students found it difficult to identify appropriate clothing required for an interview but after using the concept maps, could not only identify appropriate interview clothing, but could also mix and match a number of individual clothing items to predict a complete outfit for the occasion. The observer also noted the positive impact that the concept map had on the student's interest and involvement in the lesson.





**Figure 2 Student worksheet using concept map on the topic ‘Clothing and costume’**

Teachers 1 and 4 were observed during their lessons about the colour wheel. Traditionally, this lesson would have been taught by ‘chalk and talk’ and learned by rote. For example, students would have been expected to recite, ‘Three primary colours: red, yellow, blue’. To learn the secondary colours, they would have been expected to verbally learn word-equations: blue plus yellow equals green etc. The difficulties associated with this approach included the need for students to rely on their reading, comprehension and memory skills, as well as the disconnection of the classroom activity from any real-world experience because of the absence of hands-on activities, and the inability of most students to mentally grasp the relational concepts of primary, secondary and tertiary colours.

Both Teachers1 and 4 introduced the lesson by graphically representing the concepts of primary, secondary and tertiary colours as subsets and sub-sub-sets of the main concept, colour. They both asked the students to mentally consider and envisage the potential mixes available from primary and secondary colours. The observer noted that in Teacher 1’s class, while most students were able to predict secondary colours, only half of the students were able to accurately predict the tertiary colour outcomes. In Teacher 4’s class the number was even less. Both teachers then used the concept map to demonstrate the possibility of predicting tertiary colours by graphically linking a primary with a secondary colour. As a means of assessment, the students were finally encouraged complete their concept maps to show the distinctions of primary, secondary and tertiary colours and to name their predicted colour mixes. Teacher 1 commented saying,

*The concept map was really useful in helping students work through the difficult concepts in this lesson. It helped them to connect the individual concepts together. The example provided a logical pattern for them and they were able to write the main concept in the primary circle and then make different branches to identify and organise the sub concepts: components of the colours, categories of colours and methods for integrating colours.*

Both the observer and Teacher 1 noted that the students appeared to enjoy using the links to find the degrees of association among the concepts. She noted particularly that each student was able to shape

her concept map to suit her own learning style and academic level. The observer recorded that by the end of the lesson, most students could either remember the primary, secondary and tertiary colours or use the concept maps to work them out.

Teacher 4 gave similar comments, saying, *‘Using the concept map was an effective way to promote student interest and encourage student participation in the lesson’*. She emphasised her thinking that the concept map had provided an effective means to providing clues and suggestions concerning potential colour mixes, without providing the solution herself. She said, *‘The concept map helped keep the students focused, even during the group activity, a time that would usually have caused some students to lose concentration’*. She added, *‘Because the concept map helped keep the students focused, I was able to take a more facilitating role in the learning process rather than be the sole provider of the information’*. In response to the question: *‘Do you think the students understood how to use the concept map and did it really help them to solve the problem?’* she said, *‘The assessment at the end of the lesson revealed that the use of concept maps in the colour wheel lesson, had helped the students to progressively develop their own understanding of colour combinations’*.

The researcher observed the high level of focused participation by the students. Moreover, she specifically noted that the students were able to complete the assigned worksheets with only a few questions and almost no prodding by the teacher.

An analysis of the data provided by the students confirmed the teachers’ perceptions and observer’s comments concerning the influence of the concept map on the students’ interest, participation and learning. Student 1’s response to the question, *‘In your opinion, how was the teaching different in this class?’* reflected the responses of all the students. She said, *‘The lesson was more interactive than usual. This made me want to get involved. It also made it more interesting and fun to learn’*. She added, *‘I think, by using the concept map, the teacher was able to make the lesson more of a discussion than a lecture and this meant that we were all able to share in the learning about the colour wheel. I really liked being able to contribute to the whiteboard activities’*. Concerning the influence of the concept map on her ability to stay focused on the overall goal of the lesson, Student 5 said, *‘Because the concept map let me see the individual colours that I was supposed to mix, at the same time as seeing the way that other colours had already been mixed, I was able to stay more focused and do the worksheet better’*.

While this lesson did not utilise the maximum potential of concept maps by enabling students to independently put forward unique responses, because colour combinations are a scientific fact, and students’ outcomes could be marked as correct or incorrect, this was considered an appropriate introduction to concept maps because it provided the basic principles of concept mapping in an environment that could be tested for validity.

In the post-lesson interview, Teacher 2 emphasised that the main advantage of using the concept map in this lesson was to provide students with a learning tool that would graphically organise, sequence and link concepts appropriately. She said:

*The concept map enabled students to include all the concepts of the lesson and to show the links between the different concepts. The concept maps provided a platform on which students could identify the hierarchical relationships between primary, secondary and tertiary colours and to show how tertiary colours are formed.*

Overall, the use of concept maps in this lesson enhanced the teacher's ability to explain the topic in detail, to demonstrate the concept mapping process, and encourage collaborative participation from the students as they jointly worked through the concept mapping processes needed to find one colour mix. It then empowered the students to build independently on what they had seen and heard and to complete the task by putting into practice the concept mapping processes that they had now jointly practised. The use of concept maps in this lesson about the colour wheel also provided an activity that was assessable in terms of its processes and factual outcomes.

### **Phase 3 – Debriefing**

During the Phase 3 debriefing session when teachers reflected on the five-week program they agreed that the use of concept maps had changed their pedagogical practices by refocusing their strategies more toward a student student-centred lesson than they had previously thought possible. For example:

- Teacher 1 commented that the concept maps had helped her feel less stressed because they made it easier to engage the students in critical thinking and less of a struggle to get the students to understand the logical connections between concepts to build a more complete picture of the topic of the lesson.
- Teachers 2 and 3 said that they liked the concept maps mainly because of their flexibility to incorporate all the concepts of the lessons in a logically sequential and easily presentable way.
- Teacher 4 added that using the concept map to link the concepts of the colour wheel both visually and textually was easier than using the traditional teaching methods of writing on the board and explaining main concepts and sub concepts without graphically interlinking them.

For all the teachers, the primary advantages in using concept maps included their ability to help the students to enjoy learning and to quickly recall the concepts learned. The teachers did, however, also agree that the most noticeable disadvantage of using concept maps was that they took up a larger space on the whiteboard.

## **Discussion**

### ***Research question 1: How does professional development concerning the use of concept maps change the way teachers approach, prepare and deliver their teaching content?***

The three-day PD was evaluated in terms of its effectiveness in connecting learning theory to classroom practice and preparing teachers to use concept maps in their FCS lessons. The inclusion of subjects such as conceptual learning, as put forward by MacLellan (2005), the relevance of visual learning tools (Ausubel, 1968) such as concept maps to classroom learning and the ability of concept maps to facilitate student-centred lesson activities, proved to be on target with the expectations of the teachers and the demands of the Kuwaiti educational system. The inclusion of peer-discussions and collaborative practice in the development of concept maps underscored Lumpe, Czerniak, Haney and Beltyukova's (2012) comments concerning the importance of empowering teachers to use their previous learning and experience to develop new benchmarks in teaching approaches and strategies. All participating teachers agreed that the professional development program had been an effective way to equip them with specific understanding of learning theory, a range of practical strategies that would help maximise the benefits of using concept maps in FCS lessons and with increased confidence in their own ability to facilitate the graphic representation of concepts of a given topic. The comment by Teacher 4 proved to be representative of the responses given by all participating teachers, that the PD had helped better prepare her for the lesson in terms of lesson content,

interactivity and individual learning. All participating teachers agreed that they were now prepared to use concept maps to meet the unique demands and disciplines of the FCS curriculum area as set out in the prescribed goals.

***Research question 2: How does the use of concept maps help teachers and students facilitate the recognition, graphic representation and linking of various concepts of a given topic?***

Findings confirmed the importance placed by Gold (2003) on the influence exerted by visual images on student's attention and knowledge retention. For Teacher 3, the use of concept maps had positively influenced the level of engagement by students with the topic by generating interest and promoting participation throughout each lesson. The reported flexibility of concept maps highlighted the expectation of Ball and Forzani (2009) for teaching strategies to be flexible, meaningful and relevant to each student. Teacher 2, suggested that this flexibility had increased students' enjoyment of the lesson by empowering each to approach the topic according to her own learning style, and that this in turn had enabled each to later demonstrate a high level of recall through her own worksheets. This was also confirmed by student 1's reflection that she enjoyed the interactivity, flexibility and personal relevance of the lesson and therefore felt encouraged to participate more in the lesson.

***Research question 3: What strengths and concerns do teachers experience when using concept maps in FCS teaching?***

An analysis of the data revealed the positive impact that student-centred teaching tools can have on the reformation of traditional teaching environments. For all teachers, the primary strengths of using concept maps were the ability to generate student interest, to motivate student participation and to enhance student recall, all of which further supports the findings of Cook, Zheng and Blas (2009) about the influence of interest and participation on student learning outcomes. That Teachers 1 and 3 pointed to the concept map's ability to promote interaction and peer-discussion about the relevancy of the topic to the students' everyday life confirmed Caskey's (2002) insistence that classroom learning be connected to the students' real world experiences. An important issue was raised by Teachers 2 and 4, concerning the ability of concept maps to increase the level of critical thinking and to broaden the scope of the peer-discussion without increasing the teachers' and students' workload.

The analysis of the data in response to Research Question 3 also revealed two primary concerns experienced by the participating teachers. All participating voiced their concern that the increased level of student enthusiasm and participation prompted by the use of concept maps would mean that they would have to spend more time preparing for each lesson to ensure that potential concepts were pre-considered and questions, potentially raised by students, were worked through before the lesson. The second concern related to the teachers' finding that not all subjects could be taught with equal effectiveness and efficiency through concept maps. However, having raised these concerns all teachers agreed that both could be overcome by practice and that therefore, neither would have any long term negative effect on the teachers' stress levels or workload demands.

## **Conclusion and limitations**

The professional development program was found to be effective in training experienced teachers to use concept maps to adopt student-centred pedagogical approaches in their FCS lessons and thereby to increase their ability to confidently and effectively engage their students in the lessons than they had through their previous traditional teaching approaches. It was found also to be effective in

enhancing the teachers' ability to further promote the students' motivation, class participation and individual learning strategies as well as learning outcomes. The findings of the study showed that the use of concept maps had provided opportunity for students to learn according to their individual abilities and learning styles and had helped to promote their understanding, logical thinking and critical thinking. These findings are important to contemporary teaching of FCS and the continuing need for innovative strategies that will promote higher order thinking and further develop problem solving skills among students.

An analysis of the research methods and outcomes revealed four primary limitations. The fact that this study only evaluated the effectiveness of concept maps through short-term results leaves unanswered questions concerning their long-term effects on teaching and learning. The fact that this study relied heavily on the subjective, self-reporting by the teachers, limits the ability of this study to be generalised beyond the subjects in this study. Most importantly, the fact that this research methodology did not include the establishment of a baseline against which to measure improvement, the assessment must be limited to the effectiveness of the teachers' use of concept maps during this study and not as a comparison to teachers using traditional methods to teach FCS topics. However, while these design limitations may limit the generalisation and comparative value of the study, the findings of this study remain important to the planning of future professional development programs and the use of concept maps within Kuwait's FCS curriculum area.

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