

Concept Maps in Early Childhood Literacy Classrooms

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Abstract

This paper explores the use of concept maps in early childhood literacy classroom, with particular emphasis on specific methods that teachers can apply. Concept maps--as visual organizers that can enrich students' understanding of a new concept-- are often used in middle schools, high schools, and universities. However, due to young children's academic and cognitive level, concept mapping has a limited use in early childhood classrooms. Drawing on both theoretical and empirical research by scholars and practitioners, the paper discusses instructional strategies and challenges of using concept maps in early childhood classrooms. The paper summarizes research from cognitive theory, developmental psychology, and information processing theory to provide a theoretical framework for understanding how concept maps might be incorporated into a early childhood literacy curriculum. Then, by synthesizing the existing researches on concept mapping, the paper attempts to explore instructional strategies and challenges in teaching concept maps. Implications for further implement of concept maps are discussed in the end.

The technique of concept mapping was developed by Joseph D. Novak in 1970s, and it was largely applied in classrooms as a tool to teach students to organize ideas and develop logic. Chang, Sung, and Chen (2002) suggest that concept mapping is a highly flexible tool that can be adapted for almost any group of learners in education. However, due to young children's limited knowledge and logic, concept maps are often overlooked in early childhood classroom. The potential for concept maps to facilitate a wider range of literacy activities in young children is far-reaching. The visual, hands-on, and representational qualities of concept maps provide a unique opportunity for children who are not yet readers to create, manipulate, share, and interact with text in a highly personal, meaningful fashion. In this paper, my proposed topic/issue is to investigate how concept maps can be applied to in early childhood literacy classroom.

First, I will introduce previous researches in early childhood literacy classroom, then I will discuss how concept mapping is consistent with early childhood literacy class with three developmental theories: cognitive developmental theory social cultural theory and information processing theory. I will address the learner by using Piaget's theory to analyze how concept maps help learners in preoperational stage develop schema in language. I will use social cultural theory to demonstrate how concept maps promote language learning. I will also use information processing theory to address the learning context that provided by concept mapping.

Then I will focus on how to incorporate concept mapping into literacy curriculum and instruction. In this paper, I will introduce several strategies to use concept maps in meaningful contexts, such as using concept maps to tell a story. In this part, I will also present specific challenges and barriers relevant to the use of concept maps in teaching literacy to young children with recommendations on how to work on them.

Early Childhood Literacy

One of the best predictors of whether a child will function competently in school and go on to contribute actively in an increasingly literate society is the level to which the child progresses in reading and writing (NAEYC, 1998). Since the development of reading and writing begins at birth and is a lifelong process, the early childhood years are very important in children's literacy development. According to the research, there are several aspects of emergent literacy, defined as strategies and skills practiced by young children that contribute to "conventional" reading and writing proficiency, including: knowledge of alphabet system and letter-sound relationships, awareness of print in the environment, understanding print directionality, and understanding that print carries meaning (Goodman, 1986). As these constructs are intimately integrated to one another and to the context in which meaning-making takes place, learning environments for literacy development should support a broad range of knowledge and skills through demonstrations, social interactions, and models (NAEYC, 1998).

Concept Maps and the Learning Theory

Concept mapping is supported by many learning theories. In this paper, I will use stage theory, social-cultural theory and information processing theory to demonstrate the importance of concept maps in early childhood literacy classroom.

In Piaget's cognitive development theory, early childhood children are in the preoperational stage. In this stage, one of the major tenets of Piaget's theory is that knowledge is organized into schemas. The schema describes an organized pattern of thought or behavior helps organize and interpret information (Newman & Newman, 2007). It includes both a category of knowledge and the process of obtaining that knowledge. In the preoperational stage, children

begin to represent schemas internally instead of relying on direct manipulation of objects to gain knowledge of the world.

The concept map is an “external visualization of a person's internal schema” (McAleese, 1999, p.352). It is a way of “thinking on paper”. Using concept maps, children express their ideas in visual way, and they learn and practice a schema to think about the world. For example, when students learn food, they need to clarify the definition of different food and relate them to objects in the real world. Making concept maps help young children think and represent what they know. With more practice, students will get used to the method that thinking about the relationships among different objects/ pieces of knowledge, and they will gradually adopt it as a schema to understand the vocabulary of different food carries meaning.

However, the schema is not constantly fixed. Another major principle of Piaget’s theory is the process of assimilation and accommodation, in which knowledge within schemas changes as children new things. Through assimilation, children take in new information or experiences and incorporate them into their existing ideas (Newman & Newman, 2007). Since emphasis of concept maps is on the relations between concepts, children are able to learn new knowledge based on the previous knowledge and existing cognitive structures, also known as the schema. Taking concept maps on shapes as an example again, when children put “earth” and “ball” under the concept “circle”, they will see the logical connection among these three concepts, which is the feature of a “circle”. Then, they will use this schema to integrate new circle-like objects, such as tire, with their previously required knowledge.

Accommodation is the cognitive process of revising existing cognitive schemas, perceptions, and understandings (Newman & Newman, 2007). Concept maps are effective to allow children to get new information and literally see relationships among concepts more easily.

In this process, the new information can modify, add to, or change previously existing schemas. For example, if a child has not seen a big dog before, he or she may have a schema that all dogs are small and furry. But if the child does a concept map of dogs, he or she may see various dogs including big and malicious ones. The child will incorporate this new information, modifying the previously existing schema to include this new information.

“From Piaget’s observation of children, he inferred that the information that children used to add to or change their schemas was not limited to receiving knowledge from parents or teachers. He understood that children were creating ideas; they actively constructed their own knowledge” (Daley, Shaw, Balistreri, Glasenapp, & Piacentine, 1999). As Tuan, Thuan & Bich (2011) pointed out, "the goal of education, should not be to provide information, but rather to enable students to question, examine, and reflect upon ideas and values presented to them" (p. 139). The concept map is a promising tool to accomplishing this goal. It promotes critical-thinking skills through the use of observation, comparison and classification (Gallenstein, 2005). It also shows students “unexpected connections or identify holes or contradictions in their ‘theory’ and help them to figure out ways to connect them” (Bribili, 2006, p. 37). So to conclude, Piaget’s cognitive development theory provides concept mapping a theoretical framework in developing schemas. By making concept maps, children learn new schemas, assimilate new language into their schemas and prior knowledge, accommodate new schemas to new knowledge, and create new ideas in the literacy classroom.

According to Vygotsky’s social cultural theory, language is a psychological tool that serves as “a means through which the human mind is shaped and modified over the course of history” (Newman & Newman, 2007, p. 246). Language is an important part of early childhood literacy. It links speech and thought. Concept mapping is a tool that allows students to visualize

and manipulate their language within a context. Abi-El-Mona and Adb-El-Khalick (2008) explain that concept mapping can “facilitate the essential processes of visual coordination and integration with other cognitive operations, which are essential to language development” (p. 298). As students visualize these concepts and create language to share their maps with their peers and adults within the classroom, the concepts gradually become integrated into their literacy development.

Finally, information processing theory also supports concept mapping. Information processing theory “focuses on how individuals make sense of the great amount of information that is present in their environment” (Newman & Newman, 2007, p. 140). According to information processing theory, information is attended to through the senses, incorporated into a person’s short-term memory, and then either lost or integrated in a person’s long-term memory through linking it to other information already in long-term memory. In early childhood literacy classroom, Concept mapping allows students to store and retrieve information (vocabulary) more efficiently. With vocabulary as a foundation, children will develop reading and writing fast.

Concept Maps As a Tool For Assessment

The theories above illustrates that concept maps can be a great learning activity, however, concept maps can also be a tool for assessment in literacy classroom. Teachers can use them to identify children’s preexisting knowledge or misconceptions and use them as an evaluation tool in the end of the unit. Once children learn how to make concept maps, teachers can use them to diagnose students’ misunderstandings. As Ausubel, Novak & Hanesian (1978) argue, preconceptions (and misconceptions) are crucial for the quality of subsequent learning. Missed relationships and concepts, in particular, as well as wrong connections, can tell teachers about

children's conceptions and comprehension of the topic. To reveal and break down children's misconceptions, the teacher can use concept maps as an evaluation tool in class. A concept map at the beginning of the lesson can be a tool to see children's prior knowledge, while a concept map at the end of the lesson helps teacher reveal and break down children's misunderstandings.

Feasibility and Implementation in Early Childhood

As it was stated in the previous paragraphs, concept maps contribute to young children's learning new vocabulary and developing reading and writing skills. When considering feasibility, although young children have just started to develop cognition, they have the ability, or even advantage, in making concept maps. The study of Noyd (1998) showed that children after two years old could label symbolic representations verbally for disclosing conceptual meanings, manipulate concepts to show reading direction, and perform simple classifications. These three skills can basically cover the process of making a concept map, which suggests the feasibility for children to make concept maps. Furthermore, Wandersee stated that young children may quickly learn how to make good concept maps since they haven't yet been exposed to years of rote-learning (Novak, 1990, as cited in Novak, 1998). Without existing stereotypes, it is much easier for children to learn concept maps. Thus, if introduced and used in developmentally appropriate ways, concept mapping is particularly effective in early childhood education.

However, young children are not going to be in a position immediately to construct a concept map on their own, so concept maps can be introduced and practiced with the help of the teacher, children's books, and computer software.

Teacher modeling is a most common way to introduce concept maps. Before children make concept maps, teachers should show them what a concept map is, what a concept map

consists, and the steps to make a concept map. As Ferry (1997) pointed out, a period of direct instruction is necessary before children can successfully construct their own concept maps. This process should start by having children observe their teacher creating concept maps. During the modeling, teachers can give particular emphasis to the linking or “joining” words and help children understand that it is the linking that makes the whole thing has meaning. For example, a joining word can indicate what happens first in an event. A joining word can also indicate what is the central word, and the often the central word is the most important one.

Two kinds of books can be used to help children develop skills in concept mapping. The first type of book, such as Mapping Penny’s World, is used to scaffold the creation of concept maps, whereas the second type of book, picture books, is used in children reading and generating their own concept maps. Mapping Penny’s world provides children with direct opportunities to interact with different types of “incomplete” maps. Those include "concept-only" maps, where key concept words are identified and pre-structured on the map and children are asked to fill in the missing propositions and direction arrows in the spaces provided; and "link-only" maps, where key relationships/propositions are already pre-structured and labeled on maps and children are asked to fill in the missing concept words in the spaces provided (Chang et al., 2002).

The second type of book does not involve concept maps in them, but they have a clear topic and organization so that they can be concluded with a concept map. For example, teachers can read a story book describing someone’s typical day, then teachers can guide students to make a concept map with time lines to describe each event in this day. Similarly, Venn diagrams can be applied in concept maps to illustrate differences and similarities, such as dogs and wolves; event chains can be used to show the sequence of events in the story, such as cooking a dinner; and cycle diagrams can tell us how events interact and repeat themselves, such as the water cycle.

This kind of activity will enlarge students' vocabulary and develop their reading skills.

In addition to teacher modeling and books, there are many types of computer software designed for making concept maps, such as Kidspiration for preschool children. Compared to by hand, concept maps are created faster and more convenient made using computer software. The main benefit of using a computer is that concepts and links can be easily manipulated and updated while the format can be modified or enhanced visually by inserting colorful symbols, pictures, connectors, or clip art. For children who are good at drawing pictures, working on a computer can be a great help. Another advantage of concept-mapping software is that it comes across all subject areas and offers ready-made templates of different types of concept maps. For science, there are different hierarchical structures; for art, there are different patterns. In this way, teachers can combine literacy with other subjects to make the literacy classroom more meaningful. Because of these characteristics, "computer-based concept mapping is gaining ground as a popular alternative to the traditional paper-and-pencil concept-mapping method" (Wehry et al., 2012, p. 88).

Challenges and , Instructional Strategies in Early Childhood

Although there are many resources to help young children with concept mapping, there are still some barriers and challenges. First, according to Piaget's cognitive development theory, although children's cognition is developing, it is considered to be far from "logical thought" in the preoperational stage (Newman & Newman, 2007). They cannot perform some logical mental operations. Since connections among different concepts are emphasized in a concept map, it is possible that young children have difficulties in forming the connections. Second, as children are young, they have limited knowledge in understanding the world. There are so many objects and

relations that young children have not seen or been taught. In other words, young children may not have enough sources to form a concept map. Third, Piaget's cognitive development theory suggests that in the preoperational stage, children's language and literacy skills are just emerging (Newman & Newman, 2007). They just start to learn new vocabulary and express their ideas. To make a concept map, students not only need to understand the vocabulary and connections between different concepts, but they also have to use or even write the new vocabulary and demonstrate the connections. In this situation, children's language can be a barrier in making a clear concept map. With limited knowledge of the world, insufficient language expression and the absence of logical thinking, concept mapping can be challenging for young children.

When taking children's cognitive abilities, knowledge and language into consideration, careful guidance from teachers and practice are needed for developing concept-mapping skills. Teachers can use different strategies, such as designing concept maps through pictures and objects, preparing enough materials, simplifying the concept maps, and allowing some wait time.

First, for children who have limited cognition and language skills, teachers can ask them to draw pictures or even use objects in the classroom to express their ideas. Concept mapping provides an opportunity for children who are not yet readers to plan, create, and check their own literary products. In this manner, concept mapping acts as a "precursor" to tasks of written expression. One important aspect of the preoperational stage in a child, is that of "symbolism". Children learn to recognize symbols, and they become increasingly adept at using symbols (Newman & Newman, 2007). Compared to words, pictures and objects are more vivid symbols. For many young children, thinking through pictures is much easier. Another benefit for pictures and objects is that they help children who have limited language skills. By drawing pictures and placing objects, not only children with reading or writing problems, but also children who speak

a different language can communicate their ideas and come up with a concept map (Pearson & Somekh, 2003). However, there are some potential problems in using pictures and objects. If students' drawings are not clear due to children's limited drawing skills, it will be difficult for children to remember their representations if they need to revisit their maps (Chularut & DeBacker, 2004). Often pictures are more or less different from the real objects and do not accurately represent the ideal concepts. Noticing the difference might distract children's mind. For example, when talking about the concept of a "triangle", teachers may show students a picture of "a slice of pizza" and a real clothes hanger. Since young children do not have logical thinking, they might not see the inner fundamental connection of these three things. They might be distracted and argue that the picture of pizza is not pizza and the hanger with a spin is not a triangle. Therefore, as children become better readers and writers, pictures and objects should be gradually changed back to simple words.

Second, considering children's limited knowledge of the world, teachers can prepare enough sources, such as key words and pictures, for students to combine together. The research of Noyd (1998) indicates that young children can create concept maps by arranging objects (concrete level) and/or pictures (pictorial level) in a format with general concepts at the top and supporting concepts positioned below them. This also helps students enlarge the vocabulary and connect the new words with previous vocabulary.

The third strategy is simplifying the concept maps. Teachers should make it easy for students in both understanding and making a concept map. To overcome barriers presented by children's language and cognitive limitations, teachers can develop interesting metaphors in explaining a concept map based on students' prior knowledge. "All new learning involves transfer based on previous learning" (Bransford, Brown, & Cocking, 2000, p. 53). So it is easier

for children to understand a new concept map if the teacher relates it to something they have already learned. For example, when teachers explain a classification chart, they can compare it to a tree. The concept at the top is the tree, and the sub-classes are the branches and leaves of the tree. In this way, children will understand that the sub-classes belong to the concept on the top. Apart from explaining the concept map, the way to make a concept map should also be simplified. Since children in the preoperational stage do not think logically (Newman & Newman, 2007), teachers should encourage children to start from concept maps with linear structure such as a time line, instead of complex hierarchical structure. Also students are encouraged to use concrete concept that they are familiar with instead of abstract concepts.

Fourth, teachers need to be patient and allow ample wait time. Due to children's limited knowledge and cognition, concept mapping should not be taught in a single day. The various concepts involved in a successful concept map come from children's prior knowledge. For example, children must have observed a basketball and remembered its shape before they classify it under the concept "circle". So children need many opportunities to manipulate real objects, observe what is going on around them, record their observations, and communicate their findings and impressions in different ways (McAleese, 1998).

However, concept maps can be a challenge for literacy teachers. First, as a tool and an activity in class, the concept map should be evaluated to offer a reference on how children are learning. But due to its various forms and different contents, it is very hard to judge which concept is the better. Second, teaching concept maps can be hard. As it is stated in the previous paragraph, children need a lot of time and practice to make a good concept map. Sometimes teachers quit because they cannot see the lifelong benefit. In the future, there can be more research exploring how to assess a concept map, and there should be more teachers' training in

teaching concept maps.

Conclusion for Early Childhood

The concept map is a useful instructional and learning tool in early childhood literacy classroom. It helps students to enlarge vocabulary and develop reading skills. It helps students with metacognitive skills. It also helps teachers to assess students' conceptual understanding and identify misconceptions. In preschool education, teachers, books, and computer software are the three main sources in facilitating concept mapping. Since young children are limited in their cognition, knowledge and literacy, teachers should use different strategies, such as replacing words with pictures and objects, preparing enough materials for concept maps, simplifying the introduction and application of concept maps, and allowing some wait time. However, concept map in itself is not the ultimate target. Rather, it is a tool that helps children develop literacy. Just as (Pearson & Somekh, 2003) argues, it is not really the resulting map that is important, but what the mapping process involves: linking language with meaning, representing and organizing knowledge, new linguistic forms to express and talk about concepts, and getting familiar with expository, information-bearing language structures.

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