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Overcoming Issues In Cognitive Engagement For Learning Computer Related Subject Through Computer Supported Collaborative Learning

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ABSTRACT: Learning computer skills is essential to survive computer science's subjects. Subjects such as web programming, programming language as well as authoring language are complex, demand multiple skills and require high cognitive engagement. This research suggests the use of computer-supported collaborative learning approach to help the students survive the computer-related subjects. Based on the socio-cultural theory, this research attempts to engage students in learning discussion for the construction of knowledge among peers for better knowledge understanding.

***Keywords**: Cognitive Engagement, Learning Computer, Collaborative Learning*

1.0 INTRODUCTION

For learning to be truly meaningful, students' need to be cognitively engaged (Solis, 2008). Cognitive engagement is an indication of learning process being take place where students exert an amount of mental effort to get engaged to the learning material (Richardson & Newby, 2006; Walker et al., 2006). Research that explains cognitive engagement in online learning is plentiful (see works by Zhu (2006) and Wysocki (2007)) as cognitive engagement is prerequisite for students' meaningful learning (Solis, 2008; Bai, 2003) and are critical for the creation of new knowledge and understanding (Zhu, 2006). All of these contribute to students' cognitive change. Students' cognitive change as a result of learning is important as an indication that learning does take place, and as a result, managed to modify the students' prior knowledge towards a better understanding (Zhu, 2006).

Zhu and his friends mentioned that it is important to clarify to what extent does the students' are cognitively engaged in their learning task, as it will contribute to knowledge acquisition (Zhu et al, 2009). Studies found that, for some period, most of students' online discourses are information-sharing statement which falls under the lower degree of cognitive engagement (McLoughlin & Luca, 2000; Zhu, 2006; Schellens & Valcke, 2005; Schellens et al., 2008; Ma 2009). There is no empirical mark that higher order learning such as construction of new knowledge and critical analysis of peer interaction had taken place in their discussion (McLoughlin & Luca, 2000). Aspiring for the higher level of cognitive engagement relies very much on the proper planning of learning activities and facilitation during online discussion (Zhu, 2006).

Richardson & Newby (2006) continues to explain that students' cognitive engagement in online learning is important where; as the students gain experience in online learning, they appear to be more responsible for their own learning. It is explainable in the sense that students' level of engagement will influence learning and their motivation (Mandinach & Corno, 1985). In fact, even though students are highly motivated, they are found not to be reaching the deep cognitive engagement (Blumenfeld et al., 2006; Hanrahan, 1998).

A broad definition of cognitive engagement is that it comprises two elements; mental effort and the engaging material. Mental effort in cognitive engagement can be defined as the employment of students' cognitive in learning voluntarily (Zhu et al, 2009; Blumenfeld et al, 2006). Engaging material refers to the task (Scott & Walczak, 2009), the classroom activity (Helme & Clarke, 2001), the learning subject (Richardson & Newby, 2006; Walker et al., 2006; Zhu et al., 2009), or simply the information and difficult skills that require understandings (Connell & Wellborn, 1991).

In face-to-face learning environment, cognitive engagement is observable when the students give sustained attention to the given task that requires mental effort (Corno & Mandinach, 1983). However, different way of observing cognitive engagement in online learning is necessary. Zhu explains that cognitive engagement is not observable in online learning environment but can be understand from the richness of discussion messages (Zhu, 2006). Thus, for online learning context, Zhu (2006) clarifies cognitive engagement as:

> ".. attention to related readings and effort in analyzing and synthesizing readings demonstrated in discussion messages. Cognitive engagement, as defined, involves seeking, interpreting, analyzing, and summarizing information; critiquing and reasoning through various opinions and arguments; and making decisions. "

2.0 COGNITIVE ENGAGEMENT IN LEARNING COMPUTER-RELATED SKILLS

Cognitive engagement in online learning has been explored in various subjects, however, less attention are being paid to research in technology context (Wysocki, 2007; Zhu, 2006). For subjects that manipulated the use of skills such as in learning computer subject, Scott and Walck (2009) mentioned that cognitive engagement is the critical determinant.

Learning computer skills require high cognitive engagement due to the complexity of the task (Joung, 2005). It involves a higher degree of cognitive engagement to meet the challenges of the given task (White & Sivitanides, 2002; Ismail et al., 2010). In learning Programming Language, students lack the required cognitive demand of knowledge and understanding. In fact, at the lower level of cognitive engagement itself, students are found to have difficulties to understand the given computer skills-related problem where students are unable to organize and plan solutions to problem (Ismail et al, 2010).

For Website Development subject, it is especially challenging as the technologies involved are rapidly changing (Yue & Ding, 2004; Carter & Boyle, 2002), it is inter-related with other skills, and requires other infrastructure supports (Yue & Ding, 2004). Although there are many websites that provide step-by-step guidance on developing a website, which may, help the students to know more about this subject, however, rare works are found that cover this subject deeply (Yue & Ding, 2004). Thus, students need to come up with a set of basic computer skills before learning this subject (Greer, 2002).

From software, hardware to design, Website Development subject will challenge the students in these competencies. Rathswohl (2002) gave step-by-step modules to his students, starting with the modules of basic information literacy skill set, to modules of networks, e-commerce topics, and Web presentation design. In a study conducted by Greer (2002), there are 59 students who claimed that they surf the internet, use emails, and FTP packages but not more than 20 percent have average skills in html codings which is equally necessary to learn the subject.

The findings provide information that learning Website Development subject requires a considerable mental effort and multi-skills for success. However, the existing mode of

learning computer skills cause the students to be passive information receiver, and reduced student-teacher interaction when lessons are conducted in a large group of class members (Ismail et al., 2010). The nature of learning 'skills' in online setting as in online discussion is not similar as in the way of learning conceptual and factual subjects such as physics, chemistry, and social sciences subjects.

Yue and Ding (2004) proposed the used of authentic while Cook (2008) suggest high-level problems for learning computer skills to be successful. For students learning Website Development subject, it is recommended that the instructor apply multiple learning approaches such as discussion and giving real-life problem solving (Rathswohl, 2002). Given a computer skills-related problem, it is interesting to observe how the students get their cognitive activated and constructing knowledge while interacting with peers. These types of assignments are useful to get the students actively engage in the construction of knowledge which is meaningful to them (Rathswohl, 2002).

3.0 COMPUTER-SUPPORTED COLLABORATIVE LEARNING TO ENHANCE COGNITIVE ENGAGEMENT

For the students to be able to move between levels of cognitive engagement, students need to be placed in an encouraging environment (Zhu, 2006). Computer-supported collaborative learning is an emerging educational technology paradigm (Koschmann, 1994; Lipponen, 2002; Gros et al., 2005) that provides principles to design effective online learning environment. Originating from collaborative learning, computer-supported collaborative learning (CSCL) is where the process of peer interaction, working in groups, sharing and distribution of knowledge are supported by technology (i.e computer) (Lipponen, 2002). CSCL highlights on how technology-assisted collaborative learning increases interaction with peers and cooperativeness in group (Dillenbourg & Fischer, 2007). The purpose of collaborative learning is to get the students to learn by working together to solve learning tasks (Kumar, 1996; Gros, 2001) where students are found to possess knowledge sharing behavior in a CSCL environment through the implemented peer-assisted learning (Auttawutikul & Natakuatoong, 2008).

CSCL as concluded by Gros et al (2005), expresses two important ideas, one of which is the research concerned which is CSCL as the idea of learning collaboratively, with others, in a group. At this point of view, the learner is not described as an isolated person but rather in interaction with others. While the interaction element is part of Gros's concern, Dillenbourg & Fischer (2007) outlined some of the basics of CSCL that is online communication-related. There are (a) the tasks in CSCL mediate verbal interactions; (b) interaction is a substance of CSCL; and (c) virtual communities of CSCL effectively share knowledge.

As being described by Jonassen and his friends, an individual does not own the knowledge and intellectuality, but it is shared among the community of practice. One of the underlying principles to engage students in learning and knowledge construction is collaboration (Jonassen et al., 1995). The practice of CSCL to enhance cognitive engagement is appropriate because collaborative learning allows the distribution of workloads among the group members and allows the construction of knowledge in a social context; which are both necessary to learn complex knowledge and higher order cognitive skills (Ma, 2009; Lehtinen et al., 1999).

CSCL is efficient for the purpose of enhancing higher-order thinking skills as through CSCL process, old and new knowledge will integrate, thus creating new knowledge that can be applied for other applications (Ma, 2009). CSCL also emphasized more on higher-order

skills such as argumentation, self-regulation, and media-literacy, and the sharing of informal knowledge (Dillenbourg & Fischer, 2007). It also offers realistic learning environment (Kumar, 1996; Jonassen et al., 1995), socially enriched learning contexts, and is cognitively motivating (Kumar, 1996).

A critical research was conducted by Schellens and Valcke using a double set of models; the Veerman and Veldhuis-Diermanse and Gunawardena's (Schellens & Valcke, 2005). Significantly less communication related to presentation of new facts, significantly higher amounts of communications that reflects ideas based on theories and evaluation was resulted in the research where Schellens and Valcke broadly concluded that CSCL environment fosters higher phases of knowledge construction. However, they indicated that the more discussion activity in the group, the more phases of higher knowledge construction can be observed (Schellens & Valcke, 2005).

There are various researches that outlined the principles for practicing CSCL. Kumar (1996) draws eight characteristics for collaborative learning. There are:

(a) The type of collaborative control,
(b) Type of collaborative tasks,
(c) Theory behind the type of collaboration,
(d) The context in which collaboration happens,
(e) The type of participants,
(f) The role of collaboration participants,
(g) The collaborative domain,
(h) The type of tutoring in a collaborative environment (Kumar, 1996).

Most of the characteristics being outlined by Kumar (1996) are being emphasized by other researches as well. For instance, the dimension of CSCL tasks (Strijbos et al., 2004; Van der Meijden, 2005; Dillenbourg & Fischer, 2007; Gros et al., 2005), theory behind the type of collaboration (Lipponen, 2002; Dillenbourg, 1999), the role of collaboration participants (Van der Meijden, 2005), and the type of tutoring (Koschmann, 1994; Gros et al., 2005).

While CSCL environment provides a platform for knowledge construction (Lipponen, 2002; Lehtinen et al., 1999) and supports greater social interaction (Lehtinen et al., 1999; Paavola et al., 2002), there is a need for research on the students' level of cognitive engagement in CSCL environment. It is also beneficial to provide ideas on how to cultivate cognitive engagement of higher level particularly in CSCL environment as it will facilitate students' learning (Mandinach & Corno, 1985) and increase students' academic performances (Walker et al, 2006; Zhu et al., 2009).

4.0 CONCLUSION

This paper addresses issue where learning computer-related subject, particularly subjects that involved skills such as Programming Language and Website Development subject, multiple skills are required as well as higher level of engagement should be established by the students especially in online learning settings. Computer-supported collaborative learning is an approach being proposed for the benefit of engaging students in environment that encourage co-construction of knowledge through peer interaction. Further research can be done to investigate at what condition does CSCL fits the best and what type of interactions that enable the co-construction of knowledge for online learning of computer-related subjects.

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