Examining Individual Students' Perceptions of Curiosity Utilizing a Blend of Online and Face-to-Face Discussions: A Case Study

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Abstract

Research has established that the exploratory behavior of an individual student has a positive effect on learning and academic achievement. However, very little is known about the impact of a blended learning approach on individual student curiosity and whether combinations of online and face-to-face learning activities significantly enhance student exploratory behavior. This paper assesses the effects of blended learning on perceived individual student curiosity, utilizing a blend of online and face-to-face discussions. This research collates elements from the theories of curiosity. A qualitative research methodology was utilized for the purpose of the research. Data were obtained through in-depth and semi-structured one-on-one interviews with undergraduate students. Results from the qualitative study showed that individuals' perceptions of curiosity were strongly supported. The results of our study may suggest that future research should explore more deeply, the importance of technology on learning and academic achievement (Alavi & Leidner, 2001). For example, specific studies could address various aspects of online learning and instruction, such as an individual's patterned ways of thinking, feeling and reacting. These interconnected thoughts, feelings and behaviors, may reflect the differences in motivational behavior between an individual and groups.

(Keywords: blended learning, curiosity, online, face-to-face, discussions.)

INTRODUCTION

Colleges and universities share a common mission to educate their students in the best possible way, by creating environments where students are intellectually challenged, where current and relevant subject matter is disseminated in a professional manner and where life-long learning and high standards of professional education are fostered. Given the technologies of the 21st century, we ask the question, how can educators successfully accomplish this mission? Universities world-wide are currently facing a restructuring of traditional educational paradigms. What is emerging within this restructuring is a blended learning model that combines the best practices of online and face-to-face formats (2005; Boyle, Bradley, Chalk, Jones, & Pickard, 2003). Blended learning offers the convenience of the online format with-

out the loss of face-to-face contact (Dziuban, Hartman, & Moskal, 2004). By combining face-to-face and computer-mediated elements into a blended learning activity, the learning activities become more authentic for the students. Moreover, when technology is used as a tool to support students in performing authentic tasks, the students are in a better position to define their goals, make decisions and evaluate their progress (Leidner & Jarvenpaa, 1995).

Both online and face-to-face delivery has the potential to facilitate environments where: (1) meaningful and authentic learning takes place; (2) construction of knowledge is promoted; (3) collaboration and conversation (between and among students and instructors) is supported; and finally, (4) individual student curiosity and exploratory behavior may be significantly increased. However, a major problem we encounter is that we presently lack accurate information on to how to effectively make use of blended learning environments in order to effectively promote the active learning, collaboration and problem solving skills of individual students. It is not only difficult to assess how students learn but also how well they are able to adapt to these learning environments.

The following research question seeks to assess the effects of perceived curiosity of individual students utilizing a blended learning approach: Are perceptions of individual student curiosity higher in online discussions compared to traditional face-to-face discussions, utilizing this type of blended learning approach? The intention of this research is to create a blended learning platform that allows students to interact and collaborate in both online and face-to-face settings. Interaction and collaboration is one of the most important components of learning experiences in both on-line and face-to-face environments (Jonassen, Peck, & Wilson, 1999; Vygotsky, 1978). Collaborative inquiry offers a different model of learning from that provided by traditional lecture and classroom-based methods (Ocker & Yaverbaum, 2002). 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 (Hiltz, 1990; Warschauer, 1997).

This research has long-term significance for students, instructors, institutions and society at large. The information that can be gained from assessment can be invaluable in facilitating students' higher-order cognitions, active learning and self-regulated learning. The use of a blended learning approach also has the potential to change the nature of learning environments and the ways in which we design both online and face-to-face activities to support intellectual development, including the explorative strategies involved in learning. Examining individual students' perceptions of curiosity, utilizing a blended learning approach, should play a pivotal role in enhancing learning and furthering this research. Considerable discussions emanating from academic debate and research surround the emergence of blended learning environments. This paper firstly seeks to integrate and synthesize content regarding (a) blended learning environments and (b) curiosity. The paper concludes with a discussion of the results and the implications of these results.

BLENDED LEARNING ENVIRONMENTS

Currently many universities are exploring what is referred to as a unique combination of blended learning, in which a portion of the learning activities have been moved online. Blended learning is course delivery that utilizes more than one method of providing information to the learner (Garrison & Kanuka, 2004). This concept has become increasingly more prevalent, with the introduction of new technologies, which have offered innovative instructional delivery mechanisms that ultimately create new blends. The term blended learning is used to describe the utilization of computer-based online curriculum delivery with a mix of instructor-led face-to-face classroom delivery (Osguthorpe & Graham, 2003). Blended learning has been utilized by the teaching profession as an addition to a classroom capability and is usually synonymous with instruction that involves a mix of face-to-face and online instruction (Novak, Gavrin, Christian, & Patterson, 1999). As faculties consider realigning their courses to this new delivery format, many issues arise, including the perception that teaching online is the same as teaching face-to-face (Bleed, 2001).

In the past decade, there has been an increase in utilization of educational technology by educators. Dede (1996) warns that merely using technology as a tool for learning, instead of as a means to deliver appropriately designed content, will surely lead to failure. This technology is not valuable unless it is properly and effectively incorporated into the content and methodology of the course. Instructors need to employ the appropriate technology by creating an educational platform that interests, excites and motivates students to learn. These platforms can subsequently also serve as portals to more in-depth advanced information, if a learner wishes to proceed further than the required curriculum (Vaughan, 2007).

The main component that differentiates blended from face-to-face instruction is the use of more than one delivery method, which includes the use of computer-based instruction that can be implemented in a traditional classroom-based format (Thorne, 2003). The involvement of students in the blended learning environment is the key to their success in the learning process. In both online and face-to-face instruction, the learners and instructors interact, share ideas and generally try to support one another throughout the learning cycle (Boyle, 2005). This type of collaborative learning has been found indispensable for learners to integrate new information with existing knowledge, in order to create new ideas (Bosworth & Hamilton, 1994). The learners are better able to assimilate new information and solve problems when working in collaboration with others (Ocker & Yaverbaum, 2002). The unique feature of collaborative learning is its emphasis not only on individual learner effort but also on group coordination, shared understanding and even confrontation to achieve a common goal (Bosworth & Hamilton, 1994; Edelson, Pea, & Gomez, 1995) .

Blended learning is an approach that optimizes learning by incorporating the use of technologies with regular class-based teaching strategies, depending on the requirements of the course and its learner (Osguthorpe & Graham, 2003) . These practices can be in the form of regular classroom instruction coupled with online activities, self-paced tutorials, online assessment and online surveys, all of which help to facilitate learning. Once classroom and online delivery have been implemented successfully, the focus can be shifted to a combination of the two. The combination or "blend" would allow for increased flexibility, responsibility and control to students for their learning activities (Garrison & Kanuka, 2004). For exam-

ple, both face-to-face and online delivery can facilitate access to worldwide sharing of ideas and knowledge (Boyle, Bradley, Chalk, Jones, & Pickard, 2003). These types of situations encourage an individual to seek information, explore ideas and make him or her feel the need to resolve any ambiguity or obtain more information about the topic (Kashdan & Fincham, 2004). Thus, an individual needs a representative learning environment in which his or her explorations may be conducted and a blend of both online and face-to-face discussions, best serves this purpose (Keller, Schneider, & Henderson, 1994).

CURIOSITY

Research into curiosity and exploration concerns itself primarily with describing and explaining exploratory behavior. Explanations based on everyday experience often incorporate the notion of an active individual pursuing particular content-related goals (Kashdan & Fincham, 2004). That individual is not simply motivated; instead he or she is "curious" about some matter or content. Existing scientific discussions neglect the concept of curiosity research in areas of motivation (Kashdan & Fincham, 2004).This is especially surprising in light of the fact that, as early as 1949, Berlyne (1950), the original founder of research on curiosity, dealt extensively with the relation between curiosity and exploratory behavior. It may therefore, be useful to consider in greater detail, those aspects of exploratory behavior that traditionally have been essential components in theories of curiosity.

In interpreting curiosity, research approaches based on drive theories, theories of activation (Berlyne, 1960) or cognitive theories, have typically exhibited a general psychological perspective. Investigations were inclined to center on phenomena that can be described and explained in terms of general laws of human behavior. Researchers, for example, have focused on differences in behavior and on explanations or predictions of individual differences in light of personality characteristics. These researchers have assumed motivational factors to be the source of these differences in the field of exploratory behavior. Numerous methods for descriptions of various degrees of curiosity, in the sense of an exploratory motive, have been developed. Typical examples would be the theories, conceptions and methods pertaining to “seeking curiosity” (Livson, 1967), “sensation seeking” (Zuckerman, 1971), “variation motivation” (Pearson & Maddi, 1966), “cognitive orientation” (Kreitler & Kreitler, 1976) and “experience-producing tendencies” (Henderson, 1989).

Berlyne’s (1954) Optimal Stimulation Theory asserts that an individual’s behavior is mediated by his or her need for a moderate (optimal) level of stimulation (Berlyne, 1954). Berlyne’s (1960) work focused on determining which properties of stimuli evoke curiosity in an individual. According to his theory, the arousal leading to curious behavior is most often induced by the “collative” properties of a stimulus – ambiguity, novelty, incongruity and complexity (Berlyne, 1960). He later extended his theory to include “epistemic curiosity” which leads to “epistemic behavior,” the function of which is to “build up knowledge” (Berlyne, 1965).

Over the past few years, progress has been made toward the development of approaches that abandon a global conceptualization of curiosity in favor of process variables. In recent years, several studies (E. L. Deci & R. Ryan, 1985; Harter & Connell, 1984) have shown that when conditions of curiosity are created, conceptual learning, creative thinking and the quality of learning increase dramatically. Deci and Ryan (1985) argued that even

seemingly trivial or purely illusory choices have significant benefits on learning motivation and that curiosity is also promoted by placing learning in meaningful and exciting contexts.

Thus, autonomous activity and conscious goal-orientation represent fundamental aspects of exploration and may indicate how an individual's content-specific preferences influence his or her exploratory behavior. A theory of curiosity useful in describing everyday activity should, for instance, yield insights into whether and in what ways specific exploration is influenced by the presence or absence of content preferences. The conceptualization of curiosity to be presented in this research paper is based on the theoretical consideration of the effect of person-environment relationships. It is assumed that individual development is determined largely by the quality and course of an individual's relationships to the social environment. 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. Person-environment engagements thereby play a crucial role in shaping an individual's motivational structure.

Various research approaches deal with curiosity (Berlyne, 1960; Keller, Schneider, & Henderson, 1994) in predicting feelings of relatedness. Curiosity is related to social engagement because exploratory behavior is a powerful contributor to individual well-being that can interfere with social relatedness. Curiosity appears to increase opportunities for fulfilling social relatedness needs and is associated with enhanced goal pursuit, performance and individual well-being. Individuals have a need to feel related to the environment and this need provides a desire to act upon the environment (Berlyne, 1950). These desires to explore, discover, understand and know are inherent to an individual's nature and are central motivators for his or her behavior (Spielberger & Starr, 1994).

Curiosity, defined by Berlyne (1954) as a drive that is reduced by the acquisition of knowledge, has been hypothetically linked to learning and cognitive ability (Berlyne, 1978; Dember & Earl, 1957; Loewenstein, 1994). According to Berlyne (1978), curiosity is the impetus to explore and understand our environment. Berlyne (1954) promoted an Optimal Stimulation Theory of exploratory behavior, conceptualizing curiosity as a drive to reduce perceived uncertainties. According to his theory, individuals endeavor to sustain a preferred level of interaction with the environment. Uncertainty raises the level of arousal and curiosity motivates individuals to seek out stimuli, which reduce that uncertainty, thus decreasing the arousal to a more optimal level. As such, Berlyne (1978) considered curiosity and exploratory behavior central to learning by discovery and explicated that such learning leads to greater intellectual potency.

Malone and Lepper (1987) suggested that curiosity is directly related to the outcomes of motivation. According to their theory, curiosity is divided into two categories - sensory curiosity and cognitive curiosity. Sensory curiosity involves gaining an individual's attention through his or her senses, such as light, sound, smell, touch and taste. Examples of stimulating sensory curiosity include the use of colorful textbooks, educational materials that appeal to an individual's senses and educational computer programs. For instance, educational computer games use graphics, color, sound, movement and video to attract and sustain the individual's attention. Many a time, without even the conscious knowledge of an

individual, the stimulation of his or her sensory curiosity leads to an engagement in the learning process (Malone, 1981).

Alternately, cognitive curiosity is stimulated by the prospect of modifying an individual's current cognitive level (Walker, Greene, & Mansell, 2006). It involves creating cognitive dissonance and challenging the learner's current cognitive structure. Cognitive structure is challenged by a conflict between incompatible existing attitudes or ideas. Sensory and cognitive curiosity can be created and designed in various types of environments to make individuals think and learn. Through the use of interactive curricula or environments, an individual becomes a part of the learning process and in turn, his or her levels of motivation increase (Parker & Lepper, 1992). Additionally, by challenging an individual's cognitive structure, he or she learns and builds upon his or her knowledge base (Malone & Lepper, 1987). Berlyne and Frommer (1966) stated that individuals are more likely to be curious, explorative or investigative if they encounter something that is new, complex, incongruous or surprising (Berlyne & Frommer, 1966).

RESEARCH METHODOLOGY

A qualitative research approach was used to help clarify the following research question: Are perceptions of individual student curiosity higher in online discussions compared to traditional face-to-face discussions, utilizing a blended approach? A summary of the two stages of this research is outlined below (see Figure 1). As mentioned below, the preparatory stage consisted in conducting a thorough literature review, followed by the qualitative study that provided a conceptualization and interpretation of the results.

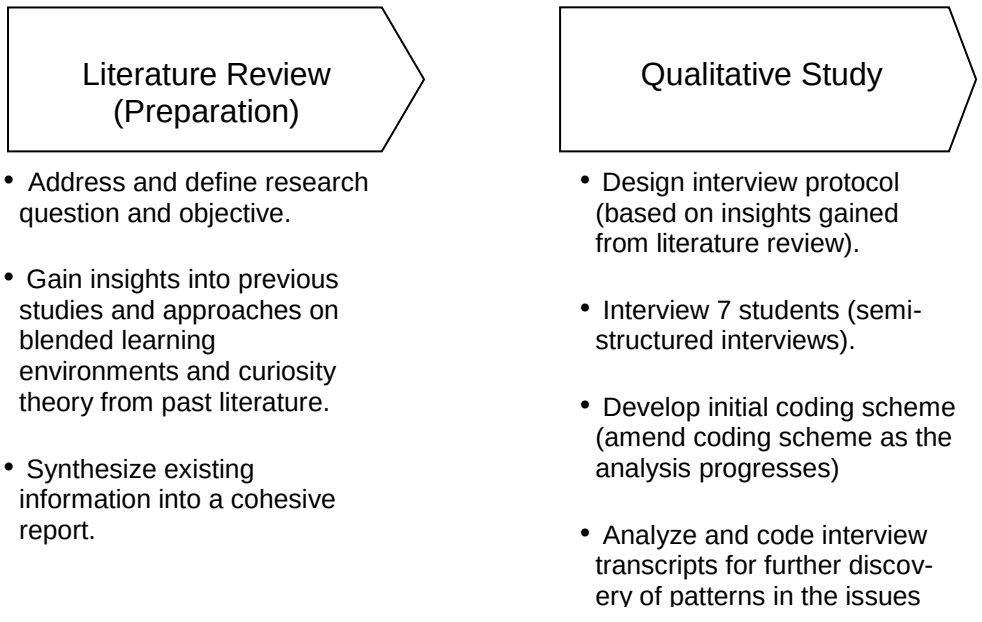

Figure 1: Overview of Research

The objective of this study was to examine individual students' perceptions of curiosity utilizing a blended learning approach. Each of the techniques employed in the qualitative

study are described below to explain their purpose and application to the study. The techniques are listed as steps in the order in which they were conducted (see Table 1).

	Method	Tools
PREPARATION	- Developed case study protocol - Designed interview protocol - Selected and contacted student subjects - Scheduled interviews - Developed initial coding scheme	- Use of framework and constructs gained from literature review
DATA COLLECTION	- Interviewed 7 FB students via semi-structured interviews - Transcribed interviews	- Interviews scheduled and conducted
DATA ANAYLSIS	Detailed analysis – Within case: - Preliminary analysis – within case- (summarizing) - Detailed analysis (coding)	- Summarized transcripts (to capture main impression) - Coded interviews - Developed summary/overview tables for each case.

Table 1: Path of Inquiry

Based upon previous literature on curiosity, a case study protocol was designed. The case study protocol was developed from a combined literature review of this paper and research question and then supplemented by the framework developed. By applying a theoretical interpretive model to the findings, the findings were mapped on to the curiosity construct. In a previous exploratory study, we had examined the implications of various other learning activities on aspects of intrinsic motivation in e-learning (Shroff, Vogel, Coombes, & Lee, 2007; Vogel, Shroff, Kwok, & Coombes, 2002). Based on a review of the above literature, we proposed that perceptions of individual curiosity will be higher in online discussions compared to face-to-face discussions. When activities heighten curiosity, then an individual is naturally involved and driven to learn because his or her motivation is increased. If curiosity is to be stimulated, the role of the environment is to provide an individual with activities/opportunities to explore.

Specifically, this study is intended to better understand individuals' perceptions of curiosity in the context of online discussions and face-to-face discussions. This study is limited to a blend of online discussions and face-to-face discussions, because, as our prior research suggests, this blended approach has the potential to influence a wide spectrum of factors directly related to individual curiosity and these factors, thus appear as a favorable context to study the subject. For example, student-student interaction is seen by Cifuentes et al (1997) as a powerful force for supporting learning and by Klemm (1999) 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." In particular, online discussions allow for the development and expansion of an individual's capacities, by presenting increased "think time," and furthermore, by providing a transcript of dialogue that can be read

and re-read, giving that individual the opportunity to clarify his or her thoughts in writing and decreasing the pressures of face-to-face discussions.

Background of Study

The research plan comprised the use of online technology-supported and face-to-face discussions to assess the effects of perceived curiosity of individual students utilizing a blended learning approach. Students enrolled for the BBA program constituted a large pool of available subjects, who qualified satisfactorily within the context and purpose of this study.

Course Structure

FB2501 "Management of Information Systems (MIS2)" was an undergraduate course offered to BBA students in the School of Information Systems at the City University of Hong Kong. This course provided students with an understanding of the role of computer-based information systems in business organizations. Emphasis was placed on management and technical concepts essential to business applications and management control of information systems. Procedures and controls used in maintaining communication channels were an integral part of the course. On completion of this course, participants were able to:

1. Understand the concept of an Information System and the crucial role it plays in all organizations**.**
2. Explain how to leverage the use of human and capital assets through Information Technology.
3. Recognize the technologies needed to implement Information Systems.
4. Outline how Information Systems are developed.
5. Assess the risks involved in the development of Information Technology.
6. Evaluate the costs and benefits of Information Technology use.

Technology

The specific type of learning activity employed in this research, was online discussions using the "Virtual Classroom" tool of the "Blackboard" online learning platform. The "Virtual Classroom" has increasingly becoming a much wider used platform, from which it is easier to teach a broad range of different topics and it also provides an opportunity for participants to engage in collaborative discussions. The "Blackboard Virtual Classroom" consists of two parts - a whiteboard and a chat room. The whiteboard area allows an instructor to display web pages and to draw on them. The chat room allows students and an instructor to communicate with each other and consists of three pages, the "Chat Panel," "Questions" and "User Info."

The "Chat Panel" is the default panel, the chat room where participants enter messages in the "Text Entry Box" (Figure 2 below). Once they press "Enter," all the participants in the chat room are able to see the comments posted in the chat display area. The "Questions" section allows participants to type questions to the instructor. When the instructor responds, participants are able to see both the question as well as the response(s) from the instructor. The "User Info" section lists the participants who are currently logged into the "Blackboard Virtual Classroom."

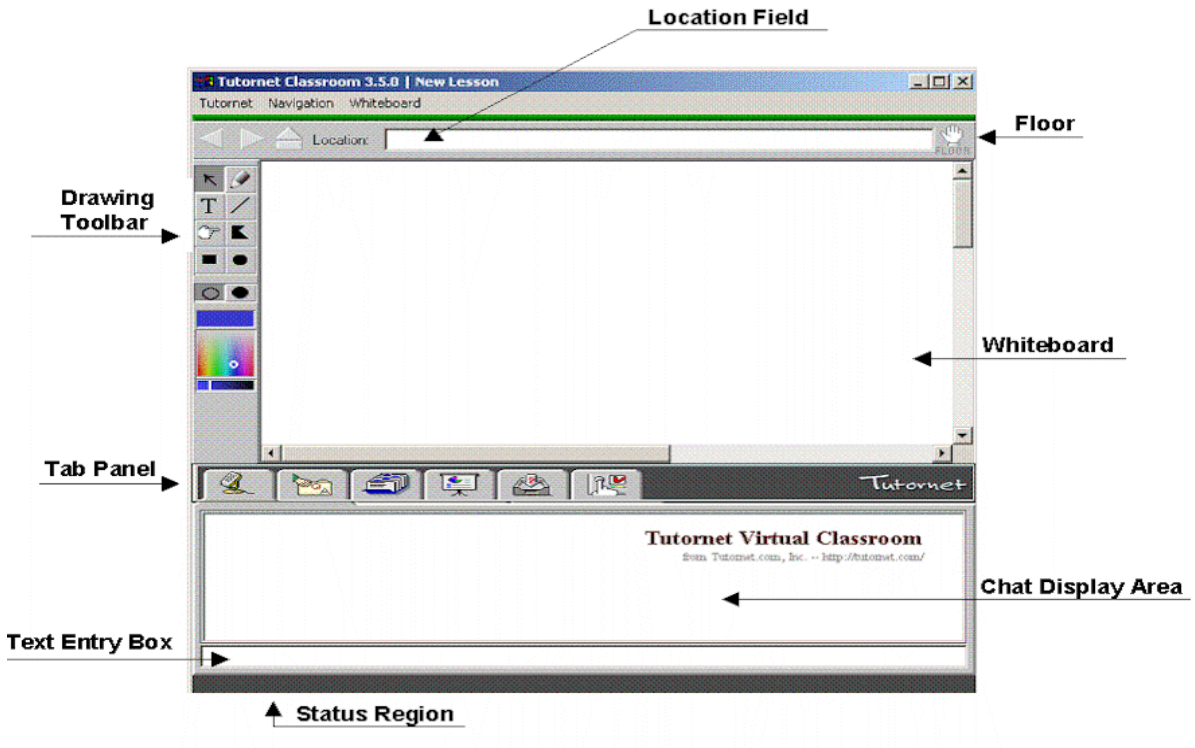

Figure 2: Example of Virtual Classroom

When using the "Blackboard Virtual Classroom," each participant sits in front of a computer terminal. The computer screen is divided into two halves. The participant composes messages on the bottom half and when ready, hits the send button. The message appears immediately on the upper half of every participant's screen, which also contains all the entries posted by all the participants. This screen is scrollable, making it is effortless for participants to read or re-read carefully what others have been discussing. The entries are listed in chronological order, with identifiable names of senders. The participants can read each others' entries at their own pace on the upper screen and thereafter, type in messages at leisure on the lower screen, without interference from incoming messages. These types of programs have introduced the possibility of real-time, synchronous, many-to-many discussions, used either by the whole class or by small groups within the class.

Teaching Methods as the Course Framework

When designing the learning activity, the Teaching Assistant (i.e. the researcher) was mindful about applying the content material to the course, and thereby meeting the course objectives. The Teaching Assistant was also versatile in the the use of "Blackboard." Designing and implementing the course activities was a challenging part of this course. Given that learning outcomes and course content had been defined clearly, the Teaching Assistant had to decide between varieties of activities to achieve these goals. A combination of activites and tasks, within the mix of technology-supported online discussions and face-to-face discussions were tailor made for this purpose. Activities for both technology-supported online discussions and face-to-face discussions were designed to reflect real-world complexities, in order to promote student-student dialogue, idea sharing and articulation of views.

Procedure

Classroom activities were organized around whole-class discussions and revolved around forums and debates for both technology-supported online discussions and face-to-face discussions. Both online discussions within "Blackboard" and face-to-face discussions were used to support student-student and student-instructor collaboration, to promote the free flow of ideas. Combining the unique characteristics of synchronous communications utilizing "Blackboard," with various common course goals, offered students the following useful educational tools:

1. A break from the classroom environment, which permits students to relax and creates a certain level of excitement about and engagement in class discussions.
2. A chance to participate in "real-life" scenarios directly related to their writing assignments.
3. Direct exposure to the importance of voice/tone in written communication, due to the immediate feedback students get from what they submit to the group.
4. An opportunity for students to test their preconceptions about how society "works," by eliminating certain factors such as appearances or membership of social groups and then examining whether and how their online groups work differently from "regular" societal exchange.
5. Experience portraying a favorable self-image, face and persona through language in real time.

Activities in both the online versus face-to-face discussions were designed to allow students to engage in discussions, thereby demonstrating ideas, posing questions, offering insights, advancing suggestions and revealing a broader and deeper understanding of the issues at hand.

The Research Setting

Students currently enrolled in the Bachelor of Business Administration (BBA) program and taking the FB2501 "Management of Information Systems (MIS2)" course, constituted a large pool of available interviewees that fit well within the context and purpose of this study. Interviewing a student sample from the BBA program helped to ascertain the generalizability of this study across populations. In addition, casting a wider net in the data collection stage, helped to cross-check data and served, "As a strategy that added rigor, breadth and depth to [the] investigation", (Denzin & Lincoln, 1994). For this study, we interviewed a total of seven students enrolled in the BBA program. A total of seven interviews appeared to be reasonable, both with respect to the goals of this study and the feasibility involved for the purpose of the study.

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 who were exposed to the online and face-to-face 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 both technology and non-technology support to both online and face-to-face classroom environments. Secondly, learning activities in the form of online and face-to-face 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 both the online and face-to-face discussions.

Interviews for the FB2501 course students took place during the first half of semester B. Resources used in interviewing included paper, a recorder, recording tapes, writing instruments and a quiet place for conducting the interviews. The unit of analysis for this data collection was the individual (i.e. the student). In-depth interviews were planned and conducted using a printed, standardized instrument as an interview guide for semi-structured interviews. The interview protocol minimized bias by providing a basis for a consistent sequence and approach to interviews (see Appendix). This was done by adopting consistent wording for the applicable questions and by asking each question in the same way to each participant, in order to minimize bias.

The procedures used for conducting the interviews were performed as follows: Participants were first scheduled for a 60(sixty)-minute session in a private room. They were asked to read and sign the informed consent form, following which they were asked if they had any pertinent questions for the researcher. The description of the research was read, which allowed for the participant to ask any questions to clarify the nature of the study and his or her expectations for participation. Following the project description, participants were asked a series of open-ended questions in a semi-structured format from the interview guide. If a question did not apply in the context of a particular participant, we skipped to the applicable question. Participants were encouraged to describe situations in significant detail and were asked follow-up questions to draw emerging meanings (Rubin & Rubin, 1995).

Case Study Measures

A semi-structured interview outline was developed to study the impact of the online and face-to-face discussions on the construct of perceived curiosity chosen from the literature and research model previously described. Measures were developed for the following construct of perceived curiosity covered in the interviews - that perceptions of individual curiosity will be higher in online discussions, as compared to face-to-face discussions (Shroff, Vogel, Coombes, & Lee, 2007). Questions relating to individual perceived curiosity were asked, such as the extent to which the online and face-to-face discussions promoted the ability of an individual to investigate, study or analyze - look into or explore, etc. The following three measures are factors supporting the degree of perceived curiosity in the online and face-to-face discussions. Perceived curiosity was measured (see Table 2) by the extent to which these factors were present or not present in the assigned activity.

Discover	Get to know or become aware of or make a new finding (Spielberger & Starr, 1994) .
Explore	The potential ability of an individual to investigate and explore the relationship between the tasks and his or learning abilities (Keller, Schneider, & Henderson, 1994).
Query	A request for information or posing a question in an attempt to search for information (Henderson, 1989).

Table 2: Measures of Curiosity

The interview questions were generated using the construct of curiosity in the literature review and research model. The construct of curiosity is highlighted in the work on "The Self-Determination Theory" by Deci and Ryan (1985) and related work on curiosity by Berlyne (1954) and others (Dember & Earl, 1957; Keller, Schneider, & Henderson, 1994). Individual students with acceptable English skills were selected to be interviewed from the FB2501 course. The objective was to interview them with the motive of exploring the influence of online and face-to-face discussions, relative to the construct of curiosity**.** Semi-structured interviews were used with leading open-ended questions, so that participants were able to reflect on the meaning of their experiences during the interviews and thus engage themselves in a deeper exploration of the meaning ascribed to their motivational behavior.

Data Analysis Procedures

In our data analysis, information was represented in the form of matrices that displayed information (tabular information showing relationships among categories of information) in a spatial format, thereby presenting that information systematically to the reader (Miles & Huberman, 1984) as well as enabling the identification of the coding procedures to be used, in order to reduce information to themes/categories (Tesch, 1990). We expected the categorization and themes to emerge from: (1) Ongoing comparison; (2) Themes generated from the literature review; (3) Themes embedded in instrument questions; (4) Themes embedded in research questions; (5) A combination of any of the above. The stages of the coding process (Figure 3) are shown below:

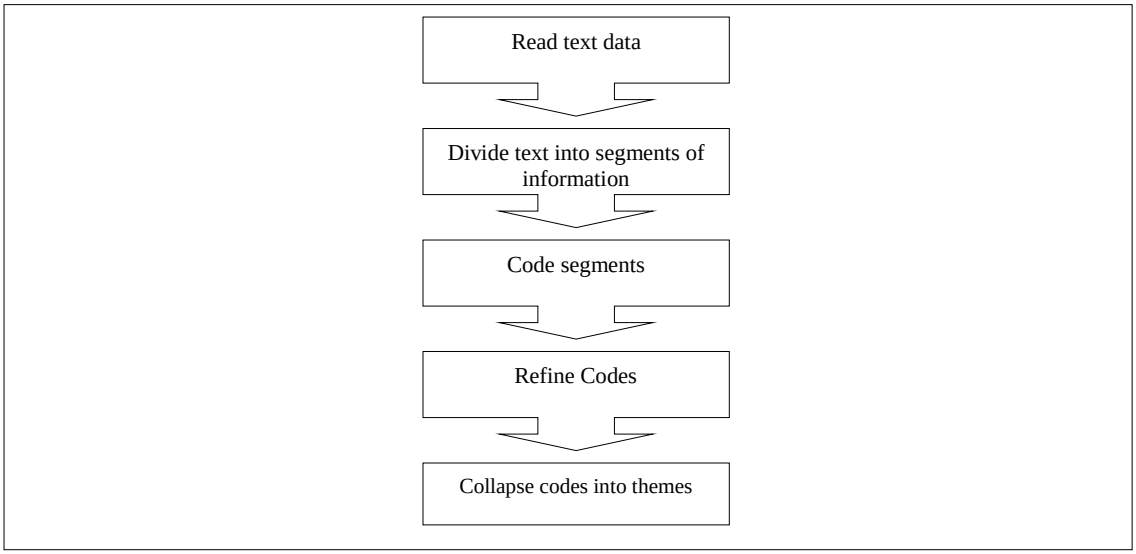

Figure 3: Coding Process

Coding was guided by a coding scheme that was derived from constructs and ideas found in the relevant literature (a so-called start-list of codes). Data refinement included selecting and thus simplifying the data that appeared in the transcriptions. The objective was to code the categories and group and organize these categories, so that conclusions could be reasonably drawn and verified. Data were displayed in matrices (see Table 3 for example), thereby illustrating the patterns and findings from the data.

Construct/Concept	Code	Measure	Sub-Code
Curiosity	CU	Discovery	CU-DIS
		Exploring	CU-EXP
		Query	CU-QUE

Table 3: Classification for Coding of Interview Responses

Analysis and coding of the data transcripts, presented in matrices and displays, were used to visualize and represent the data, thus enabling further discovery of patterns in the issues raised by the participants.

ANALYSIS OF QUALITATIVE RESULTS

The qualitative data relating to students' perceptions in the online discussions provided a valuable overview of the overall student experience and the results are discussed herewith in detail. Our results are summarized in Table 4 below, aligned with the embedded units design, with "+" and "-," indicating positive and negative comments, respectively based on the coding scheme illustrated above in Table 3. For example, "+CU" under Interviewee 1, indicates a positively related comment with respect to the construct of "perceived curiosity (CU)" and measure of "exploring," indicated by sub-code CU-EXP.

Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4	Interviewee 5	Interviewee 6	Interviewee 7
+CU (CU-EXP)	+CU (CU-EXP) (CU-QUE)	+CU (CU-QUE) (CU-EXP)	+CU (CU-DIS)	+CU (CU-QUE) (CU-EXP)	+CU (CU-DIS) (CU-EXP)	+CU (CU-DIS)

Table 4: Summarized Results

If we examine the issues from the construct of curiosity previously discussed as illustrated in Table 3, we find that perceived curiosity (CU) was positively (indicated by "+") supported by all seven interviewees and recognized in the online discussions with regard to discovery (CU-DIS), exploration (CU-EXP) and query (CU-QUE). We interpreted from the following statements that perceptions of individual perceived curiosity are higher in online discussions, as compared to face-to-face discussions.

> For example, Interviewee 1 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* (CU-EXP) *different options. The online discussions made me disclose more information than face-to-face and I got more responses from my colleagues which helped me to build stronger interactions."*

> Interviewee 2 explained, *"...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 discussion provided guidance and gave me opportunities to explore* (CU-EXP) *from different angles. For example, when my instructor or colleagues posted some thought-*

> *provoking questions* (CU-QUE) *or some surprising statements, I felt the need to explore the conflict, until it was resolved and then posted my solutions and comments."*

To summarize, there was agreement among students that the online discussions were motivating and invoked their curiosity. As Interviewee 3 stated:

> *"Quite motivated I think. I haven't fully adapted to it, but I think it has many advantages like new ideas…hmmm…may be more complete opinions and things…it's quite good. For example, I felt motivated to raise questions* (CU-QUE) *and test my own knowledge like brainstorming and answering questions posted by my colleagues. The online discussion also helped me to foster my own curious* (CU-EXP) *ways by adding more questions and looking from different perspectives….and this helped me to build my own confidence."*

As Interviewee 4 declared:

> *"Hmmm…I will motivate myself to think about more points and offer more information to others and then we can form our solution in our group. I felt motivated because a lot of different opinions rush to you and a lot of fresh ideas come to your mind .I was able to find the solutions for myself and come up* (CU-DIS) *with new ideas."*

The online discussions encouraged "independent learning," while "managing" teaching and learning with reduced tutor contact and use of online technology, which was largely perceived by students as desirable and effective. Commenting on this, Interviewee 5 said, *"I think I am highly motivated by using the online discussion. For example, I had a strong desire to know the facts* (CU-QUE) *and to monitor my progress, investigate* (CU-EXP) *different perspectives…and my performances made me feel good as I was able to share my feelings with others and feel a sense of closeness."*

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 Interviewee 6:

> *"As I mentioned before, with the online discussions, we can learn from others but we have to concentrate more, while it is easier to move onto other topics with the face-to-face discussions. As we could chat about other things very easily, the online discussions increased our efficiency. Posting comments enhanced my expression and I felt more fluency and able to elaborate and be more creative in my thinking."*

> *"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. It also gave me a desire to learn the facts, the desire to know (*CU-DIS) *and also investigating (*CU-EXP) *different possibilities"*

Moreover, our findings from the qualitative study illustrated that some students would have preferred to attend the online discussions at their own convenience or participate from wherever they were. As a student pointed out, *"I think only this course has provided the online discussions and we have only been able to discuss in the class, in this tutorial and we don't have time to discuss online outside of the class on other occasions."*

Finally, a more widely held perception among students was that the skills of presentation and communication in the online discussions were also useful and convenient from a more practical standpoint. For example, Interviewee 7 was of the opinion that, *"Of course we pay more attention to both the skills of presentation and skills from the book during the presentation. The presentation is mixed with those most useful things and that's the part I like very much. The online discussions helped us to list important points to reach agreement on which is the most important success factors and then this helps us to present more effectively, make new findings* (CU-DIS)."

From an overall perspective, the results demonstrated that students were comfortable using technology supported online discussions, through application of the "Blackboard Virtual Classroom." Students excelled in the use of the "Blackboard Virtual Classroom" and these online discussions demonstrated strong support for the construct of perceived curiosity.

DISCUSSION

Most of the comments generated by students in the interviews were consistent in supporting the construct of curiosity and its measures. The following emergent trends were noticeable:

- Compared to face-to-face discussions, all students perceived that online discussions aroused their curiosity, given the rich nature of the discussions and the more personal interactions with each other and the tutor. These types of synchronous activities seemed more familiar to them and gave them ample opportunities to influence and further explore 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.
- Yet another noteworthy advantage of communicating via computers was an individual development of thoughts and ideas, feeling part of or a sense of inclusion in an online community, gaining insights about different people and learning from each other. This also included the advantages of overcoming isolation, enhancing personal self-esteem and confidence and finally, making it appear to be less threatening to be able to contact others. Students felt that by utilizing computers for online discussions, they could learn faster, become more creative and write better. They accepted that they had more control over their learning behaviors and more opportunities to practice their written English dialogue skills. Resulting from these advantages, the online discussions appeared to enhance their curiosity for learning.
- Compared to face-to-face discussions, participants in the online discussions seemed less apprehensive about being evaluated by others and more willing to participate in the discussions. They felt less affected by wait-time, turn-taking and other elements of traditional face-to-face interactions, thereby enabling them to participate as much

as they wanted to in the discussions, along with opportunities for gainful contributions being more uniformly distributed among them.

- Students who were shy or felt inhibited in face-to-face discussions, found a "voice" in online discussions and tended to participate more actively in these discussions.

The subjects, whom we interviewed for this study, appeared to derive pleasure from the online discussions, because these discussions provided them with a level of surprise, conflicting discrepancy and novelty. Curiosity is stimulated, when something in the physical environment attracts an individual's attention or when there is an optimal level of discrepancy between his or her present knowledge and skills and what these could be, if the individual engaged in an activity. Most of the subjects in this study were participating in online discussions for the very first time, and were able to assimilate this new experience into their schemata. Individual curiosity seemed to have been further aroused as the online discussions placed participants in active roles of exploration, investigation and discovery, thereby, enabling them to use the electronic interface in meaningful ways, so as to awaken their innate sense of curiosity. Our results showed that the online discussions positively enhanced individual student perceptions of curiosity. In addition, online discussions supported feedback in the form of verbal rewards, such as praise or positive comments generated by the students. Overall, our students found that the online discussions aroused their curiosity and permitted them to make their own decisions, exercise control and set their own pace in the online activities.

Designing technologies to stimulate curiosity is more about designing effective strategies that are more appropriate for existing and available technologies. Lowenstein explained curiosity, in terms of an information-gap and the need to seek information in order to close that gap (Loewenstein, 1994). Curiosity is both a state and a trait. As a state, curiosity is commonly experienced by all individuals, wherein all events arouse a state of curiosity in almost all individuals. However, curiosity is also a trait which is much more typical of some individuals than others. In this context, the trait varies between individuals, in that some individuals will see some events as intriguing or strange or peculiar, while other individuals will consider those events as holding little interest for them (Spielberger & Starr, 1994). This differentiation should be an important consideration in designing for various technologies.

Not only is it necessary to be concerned about which design strategies will stimulate curiosity in a situation-specific context, but it is also imperative to address an individual's differences, in his or her pre-disposition to be curious when presented with novel, incongruous, complex and unfamiliar stimuli (factors that stimulate curiosity). This would be especially relevant in designing interactive learning environments, such as online discussions that could extend an individual's state of curiosity into what Csikszentmihalyi (1988) refers to as flow - where just the right amount of stimulation leads to intrinsic motivation. Online discussions, for example, could be used in such a way as to encourage extended exploration on a regular basis, such that they contribute to increasing trait curiosity.

In summary, research on the construct of curiosity has typically been seen as a positive factor supporting individual intrinsic motivation. This type of exploratory and curious behavior is performed for its own sake, independent of external reinforcements, consequently promoting conditions for intrinsic motivation to occur. Thus, activities that appeal to curiosity or invoke exploratory behavior are thought of as intrinsic and performed for intrinsic reasons.

LIMITATIONS

There are several limitations of the present study that need to be considered. The key limitations center around: (1) Generalizability between groups and individuals (2) Mediating factors (3) Potential for bias (4) Over-interpretation of the findings with a lack of triangulation.

To elaborate, firstly, the results of this study cannot be generalized between groups and individuals. Since the unit of analysis of this study is the individual student, the findings of this study cannot directly be generalized at the group level of analysis. Secondly, this study does not take into account mediating factors such as individual beliefs and values. The fact that the learners are individuals, with their own predetermined beliefs and values, may have a significant impact on their motivational dispositions. The motivation for taking the course is an important mediating factor, because different students may take the course for a variety of different reasons and therefore, their expectations for course success may differ. Similarly, a certain amount of inquisitiveness about the subject matter is important, from the viewpoint that not all students may be enrolled in the course because they find the course content interesting or intriguing. In addition, the level and type of skills (i.e. teamwork and communication) of individual students may differ and thus affect their motivational behavior. For example, a student experienced in working in teams may show a higher degree of motivation to engage in team discussions, as compared to a student with no experience of working in teams.

The third limitation observed in this study was a potential for bias. For example, because the construct of perceived curiosity was composed of an individual's perceptions of personal phenomena, self-report methods were necessary. Nonetheless, future work can reduce these potential confounds via longitudinal designs, objective procedures and behavioral measures. The fourth limitation addresses an over-interpretation of the findings with a lack of triangulation. Future research may benefit from using other sources of data such as computer file exchange, electronic meeting logs and online discussion transcripts. Data could be analyzed in relation to specific key participants, settings, behavior and activities, relevant to the theoretical framework and the emergent interests and outcomes. Additionally, other dependent variables, such as fantasy (Malone & Lepper, 1987; Parker & Lepper, 1992) and control (Harter & Connell, 1984), referred to earlier and creativity (Amabile, 1996), could also extend the scope of future studies.

FUTURE RESEARCH DIRECTIONS

For future research, we would strongly suggest investigating various aspects of Malone and Lepper's research on individual variables such as fantasy, playfulness and control (Malone & Lepper, 1987). Valuable information can be garnered from such research. For instance, Malone and Lepper (1987) mentioned that, the extent to which individuals are treating technology systems, "Not as tools to achieve external goals, but as toys to use for their own sake," increases the fantasy and control aspects of the system. This may actually explain why the male gender tends to dominate the field of computers and technology systems - this is because research has found that they tend to view the computer as a toy and not as a tool (Giacquinta, Bauer, & Levin, 1993).

The above suggestion for future research could potentially build upon our results, because such research may be essential in order to improve our understanding of the effects of perceived curiosity of individual students utilizing a blended learning approach. For example, the

results of this study can be used as base-line data for future quantitative studies. In addition, the qualitative results garnered from this study may also enable the development of improved methods of integrating technology into the classroom environment and can consequently be used as a knowledge construction tool, in which individual students work together in a collaborative setting. Such a learning environment allows students to actively discover their own thought processes and apply new knowledge appropriately.

CONCLUSION

With reference to the main effects of online discussions and face-to-face discussions on individual perceived curiosity, the findings of the qualitative study indicated that online discussions were found to lead to a more positive perception of an individual's curiosity compared to face-to-face discussions. The subjects, whom we interviewed for this study, seemed to derive pleasure from the online discussions, because these discussions provided them with a level of surprise, conflicting discrepancy and novelty. Individual curiosity could have been further aroused, if the online discussions had placed participants in active roles of exploration, investigation and discovery, to enable them to use the electronic interface in meaningful ways, so as to awaken their innate sense of curiosity. When activities heighten curiosity, then an individual is naturally involved and driven to learn.

An individual's ability to explore the environment proficiently is an increasingly meaningful trait that defines his personality. By its very nature, an individual's motive (i.e. curiosity) to explore the environment is presumably an innate behavior that enables him or her to gain information about an object or his or her environment. Research on curiosity and its subsequent exploratory behavior, could help us make decisions about designing strategies into learning environments such as multimedia, web, online discussions etc., that trigger and sustain individual curiosity and the motivation to learn. Keeping this in mind, it would be interesting to investigate different online discussion platforms that lead to a higher probability of invoking individual curiosity, where such activities lead to prolonged individual engagement, new learning and ultimately, to intrinsically motivated behavior. This study is a cautious yet assured step towards understanding the effects of blended learning on perceived curiosity of individual students.

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APPENDIX

Student Interview Protocol
For Case Study on individuals' perceptions of curiosity

(Note: Interviews will be conducted with FB2501 students. This document focuses on the student interview protocol)

[Interviewer Note: As the opening of the interview, the interviewer will introduce himself and provide a brief idea of the interview objective]

[Interviewer Note: The following demographic and general questions will be used to provide additional background and engage the interviewee in talking about the topic area]

Demographics

Personal information (introduction icebreaker)

a. Can you give me a brief overview of yourself?
b. What general aspects of education do you find most interesting?

The course in general

1. In general, why did you choose to study this course?
2. What are your course expectations?

[Interviewer Note: The type of learning activity to be examined within the FB2501 course is the online discussions using "Virtual Classroom" of "Blackboard". The following sections strive to examine the use of the "Virtual Classroom" relative to the theoretical construct of curiosity underlying this interview.

Perceived Curiosity

If curiosity is to be stimulated, the role of the environment is to provide an individual with activities/opportunities to probe and explore (Keller, Schneider, & Henderson, 1994; Spielberger & Starr, 1994). Questions relating to individual perceived curiosity were asked, such as the extent to which the online and face-to-face discussions promoted the ability of an individual to investigate, study or analyze - look into or explore, etc.

3. Compared to the face-to-face discussions, did the online discussions arouse your curiosity about the topics being discussed?
4. Compared to the face-to-face discussions, did the online discussions encourage you to probe and explore a variety of issues you might not have otherwise considered? What are some specific examples?

[Interviewer Note: the focus of the following section would be to get some specific feedback related to technology support that may inhibit or encourage the degree of exploratory behavior]

Technology Support

5. Overall, how self-motivated were you in the online discussions compared to the face-to-face discussions? Can you provide some specific examples

6. How effective were the online discussions in assisting you in your learning compared to the face-to-face discussions?

Final Comments

7. Are there any other things you would like to add or comment upon?