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Assisted Digital Storytelling and scientific concept development: A study on Preschool Children of Foreign Marriage Families

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While one can learn a concept of science from school education, the concept formation is quite different in preschool children than elder learners. Especially for preschool children of foreign-marriage families, the cultural issues can be significant in their scientific concept formation in terms of "science communication". Our research is based on Vygotsky's Cultural-historical psychology to investigate those preschool children's learning psychological path to their scientific knowledge construction by using "Digital Storytelling" activities that are assisted with adults. A total of 12 preschool children participate in our research project. We use language as the key to detect the children's higher psychological functions in the activity of "read-together" programs and storytelling that are conducted in a countryside area where local residents marry foreign bribes commonly. We use observation to the children's learning and storytelling activity in the read-together program. At the same time, we also have the preschool children work on some problem-solving activities that are associated with word usage that has been used as elements of scientific concepts. The digital form of stories that were told by children and the scratching in the process of constructing stories were later re-edited together as a final product of digital story. Finally, we have all digital stories together and shared with all 12 children. Those assisted digital stories becomes tools for the next stage of read-together/ storytelling activity. This dialectical process are children's scientific concept process and activity for their scientific concept development. We also come up with a idea of pseudo-multicultural concept for that children of foreign marriage families do not benefit from their mother in their scientific concept development.

In recent years, "Science Education" and its related studies such as "Science Communication (SciComm)" and "Public Understanding of Science and Technology (PUST)" have being pushed and encouraged by the National Science Council of the Republic of China (Taiwan). While science education for the general public is meaningful, we turned our research attention to preschool children of foreign families. As Asmolov argues that "a necessary condition for the development of different kinds of systems is the contradiction (conflict or harmonic interaction) between adaptive forms of activity ... and the manifestations of activity of elements bearing individual variability." (1998, p. 35) Thus, the adaptive activity of social norms and individual "self expression" of activity from own experience, feeling, and thought

can create a tension to one's own situation. In our study, this is the motivation that we argued to be the driven power for concept formation.

In fact, to have the learning activity that promote scientific concept formation in one's daily life can be quite challenging since science has been stereotyped as for testing subjects or as professional knowledge for scientists. In the point of view from the "Science Communication" and "Public Understanding of Science and Technology", science is for the rest of us. In order to have it happen, appropriate "tools" are needed for the communication or learning processes. In our study, a digital communication tool combined with traditional scraping tool is one way that creates the contradiction between activities that associated with those two different tool usages. As Vygotsky's position on psychological development, it did not matter what kind of tools (both psychological and physical) are used, but the meaning that is encoded into the tools is important (Knox, 2002).

Science education in early childhood education has been always a challenge to educators, especially when science become a social means of production to one child's socialization. In other words, the term "science" becomes a mediation tool for the children to think internally as well as behave externally. Thus, the science education for those young children is less a academic issue, but a practice of learning to the world. In our study, we investigated science education in foreign marriage families of those preschool children and their scientific concept formation within that domain by the assistance of a predesigned parental read-together program. Through all activities within that program, we have learned great detail about how those children form their scientific concept and their higher psychological function in the process of problem solving. Among all activities, image making and storytelling becomes very meaningful tools for our study.

It has been about four years when I first gain entry to the study of preschool children of foreign families. At the very beginning, it is just a simple parental read-together program sponsored by Ministry of Interior in Taiwan, R.O.C. Our activity site was a day-care center in mid-Taiwan rural township under the foot of Ali Mountain. It was a beautiful place with friendly residents who do agricultural works. They plant persimmon and high altitude tea. Those two important agriculture products drive the economy of this rural township, at the same time, the function and their psychological functions toward the concept of science education as well. Because of the heavy duty of agriculture works, working force is important to their economy activity; therefore, marriage comes in as a very import function to this township: as a function of labor in working and giving birth. Social-economically disadvantaged families here need marriage for their next generation, as well as means of production. As the matter of fact, foreign marriage becomes a way out for single guys in this township. Foreign brides, who are usually from Mainland China and the south-east Asia, form foreign marriage families in this township. They are at the same time giving birth to the next generation, and working for their families. Foreign marriage moms therefore, not only provide opportunities for the next generation of families, but also support their families' economic greatly.

Our study is mainly on those families' preschool children and their learning toward science. Imagination and language expressions become reflection to their psychological function that is outward as behavior and inward as regulation to their thinking. We used some learning techniques and technologies to facilitate those learning process and to guide our

inquiry. We will discuss our first argument on the assumption of "foreign marriage families are multicultural families."

Multicultural Families

It all begins with the concept of "multicultural" education. There has been a strong believe that those children from foreign marriage families have multicultural immersion. Multicultural has been defined as an ideology toward one society to rule the societal differences. Those social condition becomes the guidelines for decision makers to impose the value of science education and those tools that support science education to preschool children of foreign marriage families. In addition to the societal differences, social-economical condition of foreign marriage families are often disadvantage that brought the whole science learning process for those preschool children dimmed. The lack of motivation from foreign-marriage families can be a negative force for preschool children's study.

Mediation

Mediation can be discussed in an opposite pair of terms, mediate and immediate. The Merriam-Webster dictionary (Mish, 1997) describes the word mediate as "act as an intermediary … to bring about, influence, or transmit by acting as an intermediate or controlling agent or mechanism" (p. 458). The word immediate on the other hand is described as "acting directly and alone … near to or related to the present time" (p. 371). In other words, the synonyms to the terms mediate and immediate are indirect and direct. Hegel in his book Logic describes the connection between idea and being by using immediate and mediate (Hegel, 1975). He mentions immediate connection is "a primary and self-evident interconnection" while mediate connection is "shown in experience" (p. 104). In Hegel's mind, immediate is unrelated to other things while mediate is related to other things. Thus, in Hegel's dictionary (Inwood, 1992), mediation is the action that "uniting of two terms by a third term" (p. 184). For example, if God's miracles are onto men immediately, the working of nature by god is onto men mediately through men's experiences. The mediator or priest in the church is the mediation of uniting the mind of God with the men's body of experience. (p. 185)

Because of translation, the English word, mediation, can mean differently from Hegel's mediation, Vermittlung, in German, and Vygotsky's mediation, "oposredovanie", in Russian (Wertsch, 1985). In English, mediate has a more fixation meaning of intermediary (Mish, 1997), while "Vermittlung" in German has the meaning of uniting two sides, immediate and mediate. Vygotsky uses the Russian word oposredstvovat for mediate which means "acting indirectly through something" (Cole, 2003) For mediation, Vygotsky makes a cognitive rationale between them by stating that "… the use of signs and of tools using the schema … shows each concept subsumed under the more general concept of indirect (mediated) activity." (Vygotsky 1978, p. 54) The word mediate for Vygotsky is not a thing as in English or a side as in German, but an action of process. Mediation perhaps is the most important concept that Vygotsky contributes to the cultural-historical theories. Vygotsky thinks that the mediation happens when tools and signs work together to perform an indirect function (Vygotsky, 1930/1978)

Based on Les Vygotsky's notion of social interaction in human cognitive development, learning is socially constructed. The socio-cultural context affects the use of tools and signs to construct meaning of new knowledge. In other words, humans are meaning makers and yet are affected and mediated through the meaning making process by the environment.

The mediation process involves signs and tools. According Vygotsky, signs are the processes of internal activities to master the self. The sign "changes nothing in the object of a psychological operation." (Vygotsky 1930/1978, p.55) The tool on the other hand, is externally oriented. The function of tool "is to serve as the conductor of human influence on the object of activity …"(Vygotsky 1930/1978, p.55). Sings and tools are opposite yet are linked to each other in order for mediated activities to happen; therefore, we should see both at the same time dialectically.

Tools, according to Vygotsky are the external instruments to change the goal of activities. From a psychological point of view, tools are not limited to physical devices, but there are also cultural tools. They work and affect externally. Sings, on the other hand, work internally for self-operation. For example, language and symbols can be sings to regulate one self internally in order to use tools to shape the environment externally. Vygotsky used a systematic way to examine the tools and sings role in mediation. (Mahn, 1999) This understanding is an elaboration of a concept from Engels that humans use tools to change nature, but nature will come back to change humans (Vygotsky, 1930/1978). Vygotsky later uses the term nature from Engels as environment in the concept of how humans use tools and signs to interact with the environment (Vygotsky, 1930/1978).

Concept Formation

In order to have complete knowing of the zone of proximal development, Vygotsky suggests us to understand the role of imitation in learning. (Vygotsky, 1930/1978, p.87) Vygotsky states, "Human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them." (Vygotsky 1930/1978, p. 88) Through the social nature, children can imitate in more advance level then their own actual developmental level with the more knowledgeable other. (Vygotsky 1930/1978, p.88) Through experiments, Vygotsky discovers that "children do not imitate anything and everything but only what is in the ZPD." (Newman & Holzman, 1993, p.150) Vygotsky describes imitation that "the source of instruction's influence on development" and "instruction is possible only where there is a potential for imitation." (Vygotsky, Robert, & Carton, 1987, p.211-212) Therefore, imitation is the driving force for learning-development unity and for one's development of meaningful doing what one cannot yet do by oneself. Newman and Holzman argue the imitation-learning/development unity that "imitation in the ZPD, far from being rote behavior, is the revolutionary activity of making meaning." (Newman & Holzman, 1993, p.151) Thus, the meaning making happens in the activity of zone of proximal development by doing imitation. Further, imitation cannot be understood as a mechanical process. It will be a mistake to think that one can imitate anything. Vygotsky uses the following example:

> If L.N. Tolstoy, the genius novelist, might want to work on mathematics, might want to take up medicine or even chess, there would probably be an enormous discrepancy between his abilities as a novelist and his potential for mathematics and chess. (Vygotsky, Rieber, & Carton, 1987, p.233)

Therefore, it is very important to understand the potential of the development, but not to extend it into unlimited. Imitation can only be conducted in the activity of one's zone of proximal development. (Newman & Holzman, 1993, p.56)

The Zone of Proximal Development has to do with the concept development. The development is both intramental and social process. (Daniels, 2001) The intramental side of concept development is when they move from totally unorganized "heaps" to "complexes" and finally to "concepts" that includes scientific concept and spontaneous concept. (Vygotsky, 1934/1986) At the same time, concept development is in "institutionally situated activity." (Daniels, 1996, p.14) Before one goes to school, he or she has already had their own spontaneous concept developed. This developed concept later has discrepancies with the concept from formal schooling, which provides a framework for the formation of scientific concept. (Daniels, 2001) Those differences or discrepancies from spontaneous concept and scientific concept produce the consciousness that constitute learning. ZPD then is the explanatory interaction activity of spontaneous and scientific concepts. (Kozulin, 1990)

When we discuss Vygotsky's idea on instruction in development, we have to analogy that "there are ideas that simply cannot be thought [translated] in another language." (Cole, 2003) In English, the term instruction mainly means teaching. Although the Russian word "*obuchenie*" is translated as "instruction," since there is no precise English word to represent, Vygotsky uses instruction as teaching as well as learning, a "learning-teaching process." (Rogoff & Wertsch, 1984, p.3) In the learning-teaching process, the level of negotiation between the learner and the more knowledgeable person should be investigated closely. In Vygotsky's thought, instruction should be placed before the maturing of the development. (Rogoff & Wertsch, 1984) In other words, the social and institutional learning-teaching process works with the intramental concept development and that leads the spontaneous concept to meet scientific concept half way and synthesize to a new understanding of knowledge. Therefore, Vygotsky claims that, "the zone of proximal development furnishes psychologists and educators with a tool through which the internal course of development can be understood." (Vygotsky, 1930/1978, p.87) As a result, the Zone of Proximal Development is a psychological tool that has the mediating function to the learning and development.

Zone of Proximal Development

The Zone of Proximal Development is an approach and concept that Vygotsky discovers to the study of the interaction between learning and development in school learning. (Vygotsky, 1930/1978, p.84-85) According to experiments, Vygotsky believes that children with similar levels of mental development can have a result of very different degree of "subsequent course of their learning" from the guidance of a teacher. (Vygotsky, 1930/1978, p.86) The development of the children's mental capabilities can go further with the adult's

assistance. Thus, Vygotsky calls the difference of development between without and with adult assistance as the zone of proximal development and describes:

> It [the zone of proximal development] is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. (Vygotsky, 1930/1978, p.86)

Because of the help from the more knowledgeable other, Vygotsky distinguished what a child can learn by them own and what can be learned through the assistance from the more knowledgeable others. (Snowman & Robert, 2003)

The two levels that are described above have to be seen in two fundamentally different natures. The actual developmental level identifies those mental functions as "the end products of development." (Vygotsky, 1930/1978, p.86) On the other hand, the zone of proximal development defines "those functions not yet matured but are in the process of maturation …" (p.86). Compare with the static actual developmental level, the zone of proximal development is full of action in between the actual developmental level and potential development level. Through the process of learning with the assistance from the more knowledgeable other, the actual developmental level of tomorrow falls into the distance in between, or the zone, but cannot be the maximal potential of today. As Cole (2003) points out for the role of discoordination, that mediated and immediate experience will never be complete the same, that is, they can never be completely coordinated or discoordinated. Life is in between totally structured and random. (Cole, 2003) The potential development level, therefore, can never be completely reached nor the minimal potential development level can never be the same or even less then the actual developmental level. To extend this idea, in the dialectical logic and philosophy, Vygotsky does not talking about the actual developmental level and the potential development level in separation, nor he distinguishes the learner with the more knowledgeable other or individual with the society in metaphysically duality. Newman and Holzman (1993) point out that it is the historical unity. As a historical unity, he does not talk about learning nor the development or even the zone of proximal development. Learning and development cannot be separated and the zone is not a place for learning and development. "It is an activity, an historical unity." (Newman & Holzman, 1993, p.79) They think "it [the zone of proximal development] destroys the need for interactionist solutions to the dualism of mind and society because it does not accept their ontic separation..." (Newman & Holzman, 1993, p.79) Vygotsky describes the relationship between development and learning as:

> Developmental processes do not coincide with learning process. Rather, the developmental process lags behind the learning process; this sequence then results in zones of proximal development. (Vygotsky, 1930/1978, p.90)

In this statement, it seems that the learning is leading development as if learning causes the development, but Newman and Holzman (1993) thinks that in Vygotsky's view, learning does not cause development, and in fact, they do not have causal-effective relationship. In the dialectical view, one cannot exist without another. "In which dialectical unity (not metaphysical duality) is the central paradigm, or anti-paradigm.... the 'bicondition' for the other." (Newman & Holzman, 1993, p.147) This analysis can also be used for Vygotsky's

concept on thought and word that "Thought is not expressed but completed in the word" (p. 147-148) and the analysis on the problem of method that "...the method is simultaneously pre-requisite and product, the tool and the result of the study." (Vygotsky, 1930/1978, p.65)

Based on the above acknowledge, the following statement from Vygotsky becomes meaningful:

> The state of a child's mental development can be determined only by clarifying its two levels: the actual developmental level and the zone of proximal development. (Vygotsky, 1930/1978, p.87)

Clearly, Vygotsky now does not talk the zone of proximal development as a zone, space, area, or distance, but an activity of the unity of learning and development. Then the activity of the unity complete itself with the completed mental functions of actual developmental level and go on with the further learning and development. Further, Vygotsky (1930/1978) believes that "although learning is directly related to the course of child development, the two are never accomplished in equal measure or in parallel" (p.91). Therefore, learning and development are in dialectical relations, and the zone of proximal development is "where and how the unity [synthesis] of learning and development takes place." (Newman & Holzman, 1993, p.146)

The speech of Digital Storytelling and stimulation

According to Lambert (2007), the Digital Storytelling is not pushing people to learn and explore newer type of media technology; instead, he "use the visual culture to bring people back into language and the written word." In other words, "story first, media later" becomes very import philosophical turning point to the whole story construction; therefore, Digital Storytelling has an emphasis on digital and multimedia mediated (or assisted) storytelling.

Luria (1979) believes that mediated nature of higher psychological functions are not simple stimulus-response reactions. Indeed, the human beings' higher psychological functions incorporate the stimuli that are produced by themselves. A person does not only receive stimuli from other human beings and/or the nature, but also "actively modifies those stimuli and uses his modifications as an instrument of his behavior" (Luria, 1979, p.44).

Because of the mediated nature of human psychological development and behavior, the mediation is an instrument used to study as well as being studied. Minick (1996) explains the analytic unit that Vygotsky called the "instrumental act" as "a unit of activity mediated by signs that are used as tools or instruments to control behavior" (p.28). Therefore, the mediated unit that Vygotsky uses as an approach to study is different from a behaviorist's stimulus-response laws. Minick further extends Vygotsky's argument:

> Speech and other historically developed sign systems provide humans with a unique form of stimuli that they can use to influence or control their own behavior. (Minick, 1996, p.28)

Therefore, one's internal motivation can develop from inner speech as well as oral speech to the outer world by using a socially conditioned signs and meaning of words. This mediation effects will be the foundation for higher psychological functions for the consciousness.

Conclusion

In the study of our foreign marriage families, we have investigated, we found they are socially and culturally mediated and conditioned, in return, we culturally mediated within a culture, socially mediated within a society, that support the culture and social change toward learning as a community. Are immigrant families? No! Are they bilingual? No! The idea we formed is a pseudo-multicultural culture within "the" culture that doesn't really facilitate learning scientifically. the multicultural assumption from the government and the mainstream scholars in the foreign-marriage families' social-cultural settings are improper; instead, we come up with the idea "pseudo-multicultural" to appropriate our links from preschool children's higher psychological functions into their scientific concept formation. Technologies may, at least, provide meaningful tool for the children and families to work as a learning community.

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