An Exploration of Individual Student Perceptions of Mastery of Knowledge in an Online Collaborative Context

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Abstract

Technology-supported learning environments no longer need to conform to the traditional classroom environment where information is uniformly disseminated. Instead, the application of technologies means that learners can participate actively in their own knowledge acquisition process. Over the years teaching and learning practices have moved from instructor-centric to student-centric. As the focus moves from instructor-centric to student-centric, the knowledge to be collected has grown hyper exponentially. Individual mastery of knowledge has been shown to be effective in a variety of learning situations, particularly in face-to-face collaborative learning environments. This qualitative study explores individual perceptions of mastery of knowledge acquired in a technology-supported online collaboration context. Results from the study indicate individual student mastery of knowledge was strongly supported in online collaboration via engagement in online discussion forums. By using mastery of knowledge to enhance the learning process, there would be a commensurate enhancement of the likelihood of the transfer of knowledge. The enhancement of this learning process can assist Web course designers and educators to create online learning programs that best utilize the students' capacity for knowledge management, processing of information and information sharing.

(**Key words:** mastery of knowledge, knowledge management, discussion forum, collaboration)

1. Introduction

Today's learning environments have the technological means to open learning to the world and support interaction styles that are fundamentally different from those encountered in a traditional classroom environment. It is difficult to ignore the visible impact of technologies that accelerate the pace of learning and create unlimited opportunities for collaboration, insight and knowledge production [1]. In education, it is presumed that individual mastery can integrate a student's experiences outside the school in the learning process, encourage the student to use prior knowledge in pursuing new knowledge and motivate him or her to engage in learning tasks at hand [2].

A number of researchers have implied a link between mastery and knowledge [3, 4]. It appears that if learning is maximized, as in a mastery context, knowledge acquisition is more likely to occur. Knowledge is composed of information that is interpreted, consciously and unconsciously, by an individual in the course of a learning process. Mastery is the accumulated result of one's interactions with the environment, of one's learning and of one's adaptation to the environment [5]. The level of knowledge already mastered has a positive impact on our ability to learn new knowledge. Hence, the more diversified the basic level of knowledge, the more easily new knowledge is learned since the information is linked to the knowledge that we already possess [6].

Deci [7] suggested that the need for mastery leads individuals to seek and conquer challenges that are optimal for their capacities and that mastery acquisition results from interacting with stimuli that are challenging. By interpreting the environment as a learning environment, mastery can be achieved once the knowledge or information within that environment is mastered. As students achieve the ability to manage information, they go on to master the environment. Dweck [8] pointed out that students who feel confident

will engage in "mastery-type" behaviors while a perceived threat to perceived mastery will lead to maladaptive, helpless behaviors.

Individual mastery of knowledge exerts a crucial influence on learning, performance and persistence [9]. Technology presents an approach to effectively and efficiently deal with the complex phenomenon of exploring the perceptions of individual mastery of knowledge in online collaborative learning activities. For example, the use of technology enables us to create innovative learning communities that promote active learning, collaboration, problem solving and the use of real-world contexts [10].

The following research question seeks to explore individual perceived mastery of knowledge: what are student's perceptions of mastery of knowledge in online collaboration? The intention of this research is to create a learning platform that allows students to interact and collaborate in an online setting. Interaction and collaboration is one of the most important components of learning experiences in on-line environments [11, 12]. Collaborative enquiry offers a different model of learning from that provided by traditional lecture and classroom-based methods [13]. However, recently developed instructional and communication technologies can facilitate the collaborative learning process for students by adding structure to their group experiences and giving them additional tools to support their work [1, 14].

2. Literature Review

Numerous studies have demonstrated that mastery is an important factor of motivation research [15-18]. Individual mastery refers to one's beliefs about his or her ability to be successful in an achievement domain. For example, students can interpret comments from an instructor as positive information that serves to maintain or enhance their mastery toward the activity. As mentioned, mastery learning represents the extent to which an individual believes that he or she has performed or is able to perform well in an activity [19, 20]. For example, Danner and Lonky [21] found that when individuals were free to choose from among a range of activities, they selected an activity that stretched their capacities to a slight degree. These studies documented that individuals prefer to work on challenging activities when they are free to do so. Thus, the concept of mastery relates to individuals' need to master challenges by effectively processing and managing information.

Individuals seek out challenges and their engagement with those challenges contributes to the continuing differentiation and integration of their existing capacities. As Montessori [22] described it, the individual needs to find stimulation in the environment that is, "Organized in direct relation to his internal organization which is developing by natural laws." In broad terms, mastery learning refers to individuals' perceptions that an activity invites them to perform to their full capacities. As such, individuals have a typical and customary level of task challenge they are willing and capable of handling. For any specific task, some individuals will be more challenged than others. From this perspective, an individual's subjective assessments will be more important than objective task characteristics. Fundamentally, mastery learning involves an individual's anticipatory self-appraisal of two factors - expectations about goal-directed accomplishments and a perceived ability to perform activities directed at achieving those goals.

Numerous qualitative and quantitative studies have converged on the key factors which define mastery learning [23]. For a task to be mastered by an individual, an individual's expectations about what can be accomplished must be matched by self-evaluations of his or her own capabilities. Therefore, when the individual's self-recognized capabilities are equal to the expected task mastery, he or she is more likely to have a positive self-rewarding experience with the task activity. The positive emergent profile that becomes apparent from completion of the activity includes the perception that expectations were fulfilled as well as an awareness of being active but relaxed during the task activity.

The need for mastery learning motivates an on-going process of seeking and attempting to conquer challenges. When individuals are free from the intrusion of drives and emotions, they seek situations that require the use of their creativity and resourcefulness. They seek task that are neither too easy nor too difficult. When they find challenges, individuals work to conquer them and they do so persistently. In short, the need for mastery learning keeps individuals involved in ongoing cycles of seeking and conquering challenges.

Thus, individual mastery of knowledge can be viewed as evolving along with an individual's knowledge repertoire and value system. It allows recognition of the meaning in a learning task, leads to meaningful learning behaviors, promotes long-term storage of knowledge and provides motivation for continued engagement in learning [24]. From this perspective, mastery of knowledge triggers an individual's desire to engage in gaining the knowledge and skills he or she lacks in. Continual interaction with other individuals, objects, events and areas of subject matter (i.e. content)

leaves behind traces in both that individual and the environment. Each experience adds to and differentiates an individual's store of knowledge.

Also, by challenging an individual's cognitive structure, he or she learns and builds upon his or her knowledge base [25]. Berlyne and Frommer [26] stated that individuals are more likely to be curious, explorative or investigative if they encounter something that is new, complex, incongruous or surprising [26]. But how are learners able to apply knowledge in complex and diverse environments and are they able to learn in settings similar to those that they will encounter in the workplace? Classroom activities, per se need to be placed in meaningful contexts, involving real-life situations, within communities of practice. Such learning environments, where social constructivist learning is facilitated by the design of activities that command student collaboration, self-pacing and active engagement in problem solving and critical thinking, offer the potential for locating learning in the context of real-life situations and problems [27].

Web-based delivery tools such as the "Blackboard™ Virtual Classroom" facilitate environments (1) where meaningful and authentic learning takes place; (2) where construction of knowledge is promoted; (3) where collaboration and conversation (between and among students and instructors) is supported; (4) where individual mastery may be significantly increased. Participation in technology-supported online activities includes increased apprenticeship learning (i.e. more opportunities for an individual to learn during interaction with peers and instructors), the development of important literacy skills (e.g. learning the genre of online communication, learning to read and write hypertexts) and increased mastery in the content and subject matter [1].

Research has shown that interactive technologies such as Web-based discussions create successful learning environments from four perspectives: (1) challenging and supporting learners' higher level thinking; (2) promoting learners' deep and flexible understanding on the basis of introductory knowledge acquisition; (3) enhancing learners' conversations and collaborations; (4) facilitating learners' self-regulation during learning [27-30]. As such, the use of technology-support in the classroom provides "real world" learning activities, problem-based learning, embedded interactive applications, flexibility and control of learning and an increased sense of learning and academic success.

Communication resources such as the "Blackboard™ Virtual Classroom" may increase individual web etiquette, the skill of active listening, using concise communication, analyzing, synthesizing and evaluating information from multiple sources. Using the "Blackboard™ Virtual Classroom" as a tool for online discussion encourages a collaborative environment between and among students and may extend the learning process. Prior research has shown that group collaboration encourages individuals to actively participate in the learning process, support information sharing, provide immediate feedback and increase the amount of information retained [31-33]. Such social interactions, in the form of group discussions, can have significant effects on individual perceptions, attitudes and mastery content [7, 13].

Group collaboration not only provides valuable sources of information that facilitate an exchange of ideas through communication but also facilitate social interactions. There seem to be at least two preferred reasons for employing group collaboration to seek ideas: (1) Groups bring multiplicity of cognitive resources to the task based on a broad range of skills and experiences of members and combine them into a coordinated performance through social process [32] and (2) Cognitive learning perspectives suggest that a higher level of abstract thinking (e.g., metacognition) is stimulated through a dynamic interaction in a social environment [11, 34, 35].

Electronic discussion forums stimulate communication utilizing existing technology features (e.g., parallelism, anonymity, group memory and structured group processes) as it allows the facilitation of idea stimulation and generation. Another significant aspect of online communication is the collaborative and constructive nature as a way to construct knowledge through peer interaction [36]. This sort of collaborative and constructivist learning environment is being increasingly incorporated into university online learning platforms such as "Blackboard™" or "WebCT™." These and other electronic discussion forums enhance communication and dialogue both in the classroom as well as in business organizations, thus preparing students for their careers. Students require a curriculum that allows them to collaboratively construct a new reality based upon world experiences.

3. Research Methodology

This study used an exploratory, inductive qualitative approach. This study is limited to online discussion forums, because, as our prior research suggests, these discussions have the potential to influence a wide spectrum of factors directly related to mastery learning and thus appear as a favorable context to study the subject. For example, student-student interaction is seen by Cifuentes et al [37] as a powerful force for supporting learning and by Klemm [38] as a means for

ensuring participation, which is critical based on his view that, "Learning is best accomplished when the learner is actively engaged in the process." According to Cifuentes et al [37], in addition to the collaborative dimension, an equally important purpose is, "Promoting self-direction by encouraging greater learner autonomy." The research plan comprised use of online technology-supported discussion forums. Assessment was based on learning activities within the discussions that allowed individual students to interact together. The objective was to explore individual students perceptions of mastery of knowledge using discussion forums as a tool for online collaboration.

Students from the Bachelor of Business Administration (BBA) program taking the FB2501 "Management of Information Systems (MIS2)" course, constituted a large pool of available subjects, who fit well within the context and purpose of this exploratory study. The selection of this course was based on the following criteria: Firstly, this course provided a rich opportunity for applying a learning approach comprising of technology to both online environments. Secondly, learning activities in the form of online discussion forums were structured into the design and organization of the course. We expected students to engage in "expert-like" ways of thinking, acting and problem solving (i.e. making interpretations, engaging in negotiations, providing rationales and reaching conclusions) in the online discussions.

Online discussion boards through "Blackboard™ promotes reflection and analysis, thus enabling discussions among all student participants. Knowing that their comments will be available at all time to the instructor, students should typically take more time to consider, write and edit their thoughts, as well as support them using quotes, hyperlinks and attachments. In addition, the online discussions help students learn to appreciate and evaluate positions that others express. This gives them the opportunity to be challenged, corrected and questioned by their peers, thereby inviting students into a community of practice that motivates them to learn the subject matter and helps them to gain social skills.

Once the overall course structure had been determined, learning activities were designed for online discussions. For example, online discussions using "Blackboard™ were structured around the case method to engage students in more expert-like ways of thinking, acting and problem solving (i.e. searching for learning resources, making interpretations, engaging in negotiations, providing rationales and reaching conclusions) [39]. For example, students, working in groups of four, were told to examine one of the processes of the Information Systems Development Process. Each group of students was required to examine one the processes and present to the class the pros and cons in the form of a "PowerPoint™," presentation. The purpose of this activity was to allow students an opportunity to share their knowledge, to constructively critique each other's work and discuss improvements and new insights.

Respondents were selected using a two-stage sampling procedure. In the first stage, the FB2501 "Management of Information Systems (MIS2)" course was selected and in the second stage individuals were chosen from the FB2501 course. Seven students exposed to the online discussions were interviewed from the course. The selection of this course was based on the following criteria: Firstly, this course provided a rich opportunity for applying technology to online classroom environments. Secondly, learning activities in the form of online discussions were structured into the design and organization of the course. We expected students to engage in "expert-like" ways of thinking, acting and problem solving (i.e. making interpretations, engaging in negotiations, providing rationales and reaching conclusions) in the online discussions.

Interviews for the "Management of Information Systems I" took place during the first half of semester B (Cohort 2003). The interview protocol minimized bias by providing a basis for a consistent sequence and approach to interviews (Appendix 1), by adopting consistent wording for the applicable questions and by asking each question in the same way to each participant to minimize bias. Interviewing a student sample from the BBA program, helped to ascertain generalizability of this study across populations, and helped to cross-check data and served, "As a strategy that added rigor, breadth and depth to [the] investigation" [40]. For this study, we interviewed a total of seven students enrolled in the BBA program.

4. Results

Individual perceived mastery was positively supported by all seven interviewees and recognized in the online discussions with regard to difficulty, problems and obstacles. We interpreted from the following statements that perceptions of individual mastery were high in the online discussions.

"Yeah…actually when we are talking about something we try to explain and use some examples, but when we do online discussion, we can only give some abstract concepts…we cannot say a long story to say what I've just mentioned about this point…and this part is the most challenging." "…it may be difficult because if one types one sentence and the other types one sentence,

then the previous sentence will go up. Sometimes a sentence comes up and others may not understand what this sentence relates to."

For example, one student noted that, *"...it's very interesting and I think it's a good way for me…it is so efficient for me. It's more efficient I think, as compared."*

Another student noted, *"…the virtual classroom is different. It can arouse some different opinions."*

Yet another student said that, *"I think online discussions are interesting because it is more interesting to use the computer."*

Here the students sought engagement in the activity because using the computer technology was both interesting and enjoyable. Yet, they also recognized that being interested precipitated their learning process:

"I think it was very interesting because the tutorial last semester was very boring; the teacher would just say something and we would listen, but now we can participate more, so it is interesting. I think the online discussions are a very appealing way of learning."

For example, one student noted that, *"If I typed in my own comments and didn't look at theirs, they will tell me that next time I need to look more at their comments, their opinions and not just formalize my own, so I need to explore different options."*

Another student noted, *"…sometimes you want to say something but you find that others have already pointed it out, so it will encourage you to search for more points so you can add more opinions."*

The online discussions encouraged "independent learning," while "managing" teaching and learning with reduced tutor contact and use of online technology, which was overall perceived by students as desirable and effective. Thus, the online discussions enabled and encouraged a "learning to learn" approach and we had proof of this, as is evident from the following opinions of some of the students:

"I think it's also highly effective because of the information ways...the ways the information is provided and also I said it's more efficient to use this, because we cannot discuss about some stupid things. So I feel it is [online discussions] very effective in assisting my learning."

Finally, a more widely held perception among students was that the skills of presentation and communication in the online discussions were useful and convenient from a practical standpoint. From an overall perspective, the results demonstrated that students were comfortable and exercised mastery using technology supported online discussion forums. All the students found the online discussions most stimulating. These types of synchronous activities seemed more familiar to them and gave them ample opportunities to influence the directions of the topics under discussion. A significant benefit arising from the online discussions was that these discussions compelled students to give more serious thought to the issues being discussed online and the effects the use of technology has on their learning behaviors.

Another significant benefit of communicating via computer seemed to include individual development of thoughts and ideas, feeling part of an online community, gaining insights about different people and learning from each other. Students felt that by using the computers for online discussions, they could learn faster, become more creative and write better. They felt they had more control over their learning behaviors and more opportunities to practice their written English dialogue skills. As a result, the online discussions appeared to enhance their opportunities for mastery of learning.

5. Conclusion

Our study explored individual perceptions of mastery learning on knowledge acquired in an online collaborative learning discussion forum classroom context. In the course of this study, examining technology-supported classroom contexts and integrating the findings into theory and research was a challenging task. We have seen that online discussions provide unlimited opportunities for information sharing, quick exchange of ideas and affords users more time to analyze and prepare contributions, as a result of the self-paced nature of the medium [10, 41]. Online discussion forums may also facilitate a more inclusive environment, by providing more opportunities for equal participation and collaborative learning, thus enabling shy or reluctant students to communicate more comfortably with their peers.

The use of interactive technologies may provide educators a valuable guide for designing technologies that considers principles of all three pedagogies where the individual learner may find him or herself in an environment that both instructs about subject matter and encourages him/her to construct knowledge from subject matter more meaningfully and effectively than ever before [42]. As such, these social interactions have the potential to enhance individual construction of knowledge by engaging the individual learner in the

mastery of learning activities that are interesting, challenging but not too difficult, arousing his or her perception of curiosity, permitting him or her to make decisions and allowing him or her to exercise control in terms of setting his or her own pace in the technology-supported online activities [43, 44].

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