PROMOTING ONLINE DISCUSSION PARTICIPATION BY INTEGRATING
IDENTITY-ENHANCING FEATURES FROM DIGITAL GAMES

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Abstract

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This study investigated the influence of four identity-enhancing (IDE) features on online discussion participation, discussion quality, and students’ sense of satisfaction. IDE features included avatars, signatures, point systems, and rankings which are commonly found in digital games. From the perspective of sociology, communication theories, behaviorism, and metacognition, avatars and signatures could enrich the static presentation of students’ virtual identities while point systems and rankings provide students with self-monitoring clues and a videogame-like competitive environment. A modified PhpBB2 Forum was used as the platform to implement the experiment.

The experiment was conducted in six sections of an introductory instructional technology course and an introductory philosophy course at two Midwestern universities. The 124 students were assigned to either the experimental group, which
used the IDE discussion forum, or the comparison group, which used the same forum but without the IDE features.

The results found that a forum designed with IDE features could significantly promote discussion participation and increase students’ sense of satisfaction with the discussion forum. We also found that students of different backgrounds have differential preference for each IDE feature. Students who have more video game experience and online discussion experience prefer avatars and signatures more than those who have less experience.

Approved:

Sandra V. Turner
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Chapter 1: Introduction

Background of the Study

The prevalence of the computer and Internet in the past two decades has changed education and entertainment in our society. According to the observation of Marc Prensky (2001, 2006), students now under college level are in fact "digital natives" while most instructors are "digital immigrants." Digital natives are fundamentally different from digital immigrants even in their thinking patterns (Prensky, 2001). They are no longer the people our educational system was designed to teach. Digital native students have spent their entire lives surrounded by computers games and the Internet. Traditional ways of learning are to them foreign languages and thus hard to adapt to. Prensky (2001) suggests that learning via digital games is one good way to reach digital natives in their "native language." In fact, computer games continue to engage more and more devotees through the years (Entertainment Software Association, 2005; Rovner, 2006). Online learning courses and programs have penetrated the mainstream of education (Allen & Seaman, 2005; Ohio Learning Network, 2005), and more educators have investigated the possibilities of applying Internet technologies and computer games in educational practices (Rollings & Morris, 2003). Their assumption is that there will surely be benefits if online learning could
be as attractive as computer games.

In terms of applying Internet technologies in education, Nguyen and Cripps (2004) believe that online learning will revolutionize the present educational system. Many advocate that asynchronous online discussion is the main benefit of online learning (Murphy & Collins, 1997; Phillips & Santoro, 1989) for it inspires more scrutiny and deeper discussion (Ali, Hodson-Carlton, & Ryan, 2004; Chen & Hung, 2002; Hawkey, 2003; Meyer, 2003; Nickel, 2002; Wilson, 2004). Although participation in discussion is in itself not sufficient to ensure learning quality, low levels of participation and low evidence of higher order thinking have been found to produce poor results for online learning (Hammond, 2005; Rovai & Barnum, 2003). Therefore, the quality of participation is important to successful online discussion.

Three elements found in the literature which influence the quality of participation are curriculum design, instructor support, and software design (Beaudin, 1999; Hammond, 2005; Herrington, Oliver, & Reeves, 2003). However, some researchers claim that software design for online discussion is much less important (Hammond, 2005). The reason is that many studies were based on either WebCT or Blackboard, two course management platforms with similar features. If more versatile software designs were used, its influence on online discussion might vary from
previous studies. This study intends to integrate some features from computer games into the design of an online discussion platform in the hope that learners’ participation can be objectively enhanced.

Most of the research in integrating computer games into education can be categorized into two groups. The first group tends to apply certain sorted computer games available in the commercial market directly into their instruction (Dawes, 2002; Facer, 2006; Shaffer & Gee, 2005). The second group tends to develop original computer games for a specific educational purpose (Carlson, 2003; Facer, 2006; Leyland, 1996; Wheeler, 2002). Both groups share the same goal: using computer games as a virtual world for learning (Capin & Thalmann, 1998; Shaffer, Squire, Halverson, & Gee, 2004). Both groups use the whole computer game program in their instruction. As a result, some problems like shortage of time, lack of budget, and learners’ excessive playing of games (“Ananova”, 2001; “BBC”, 2002; Stoll, 1999) will inevitably become constraints when integrating computer games into education. However, these constraints could be avoided if only some attractive game features were integrated into the online learning platform instead of integrating the whole computer game into learning. Thus, the potential benefits are multiple. First, time could be saved if students do not need to spend their time to learn to play the
computer game. Second, the cost of buying computer games could be saved. Third, learning in an asynchronous online discussion forum might become as engaging as computer games.

Some common features in computer games like avatars, rankings, and point systems are crucial features that keep the computer games interesting. We can easily imagine how boring a computer game would be if a computer game were programmed without avatars, or up-levels, or point systems, or medal bonuses. Furthermore, these features enhance the game player’s sense of identity, level of progress, and what he or she has achieved in the game. In this study, these four features are called identity enhancement features. Avatars and signatures enrich the static representation of the forum identity. Point systems and ranking enable the dynamic progress of the identity. These identity enhancing features will be integrated into an online discussion forum. An experimental study will be conducted to see the effects of these four computer game features on online discussion participation.

Another element which might influence discussion participation and discussion quality is gender. Gender differences have been found in both face-to-face communication and online communication in many studies (Herring, 2003). Females are said to be more motivated to participate in asynchronous online discussion (Im &
Lee, 2003; Pickner & Mehlberg, 2001). Moreover, with the evolvement of user-friendly interfaces and a new generation of young people who have grown up in an information age feeling comfortable with computers and the Internet, females were slightly more than 50% of Web users in the U.S. in the year 2000. It appears that participation in asynchronous online discussion favors females. However, in this study a modified online discussion forum is integrated with videogame-like identity enhancement features. In terms of videogames, male game players outnumber female players by 62% to 38% (ESA, 2006). Therefore, the modified discussion forum in this study may be more attractive to males. How gender plays a role in this discussion forum integrated with game features will be investigated in the study.

Statement of the Problem

The online discussion forum used in this research is designed with four new features borrowed from computer games. The purpose of this research is to investigate whether the features borrowed from computer games can be effectively transferred to asynchronous online discussion. The research questions derived from this purpose are:

1. Does the use of identity enhancement features in an online discussion forum enhance discussion participation?
2. Does gender influence learners’ participation in an identity-enhanced online discussion forum?

3. Is there an interaction effect between gender and discussion forum design on discussion participation?

4. Does the use of identity enhancement features in an online discussion forum improve the discussion quality?

5. Does gender influence learners’ discussion quality in an identity-enhanced online discussion forum?

6. Is there an interaction effect between gender and discussion forum design on discussion quality?

7. Does the use of identity enhancement features in an online discussion forum improve students’ sense of satisfaction in participating in online discussion?

8. Does gender influence students’ sense of satisfaction in an identity-enhanced online discussion forum?

9. Is there an interaction effect between gender and discussion forum design on students’ sense of satisfaction?

If the use of identity enhancement features in an online discussion positively
improves learner participation, then two questions concerning learners’ perception of each ID-enhancing feature will ensue.

1. Did students have differential preference for the four ID-enhancing features?

2. Did students with different backgrounds differ in their perception of the ID-enhancing features?

**Significance**

In this study four identity enhancement features that work well in attracting people to game playing will be incorporated into the design of an online discussion forum. If the modified design proves effective, educators may have a better option to engage learners in online discussion. With a forum with identity enhancement features, educators could have the benefits of engaging learners in discussion just like computer games engage game players in playing games without risking the limitations of budget shortage in buying games and time shortage in selecting games and playing games.

Research questions dealing with learners’ perception about each feature of identity enhancement might help to distinguish the effectiveness of each feature in improving learners’ participation. In addition to the four features dealt with in this study, there are other common features of computer games that engage game players
which could be abstracted and integrated into an online discussion forum. This study is the first one to investigate these possibilities.

**Delimitations and Limitations**

According to a review of asynchronous online learning (Hammond, 2005), courses for acquisition of skills or techniques are less conducive to asynchronous online discussion. Therefore, in this research, the identity enhancement forum was used in a setting where courses do not primarily involve the learning of skills or techniques.

The proposed study was limited to undergraduate college students, most of whom are in the age range from 18 to 25. According to a survey of Entertainment Software Association in 2005, 35% of the game player population were under age 18 and 43% were from 18-49 years old. The average game player age is 30. The report indicated that games are popular among young people and adults up to age 49.

Another limitation of this study was that students were not randomly selected to participate in the study, though they were randomly assigned to one of the two treatments.

**Definition of Terms**

1. Forum: A forum is a facility on the Internet for holding discussions. In this
study, forum, phpBB2 forum, and discussion board are used interchangeably.

2. Forum moderator: A forum moderator is someone granted special powers to enforce the rules of an Internet forum. Moderators of the discussion forum of this study are the course instructors. They can move discussions to different sections of the forum, "close" or "lock" discussions to prevent users from continuing to discuss them, edit the content of individual postings, give extra points or medals to the members, answer questions, and "pin" or "stick" discussions so they remain visible in their forum section even if no new postings are made to them.

3. Forum administrator: The administrator can edit and change anything associated with the forum. In the forum used in this research, the researcher is the administrator. He will cooperate with the moderators to set up all the details of the system to meet the instructional needs of the moderators.

4. Member: A registered user of the forum. In the forum used in this research, members are students.

5. Identity enhancing features: Extra features that help members to have a sense of selves and awareness of progress made in learning. In the forum
used in this research, identity enhancing features include avatars, signatures, ranking systems, and point systems.

6. **Avatar:** An icon used to represent a member in a forum. In the forum used in this research, an avatar is an icon less than 80x80 pixel-squares. The icon can be any photo, picture, or animation that a member has chosen to use to represent him or herself.

7. **Signature:** A block which will show under each post the member has posted. In the block the member could include words or images that reflect the member’s philosophy, hobby, or motto.

8. **Point system:** A system used to reward the contribution of each member. Through the point system, each member can monitor his or her current progress in the forum. In the forum used in this research, the point system includes four point indexes: TP, PP, QP, and RP. For more description of the point systems, please refer to Appendix C.

9. **Ranking system:** A system that ranks members according to the points they have earned.

10. **Student participation:** A measurement of posts and replies in the discussion forum represented by participation points.
11. Discussion quality: A measurement of the quality of discussion represented by rating points.
Chapter 2: Literature Review

Introduction

The original idea of the research is derived from how to integrate video game designs into online discussion. Therefore, the literature review will first introduce the rationale of transferring video game designs into an online discussion board. Following will be the analysis of the educational elements behind these designs. This part includes three aspects: identity, behaviorism, and metacognition. Finally, gender differences in the identity-enhanced online discussion board will also be discussed.

According to a survey of structural characteristics of video game playing (Wood, Griffiths, Chappell, & Davies, 2004), character development, which includes “overtime character development,” “customization of character,” “rapid advancement,” and "audio/video effects" are rated among the most important characteristics of game structures that attract game players. “Overtime character development” indicates the characters the players play will increase in abilities and equipment as their experience increases. “Customization of character” means the game players can customize the characters they play. “Rapid advancement” means players can rapidly get enough points to step up to next the level or next grade. The element of "audio/video effects" will not be discussed here since it is not commonly
used in discussion forums.

In terms of online discussion board, the relations between participants and their board identity could be likened to the relations between game players and their chosen game characters. Since identity enriching features - the avatars, signatures, point systems, and ranks - are common computer game functions for character development and rapid advancement, it is reasonable to infer that they could also be important in promoting students' participation in an online discussion board. After all, increase in student participation in an online course generally results in increased learning (Markel, 2001; Virk, 2004).

Research in sociology confirms that physical appearance affects our perceptions, judgments, and thus communication with others (Newman, 2004). Similarly, the identity enhancing features that substitute for our physical appearance might affect the impression and communication in an online discussion board. Among identity enriching features, avatars and signatures enrich online discussion board members’ representation. Ranking and point systems might improve members’ sense of progress and cyber social status in the discussion. Ranking and point systems could give members instant reward, which also greatly helps members to monitor their progress in the forum.
Since the identity enriching features are deemed important and attractive in video games, the analysis will focus on how these identity enhancement features might affect online learning discussion in terms of identity, behaviorism, and meta-cognition respectively. Gender effects in an identity-enriched online discussion will also be discussed since gender differences have been reported in online learning (Bostock & Wu, 2001; Cox, Clark, Heath, & Plumpton, 2000; Jeong & Davidson-Shivers, 2003; Rajagopal & Bojin, 2003; Young & McSporran, 2002).

In Terms of Identity

Identities have a tremendous impact on communication, especially when communication occurs among several different identities. The discussion below will first investigate the special nature of identity in an online discussion board. Then it will analyze how identity influences communication in the beginning stage of a person’s taking a new identity and how the symbols carried on the identities encourage or inhibit communication.

The Nature of Identity in an Online Discussion Board

Virtual identity is very different from real life identity. According to Turner, the liminoid is a break from society, part of play, where people can put on masks, build their identities, develop interpersonal relationships, and display an intense community
spirit (Turner, 1982). Video games or online discussion boards can perfectly provide such an environment. The identities in this virtual liminoid environment, or in Turner's term, comunitas (1995), are meant not only to hide a person's real identity but also to call attention to the person and to the masks, its expressive power, imaginativeness, capacity to instill fear, evoke humor, and so on. In other words, identities play an important role in communication in the virtual liminoid environment. Castells also advocates that virtual space could provide people a more democratic world than real life environment can (Castells, 1997). Therefore, with the versatility a virtual comunitas can provide, it is reasonable to believe that if the identity presentation in the online discussion board is enhanced, the discussion will benefit.

Phenomena of Taking a New Identity

Each person has multiple real life identities (Gee, 2003). When people play a game or come into a new context, he or she will inevitably assume a new identity that fits the new context and at the same time filters out some other identities that are not relevant to the new context (Gee, 2003). Consider a male instructor, for example; he would talk like a husband to his wife but like a instructor in the classroom. People’s identity influences how they communicate with each other in manner, content, and even depth. Therefore, it is important to recognize one’s identity in a certain context
Two phenomena exist when people take a new identity. First, the more one accepts the new role, the more one will commit oneself to the new identity (Gee, 2003). Second, the less connection between the irrelevant old identities and the new identity, the less stress a person will have in assuming the new identity. The discussion below will compare the taking of a new identity in a face-to-face environment, new identity in game settings, and identity in an identity-enhanced discussion board.

*New Identity in a Face-to-Face Environment*

The acknowledgement and confirmation of the new identities helps people to commit themselves to the roles that are assigned by the new identities (Gee, 2003). In order to impress the person and others with the new identity-taking, certain symbols like certificates, licenses, or medals can be given to people who assume a new identity. In a formal promotion, giving a symbol of up-level identity like certificates, titles, or name tags could increase one’s sense of assuming a new identity. In some context, identities are so important that people even put on visual symbols to strengthen their sense of identity whenever they are in the context. For example, badges are commonly used in military and police systems to promote the personnel’s identity as a
soldier or police officer.

Another element which influences a person’s attitude toward taking a new identity is his or her related experiences. Part of our identity is derived from our interaction with the environment (Tajfel & Turner, 1986). According to behaviorism, people tend to escape from an environment where they think they have had experiences of being punished before (Elliott, Kratochwill, Littlefield, Cook, & Travers, 2000). If people have unhappy interaction experiences with a certain environment, they tend to reject the identity derived from that environment. Therefore, if the unhappy experiences are associated with the new environment, usually the people do not assume the new identity readily.

New Identity in Education and Game Settings

According to Covington and Beery (1976), successful students are more willing to assume new challenges. They contend that students who are repeatedly frustrated in certain experiences tend to escape from the threat of failure and avoid facing new challenges. This phenomenon will likely make them reluctant to take a new identity related to their failure experiences. However, one major attractive element of games is fantasy (Wood et al., 2004). In the fantasy environment of digital games, they can avoid real world threats. To play games, people do not need to carry the burden of the
ill-formed real life old identities filled with many unhappy experiences into the game and do not need to bring the failure in the game back to their real life. A game is exciting and explorative but rarely does harm to our real life identities. The players are not only receiving but rather building identities (Turkle, 1995). More sense of control and satisfaction is obtained when people can build the new identities rather than put on given new identities.

In term of education, whenever students take new courses, they are taking new identities. If students commit themselves to the new identity happily, then there is a good chance of successful learning. For example, if students deem themselves as scientists and act as scientists in science class rather than just the same old learners in another classroom, they will have a better chance to learn well (Gee, 2003). The more students accept their new identities in a new course, the more they will commit themselves to the new identities. On the other hand, the greater the gap between the new identities and the students’ irrelevant old identities, the more students will feel comfortable when they commit themselves to the new identity. Unfortunately, in real life environment, physical embodiment is a defining characteristic of the self (Harre, 1983). We carry the same body, which indicates our old identity, to each new face-to-face environment. Therefore, taking a new course in a traditional classroom
will not make students feel so much like taking a new identity. Same faces, same names, same people, same speaking tones all mean old identities. No matter whether these identities are relevant or irrelevant to the new course, this will blur students’ sense of taking the new identity.

However, different from taking a new class, playing video games always makes people feel more like they are taking new identities. In game playing, players could be kings, queens, astronauts, or any possible character provided by the game program. Similarly, participating in an online discussion board with game-like identity enhancement features is expected to make a student feel more like taking a new identity. Avatars, signatures, and ranks provided by the discussion board are symbols of the new identity and purposely indicate some features of the new identity and thus enhance the sense of identity-taking. These avatars and signatures are visual symbols and could be images, animations, or text. Visualizations are ideal models of self-presentation in online environment (Patricia, 1999), especially for young people seeking fun and unique ways to express themselves. Actually, in many Internet forums, avatars and signatures are used to represent at least the projective identities (Gee, 2003) of the participants. Visual self-representation in an online discussion board is a big mask that conveys one’s favorite parts of the representation and helps others to get
acquainted with him or her (Turkle, 1995).

*New Identity in an Identity-Enhanced Discussion Board*

In an identity-enhanced discussion board, real life names and physical faces are replaced by a forum ID and a fantasy-like avatar. The first impressions caused by the real life appearances of the people are substituted with avatars, signatures, and ranks that have fanciful names. Every time students post and reply, they see their forum IDs, avatars, ranks, and signatures which all strengthen their sense of taking the new identity. Therefore, it is reasonable to expect that by using identity-enriched features in an online discussion board, students have a deeper sense of taking new identities in a new course and therefore a deeper devotion to the new identities could be expected.

*Symbols Facilitate Communication*

Face-to-face communication involves more than just words. The dress, emotions, acts, and even the acquaintance with the communication objects all influence the effectiveness of the communication. According to Symbolic Interaction Theory, people interact with the symbols and form relationships around them (LaRossa & Reitzes, 1993). Lack of symbol clues in communication might reduce the possibility of positive contact and increase the possibility of conflicts (Sherif, Harvey, White, Hood, & Sherif, 1961). Research found that lack of symbol clues in a plain text online
communication causes people to think they know a writer's tone 90% of the time, although they only are correct about 56% of the time. This leads to misinterpretation of the writer's intended meaning and might cause flame wars as well as serious litigation (Kruger, Epley, Parker, & Ng, 2005).

In order to compensate for this disadvantage of online communication, Fahlman, in 1982, used a sequence of ordinary printable characters, such as :-) ;( ^_^ or :-(, intended to represent human facial expressions and convey an emotion for online bulletin boards. Nowadays many Internet forums use image emoticons which are even easier to use and recognize. These emoticons help emotional expression in online communication. However, there is one element, the familiarity with the person you are communicating with, that cannot be compensated by emoticons. The same words spoken by different people might mean different things. That is the reason why in the beginning of each course there is often an introduction to each other so that students can be familiar with each other more quickly. However, few students remember what others introduced themselves as later on.

In an identity-enhanced discussion forum, students choose their favorite avatars and signatures, which represent their real identities or projective identities consistently in the identity box of each post. Students can investigate each other’s
basic information whenever they like. Therefore, the identity-enhanced discussion
forum provides students a more effective way to become familiar with each other.

Symbols that Inhibit Communication

Although face-to-face communication provides many symbol clues in promoting
communication, there are still two possible drawbacks. The first one is stereotyping;
the second one is labeling (Becker, 1963, as cited in Adams, Robertson, Gray-Ray, &
Ray, 2003). The advantages of face-to-face communication can become disadvantages
when these phenomena occur.

Stereotypes are generalizations about a group of people whereby we attribute a
defined set of characteristics to this group (Allport, 1954). Stereotyping leads people
to show bias and inaccurate judgment towards other people and thus subvert the
communication (Hilton & Fein, 1989). Stereotypes are easily created when there is a
clearly visible and consistent attribute that can easily be recognized. This is why
people of color, police and women are so easily stereotyped (Allport, 1954). In terms
of education, negative stereotypes could cause instructors to have lower expectations
of the students.

Labeling effects might also degrade face-to-face classroom discussion if some
members in the group are labeled in a negative way. According to labeling theory
(Becker, 1963, as cited in Adams et al., 2003), low achieving students might be labeled as trouble makers or inattentive. Their instructors and classmates might have low expectations of them (Newman, 2004). Once a person is labeled in a negative way, based on the halo effect (Asch, 1946), the person has a greater chance to be considered deficient in many aspects of learning. What is even worse is if the instructor, classmates, and even the person his or her self therefore have low expectations of the person, then the Pygmalion effect will be applied and the person’s learning will be in misery (Bernard, 1982). In a face-to-face classroom, people will inevitably take their old identities with them when they are physically present in a new classroom. There is no way they can hide their labeled old identities. As a result, people whose old identities are cumulatively constructed by many bad experiences or low academic performance will find it difficult to escape from the ill effect of self-fulfilling prophecy.

In an identity-enhanced online discussion, elements of permanent visual physical characteristics that may cause stereotyping or labeling effects are hidden. Students can simply change their avatars, signatures, or alias names easily when they feel the threat of being stereotyped or labeled. Since avatars and signatures are chosen or created by students as their visual representation, they may manifest themselves in any way they
please and feel comfortable with, unrestrained by physical measures that may limit their self-presentation in actual life (Turkle, 1995). Therefore, stereotyping and labeling are very likely to be diminished.

Conclusion

According to the discussion above, identity could have both positive and negative effects on communication. The identity-enhanced online discussion board keeps the positive effects and minimizes the negative effects. Therefore, it is reasonable to expect the identity-enhanced discussion board to provide a better discussion environment.

In Terms of Behaviorism

Another important function that makes computer games so attractive is point systems and ranks. Points trigger a step up in level, which provides an incentive for game playing. Scores provide a direct link between the player and the game designer with regard to the value system. Point systems and ranks also represent more dynamic parts of online identity. Points and ranks increase as people make progress in the online discussion board. According to behaviorism, the increase in points and ranks is a positive reinforcement that motivates students to participate in online discussion. The discussion below will explain why these identity enhancing features fit well with
the principles of behaviorism.

*Instant Reinforcement*

According to Skinner (1974), reinforcers are stimuli that change students’ behaviors. Behavior will increase in frequency if that behavior is immediately followed by reinforcement. The interval between the behavior and the reinforcement is very important. A long interval leads to the decrease of reinforcement effects (Gee, 2003). In terms of education, instructors are encouraged to give students instant reinforcement for expected behaviors.

However, in real life learning, the interval of reinforcement could be very long. For example, most students need to spend one year to obtain their promotion to the next grade in school. In the classroom, not every instructor will give immediate verbal rewards to students for their participation in discussion. In terms of paper assignments, students will not receive their visual feedback before their papers are graded. On the other hand, with computer games, points are increased instantly almost every time a player executes an effective or successful action in a game. In terms of immediate reinforcement, computer games are designed better than the school system is.

In the identity-enhanced discussion board, which is designed similar to computer games, point indexes are prominently posted in the identity box of each view-post
page. The points change instantly whenever students post messages in the discussion board. This instant reinforcement makes contribution to the forum satisfying and therefore prevalent.

*Partial Reinforcement*

In Skinner’s theory, partial reinforcements are even more powerful in shaping behavior. In partial reinforcement, the response is reinforced only part of the time. Learned behaviors are acquired more slowly with partial reinforcement, but the response is more resistant to extinction (Elliott et al, 2000). In computer game designs, bonus and big treasures are embedded in only some of the virtual enemies. Players are even more motivated to find those bonuses since they could not gain a bonus each time. This kind of design perfectly fits the principle of partial reinforcement (Gee, 2003). Just image how boring a game would be if the player fought all through the game with the same enemy and gained the same points with each strike.

The principle of partial reinforcement was also designed into the identity enhanced discussion board. In the identity-enhanced discussion board, students are able to give points to the messages that they think are relevant, interesting, or helpful. The message author is not only rewarded with participation points in a regular and predictable basis, but also may be rewarded with rated points in a more unpredictable
basis. Therefore, the rating index in the point system supports the principle of partial reinforcement and thus is expected to enhance students’ motivation to post good articles and maintain a quality discussion in the online discussion board.

*Multiple Reinforcement*

Another behavioral principle is behavior shaping. When reinforcing stimuli are received immediately after an organism performs an act, behavior is influenced. Therefore, reinforcing stimuli can be used to form or shape behavior in desired directions (Charles, 1996). Based on this principle, games are designed to make the step to the next level easy in the beginning and progressively more difficult. Game players are thus expected to perform a more complex set of actions to succeed in upgrading to successive levels.

To apply this feature in the identity-enhanced discussion board, the transition to the next level is dependent mainly on Participation Points (PP) in the beginning. Students earn points easily by just participating. Later quizzes and essays, which are weighted more than participation in earning points, will be required for up-leveling i.e., moving up to the next level. The point range between each level will also be increased. Students have to participate more or to complete quizzes and essays to raise their levels. Under this design based on the principle of multiple reinforcements,
students are expected to gain rewards with little effort when first introduced to the discussion board and then gradually increase their efforts as the course continues.

_The Magnitude of Reinforcement_

In behaviorism, acquisition of a response, response rate, and resistance to extinction are influenced by the magnitude of reinforcement. Larger rewards lead to faster response and greater resistance to extinction than do smaller rewards (Bonem & Crossman, 1988). In the real world, sometimes large rewards are impractical. However, in an online environment, large rewards created by digital points are free. Video games using digital points, digital medals, and hierarchical ranks to magnify the magnitude of reinforcement have been extremely successful since their debut. Why not use it in a course discussion board to encourage discussion participation?

The point systems, medals, and hierarchical ranks in the identity enhanced discussion board are free and customizable. They provide a wide range of magnitude for the design of flexible reinforcements. Instructors can substitute limited real object rewards with unlimited digital rewards for students’ various contributions in the online environment. With the possibility of making students feel rewards are much bigger, it is possible to enhance students’ acquisition and continuation of target behaviors, which in this study are discussion participation and making quality posts.
Conclusion

As discussed above, the design of identity-enhancing features is consistent with the principles of behaviorism. Therefore, it is reasonable to expect that the identity-enhancing features will also work well when they are designed into an online discussion forum and will promote online discussion participation.

In Terms of Metacognition

Introduction

Flavell (1976) first used the term metacognition. He defined metacognition as one's knowledge regarding one's own cognition as well as controls and monitors of one's own cognition. A learner who has cognitive awareness has strategies for finding out or figuring out what he or she needs to do. The use of metacognitive strategies ignites one's thinking and can lead to better learning achievement (Slife, Weiss, & Bell, 1985; Tobias & Everson, 1995; White & Frderiksen, 1998), especially among learners who are struggling (Anderson, 2002; Palladino, Poli, Masi, & Marcheschi, 2000; Shinn, Ysseldyke, Deno, & Tindal, 1986). Many cognitive strategies have been classified, analyzed, and evaluated by researchers (Flavell & Wellman, 1977; Flavell, 1976; Kluwe, 1982). The discussion below will mainly focus on one strategy: self-monitoring and the possibility that identity-enhancing features could help
students to implement self-monitoring strategies in their online discussion.

Self-Monitoring, Learning, and Video Game Playing

Self-monitoring, defined as the deliberate attention to an aspect of one’s behavior (Lan, 1996), is considered one of the important metacognitive strategies. Self-monitoring students took more interest in seeking mastery in learning, solved more complex problems in less time, demonstrated more accurate self judgment ability, and developed a better knowledge representation of the course content (Lan, 1996). Metacognitive strategies, such as self-monitoring, can be taught (Gunning, 2005) and work even better when students are reminded to use them in their learning (Yang, 2002). Instructors usually take the role of reminding learners about the monitoring of their learning process. However, in video games, especially in role-playing games (RPG), ranking and point systems serve the role of the reminder. There are always ranks and point indexes on the screen to remind players of their playing progress and provide information of what strategy they should take to improve their game playing.

For example, the monitoring of game playing in RPG is visualized in three common point indexes: Health Points (HP), Magic Points (MP), and Experience Points (EXP). HP are used to determine a character's health and show how much
damage has resulted from attacks. MP indicate magical power. EXP represent a character's advancement and improvement in skill. All these point indexes are awarded for completing successful tasks in game playing. Players are reminded by the point systems of their progress so that they can make decisions about which skill to polish or which task to do next in order to move up a level or improve their game playing.

Identity-Enhancing Features and Self-Monitoring Strategies

In this study, the ranking and point systems in the identity-enhancing features are used to visualize the learning progress of the online learners. Four point indexes are designed to monitor different aspects of students’ learning progress. Participation point index (PP) indicates the quantity of posts that students contribute to the online discussion. Rating point index (RP) represents the quality of the participation students contribute to the online discussion. Quiz point index (QP) expresses the result of the quizzes students took in the course. These points could be automatically generated or renewed by the system when students make related contributions. Manual changes to the points or medal system by the instructor are also applicable when the automatic point system is not adequate for the course requirements. Thus, it is reasonable to expect that the ranks and point systems that have been transferred from video game
designs can help students to monitor their learning progress in the online discussion board.

In Terms of Gender

Gender-based differences in performance and learning have long been recognized as an important focus for research (Herring, 2003; Richardson & French 2000 as cited in McSporran & Young, 2001; Weinman & Cain, 1999). In order to approach the gender differences in an identity-enhanced discussion board, two aspects of online discussion in an identity-enhanced discussion board will be discussed. First, the gender differences in online discussion. Second, the possible influences of the identity-enhancing features to each gender in online discussion.

Gender Differences in Online Discussion

There are many studies that focus on gender differences in behaviors of online discussion. Some studies found there are no or only tiny significant gender differences in online discussion (Gunn & McSporran, 2003; Ory, Bullock, & Burnaska, 1997; Wang & Sierra, 2002; Wu & Hiltz, 2004). However, several other studies found gender differences do exist in various aspects. These aspects will be discussed in the sequence of communication styles, computer anxiety, and metacognition.
Gender Difference in Communication Styles

Males and females are different in their communication styles. According to Belenky, Clinchy, Goldberger, and Tarule (1986), most females prefer a communication style called “the interdependent voice,” which is an interdependent, relational, or connected path in communication. For males, “separated voice” is their major communication model, which means independent or autonomous. In terms of learning, research found that females place high value on behaviors like support, sharing ideas, reflection, networking, social inclusion, and they view learning from a connected perspective, while males place more value on a competitive and individualistic perspective (Cox et al., 2000). Due to the different communication styles, more tentative, open tone, supportive phrases or a clear element of 'politeness' are found extensively in women's discussion board postings while a more challenging, rude, and dominant tone are representative of males (Cox et al., 2000; Gay, Sturgill, Martin, & Huttenlocher, 1999; Herring, 2003). Basically, when these two different styles come together, the “independent voice” will prevail and likely hold back ones who prefer a “connected voice.” Therefore, when mixed gender discussion is ongoing but is not properly monitored by an instructor, males tend to dominate the discussion and females’ participation is likely to be limited (Gregory, 1997). Fortunately, in a
mixed gender online class, both male and female subjects performed better in the presence of an audience than alone, although the positive impact for males was much stronger (Rajagopal & Bojin, 2003).

In terms of school settings, online discussions are usually moderated by school instructors. It means that “netiquette” is very likely to be well maintained and cooperation is encouraged. In such conditions, the “connected voice” is encouraged. In other words, female students have a better chance to provide “social glue” far more frequently than the men (Cox et al., 2000). The “connected voice” and “social glue” help the building up of a virtual learning community and nourishes online discussion. Therefore, we can infer that online discussion in a school setting especially benefits females. Furthermore, gender is related to reading and writing skills, and thus females may experience online discussions as more motivating and enjoyable than males (Wu & Hiltz, 2004).

Gender Difference in Computer Anxiety

Besides the differences in communication styles, there are also gender differences in computer anxiety, which may influence online discussions. According to Morahan-Martin (1998), computer competency and skill level can predict online comfort, experience and behavior. Research found that males feel more confident with
their computer expertise than females (McCoy, Heafner, Burdick, & Nagle, 2001). They are more motivated to acquire computer communication skills and develop less anxiety toward technology (Nachmias, Mioduser, & Shemla, 2000). On the contrary, females present more anxiety about using technology or computers than males (Corston & Colman, 1996; Okebukola, 1993 as cited in Rajagopal & Bojin, 2003). Accordingly, Wilson also found a significant gender difference in game playing with males reporting more experience playing games on the computer than females reported (Wilson, 2002). More females than males thought they had less experience with computer applications, were less confident of using them, were less positive about using computers, thought they would use them less in their courses, thought that they would find the course difficult, and preferred paper to online information (Cox et al., 2000; Bostock & Wu, 2001). These disadvantages may combine to affect females’ contributions in online discussions. Fortunately, recent data show that more and more females are using the Internet - a recent online survey of 6629 users indicated a surprisingly high percentage of females (63.2%) online (Inter Commerce Corporation, 2003, as cited in Gunn & McSporran, 2003). Although we don’t know how exactly it will compensate for the disadvantages of females in online discussions, the gap between the genders in computer anxiety is decreasing.
**Gender Difference in Metacognition**

Metacognition is very important for successful online learning (Garrison, 2003). In a three-year study of undergraduate computing students, Young and McSporran (2002) found that female students seem to be better at scheduling their learning. In contrast, male students need the discipline that classroom sessions provide. Young males even appeared to lack the basic skills of time-management and self-regulation necessary for successful online study.

As discussed above, the elements that influence gender performance in online discussion are complicated. The gender differences in communication style do exist in online communication, however, we could not predict its influence in participation in online discussion. We can even infer that the research results of gender performance in online discussion are inconsistent. In fact, in some studies females were found to have written more messages and were more active in participation (Cox et al., 2000; Mustafa, 2005; Wang, Sierra, & Folger, 2003), while others showed that males write more messages and are more involved in discussion (Blum, 1999; Jeong & Davidson-Shivers, 2003; Li, 2005).

**Identity-Enhancing Features and Genders**

Now we take the identity-enhancing features of the online discussion board into
consideration. As discussed in the beginning of the literature review, identity-enhancing features are borrowed from videogames and are supposed to enhance participation by providing reinforcers, enhancing members’ sense of identity, helping students with their metacognition, and promoting competitive learning. The analysis below will discuss how these features might influence participation by different genders.

Since identity-enhancing features are borrowed from computer game designs, it is reasonable to infer that gender difference in game playing will be transferred to identity-enhanced online discussion. That is, the identity-enhancing features like avatars, point systems, and rankings will profit male students more than it would female students. There are indeed significantly more male game players than female (ESA, 2005). However, as the number of female game players is steadily increasing (Bryce & Rutter, 2002, as cited in Hartmann & Klimmt, 2006), this gender gap is narrowing.

In terms of sense of identity, there is evidence that more females in online environment prefer to use personalized graphic icons or imaginative conference names to represent themselves (Cox et al., 2000). According to the discussion in previous pages, this increases both genders’ sense of identity and the possibility of
more online discussion participation.

There is also evidence that more males than females need the discipline, and lack the basic skills of time-management and self-regulation in online courses (Young & McSporran, 2002). According to the discussion in previous pages, ranking and point systems help students to monitor their progress of the contribution in the class. This might not be able to cover all the aspects of metacognition; but it does provide opportunities for self-monitoring. This self-monitoring of performance to ensure professed confidence is backed up by ability to achieve high levels of performance (Gunn & McSporran, 2003). Moreover, the competition and reinforcers that come with point systems and rankings coincide with males’ learning style. From this point of view, ranking and point systems may tend to profit males more than females.

Conclusion

From the above discussion, we know that differences exist in many aspects of online learning. The identity-enhancing features might even profit both genders in online discussion with various weights. Due to its complexity, we may not be able to predict the gender differences in their overall performance or online discussion participation. In fact, there is no consensus in the research literature so far of how these features influence different genders in an online discussion. However, the
theoretical analysis based on the research literature in sociology, communication

theories, behaviorism, and metacognition shows there is the possibility of a positive
effect of identity-enhancing features embedded in online discussion.
Chapter 3: Methodology

Introduction

This study utilized an experimental design to assess the participation, discussion quality, and the sense of satisfaction of using an identity-enhanced discussion board for online discussion. This chapter discusses the operational definitions of research variables, the population and sampling plan, instrument development, findings from the pilot study, validity and reliability issues, data collection, and data analysis.

The online discussion board software used in this study was developed based on phpBB2, which is an open source, flat style, message board written in PHP. It has all standard message board features. In order to integrate identity-enhanced features into the discussion board, some code modifications created by the phpBB2 community and the researcher were added into the discussion board. A detailed introduction of the technical terms used in ranking, point systems, and usage guidelines is given in Appendix A. Finally, the instruments administered in this study are given in Appendix B and Appendix C.

Research Design

The experimental design consisted of two groups: a comparison group and an experimental group. Both groups were composed of college students enrolled in
courses that required online discussion. The two groups shared the same basic
discussion forum features like searching, posting, editing, creating simple polls,
creating quizzes, uploading files, downloading files, showing post counts, chatting in
real time, inserting emoticons, creating a calendar, editing personal profiles, and
sending private messages. Besides the basic features described above, the discussion
forum used by the experimental group had these additional features: avatars,
signatures, rankings, and point systems.

Operational Definition of the Variables

The research used a factorial design. Two independent variables and three
dependent variables were included in the design. The two independent variables were
group and gender of students. The group variable included two levels, one group had
identity-enriched features and the other did not. The dependent variables included
participation, discussion quality, and satisfaction. The operational definitions of the
variables are given below.

Independent Variable - Group

Different forums were designed for each group. For the comparison group,
students used an asynchronous online discussion forum with only common discussion
board features but no identity-enrichment features. For the experimental group,
students used an asynchronous online discussion forum with both common discussion
board features and identity-enrichment features.

**Independent Variable - Gender of Students**

Gender was the second independent variable in this study. The gender
information of the students was gathered at the end of the semester by sending out
surveys.

**Dependent Variable - Participation**

Participation was a continuous variable represented by students’ Participation
Points (PP). This index depended on the number of new topics the poster had posted,
the number of the posts that were in response to the poster’s topics, the number of
replies the poster had made, the number of words in the posts, and the number of
private messages posted. The weight of each element could be customized by the
forum administrator (Appendix A). In this study, the weight was fixed; the
participation and peer rating was set to be 5% of students' grades. The weight of each
element of the index was programmable according to the requirements of the course
instructor or the characteristics of the course content. The PP was shown for the
experimental group and hidden for the comparison group.
Dependent Variable – Discussion Quality

Discussion quality was also a continuous variable represented by students’ rating points (RP). This index represented the total points a student derived from peers’ ratings and instructors’ ratings on his or her posts. Students in both the experimental group and comparison group were told to rate peer’s posts whenever they think the posts were helpful. However, only in the experimental group would the results be shown.

Dependent Variable – Sense of Satisfaction

Satisfaction was the index derived from the questionnaires which were administered to participants at the end of the experiment. This index was derived from the questionnaire of satisfaction (Appendix B) which was sent to the students of both groups at the end of the course. The questionnaire consisted of six questions. One demographic question collected gender information. Three questions were designed based on the different features of the two different forums. Two questions were based on overall usage of the two forums.

Sampling Plan

Identification of the Population

The population of this study was undergraduate students. The researcher invited
instructors of humanities, social sciences, or philosophy courses at three Midwestern universities, namely Ohio University, Kent State University, and John Carroll University, who taught two sections of the same course or instructors who were willing to split their class into two groups. One group was assigned to use a common phpBB2-based forum for online discussion; the other group was assigned to use an identity-enhanced phpBB2 forum for online discussion. The classes that were recruited to participate in the experiment were traditional face-to-face classes. However, students in the classes were required to participate in online discussion as a supplement to their paper assignments. Before the identity-enhanced discussion boards were used in the participating classes, an IRB consent form was administered to the students electronically to ask for their consent for their data to be included in the study.

Requirements for Recruiting Participants

Two conditions resulting from the pilot study were prerequisite for the recruiting of the participants. The instructor should be willing to make participation in online discussion a part of each student's grade and the instructor should allow anonymity in the online discussion.

The first requirement for the recruited instructors was that they should be willing
to integrate students’ online discussion participation as part of the course grade in order to promote online discussion participation. According to my pilot study and some other research findings, the primary way to ensure students’ engagement in online discussion is to make participation a part of the course evaluation (Shea, Fredericksen, Pickett, Pelz, & Swan, 2001, as cited in Newberry, 2005; Doiron, 2004; Jiang & Ting, 2000). Accordingly, all students of the learning community should be graded on quantity, quality, and timeliness of their contributions.

The second prerequisite for participation was anonymity. According to Chester and Gwynne (1998), anonymity is expected to increase discussion participation. Therefore, the instructors were asked to allow anonymity in online discussion. The discussion forum itself was designed to allow anonymity among students and instructors. The system administrator of the forum (i.e., the researcher) kept a record of the connections between students' alias identities and real-life identities. The instructors could only access the list of connections at the end of the course when they calculated final grades for the students.

Sample Size Estimate

The rationale for the predicted sample size is discussed below. Two-way analysis of variance (ANOVA) was used to analyze the collected data. According to previous
research of the effectiveness of web-based learning, the effect sizes are around 0.35 (Sitzmann, Wisher, Kraiger, & Stewart, 2005). According to Stevens (1999), in a research design with two independent variables, if the predicted effect size is proposed to be as large as $d=.35$, $\alpha=.05$, and estimated statistical power = .8, then the estimated sample size for each group should be around 32. Thus the total sample for the study should be around 128. Considering some students in the classes might not be willing to participate in the experiment, the total number of students in the experiment should be around 200. Finally, the full experiment recruited instructors who had two sections of the same course and instructors who had courses with only one section but were willing to split the class into two groups that used common and identity-enhanced discussion respectively. The recruiting stopped when the number of total participants reached 200.

*Instrumentation*

The same questionnaire was administered to students in both the experimental group and comparison group at the end of the experiment. The questionnaire, which contained one gender question, and five survey questions (Appendix B), was used to assess students’ sense of satisfaction as a result of using both the common discussion forum and the identity-enhanced discussion forum.
Pilot Study

The purpose of the pilot study was twofold: the refinement of the satisfaction questionnaire and development of the tutorials for using the phpBB2 forum. The pilot study was conducted during the summer session of 2006 at three sites: John Carroll University in northern Ohio, Case Western Reserve University in northern Ohio, and Tai-Chung Instructors’ College in Taiwan.

In terms of refining the questionnaire, the case in Tai-Chung Instructor's College had a class size of 13. Among them, 10 agreed to participate in using the forum and answering the questionnaire. By applying reliability statistics, the result showed that the Cronbach's Alpha of the questionnaire is .81, which indicates the questionnaire can reliably reflect the sense of satisfaction of the students.

There were only two participants in the case of John Carroll University. Because of dropouts, the size of the class was simply too small for administering the questionnaire. The Case Western Reserve University instructor did not want to make participation in the online discussion a part of his grading. Neither of these two cases produced useful data for refining the questionnaire.

In terms of refining the tutorials for using the discussion forum, based on feedback from both instructors and students, ten animated tutorials were created to
replace the image-based tutorials. A detailed explanation of how the ranking and point
systems work was given, which originally was left to be discovered by students as is
common in popular game design. The tutorials were made for students of both groups.
The other finding from the pilot study was that the use of avatars and signatures needs
to be taught and encouraged. Instructors need to guide students to take on the new
identity and urge them to choose avatars and signatures. As a result, two tutorials for
how to apply and edit avatars and signatures were added.

Validity Issues

For many studies that use a common discussion board, the measure of
participation is the total posts of each student. However, using the total posts to
represent the discussion participation is deficient in some aspects. Females tend to use
more community-building language that males tend to think is redundant. Males post
longer posts and females post shorter posts (Cox et al., 2000; Gay et al., 1999;
Herring, 2003). Starting a discussion topic is more important in inviting a discussion
than just replying to a topic. All these reasons indicate the complexity of the
participation construct. Therefore, participation should not be measured based merely
on total posts of the students.

In order to avoid the deficient and improve the validity of the study, a detailed
algorithm for measuring participation was designed. Participation was no longer measured merely by the total number of posts of each participant but included weight of topic posts, reply posts, replied posts, and spam posts. A mechanism for monitoring spam posts was designed into the forum to increase the content validity of the participation index (Appendix A).

Data Collection

Data collection began in the beginning of March, 2007. The modified discussion forum automatically recorded students' activities on the forum. Point systems integrated into the forum transformed students' contributions into point indexes. A survey of students’ satisfaction was given to participants in both the comparison group and experimental group at the end of the term. Another simple survey that investigated learners’ liking of each identity-enhancing feature was given at the end of the term only to the students in the experimental group (Appendix C). Data collection was completed in May, 2007.

Data Analysis Procedures

This research design involved three major steps in the data analysis. The first step was to analyze the effect of the identity enhancement forum and gender on both discussion participation and discussion quality. The data used for this analysis was
automatically collected from all the participants, n=124, during the semester by the forum. The second step was to assess the students’ sense of satisfaction with the discussion forums. The data used for this analysis was derived from a survey which was given to all the participants at the end of the semester. The last one was to further analyze students’ perceptions on each identity-enhancing feature in the experimental group. The data used for this analysis was derived from a survey which was given only to the students of the experimental group at the end of the semester. Each data analysis procedure is described below in relation to each research hypothesis.

*The Effect of ID-Enhanced Forum on Discussion Participation and Quality*

This step is to analyze the first and second research questions. The first question was: How does discussion participation and quality differ by discussion platform and gender? There are three hypotheses for this question:

1. Ho1: Treatment main effect 1: There is no significant difference in online discussion participation between the group with identity enhancement features and the group with no identity enhancement features.

2. Ho2: Treatment main effect 2: There is no significant difference in discussion participation between males and females.

3. Ho3: Treatment X gender interaction effect: There is no interaction effect
on discussion participation between genders and treatments.

This question included two independent variables. The first one was group. The group variable included two categories: the control group, which utilized the discussion forum with common features, and the experimental group, which utilized the forum with identity-enhanced features. The second independent variable was gender, which included two categories: male and female. A two-way ANOVA was conducted to analyze this question. The dependent variable was the participation points index (PP) of the students.

There were also three hypotheses for the second question: How does discussion quality differ by discussion platform and gender? They were:

1. Ho4: Treatment main effect 1: There is no significant difference in online discussion quality between the group with identity enhancement features and the group with no identity enhancement features.

2. Ho5: Treatment main effect 2: There is no significant difference in discussion quality between males and females.

3. Ha6: Treatment X gender interaction effect: There is no interaction effect of discussion quality between genders and treatments.

This question included the same independent variables and the same
categories on each independent variable as the first question. What was different was
the dependent variable was the rating points index (RP) of the students. A two-way
ANOVA was conducted to analyze this question.

The Effect of ID-Enhanced Forum on Students' Sense of Satisfaction

This step was to analyze the second research question: How does students'
sense of satisfaction (Appendix B) of using online discussion forum differ by
discussion platform and gender? There were also three hypotheses for this question.
They were:

1. Ho7: Treatment main effect 1: There is no significant difference in
   students’ sense of satisfaction of using discussion board between the group
   with identity enhancement features and the group with no identity
   enhancement features.

2. Ho8: Treatment main effect 2: There is no significant difference in
   students’ sense of satisfaction of using discussion board between males and
   females.

3. Ho9: Treatment X gender interaction effect: There is no interaction effect in
   students’ sense of satisfaction of using discussion board between genders
   and treatments.
This question included the same independent variables and the same categories on each independent variable as the first two questions. What was different was the dependent variable was the survey result of students' sense of satisfaction with using the online discussion forum. A two-way ANOVA was conducted to analyze this question.

*Further Survey Analysis of each Identity-Enhancing Feature*

When the students in the experimental group significantly presented higher discussion participation, participation quality, or satisfaction, then another survey (Appendix C) that investigated students’ perception of each ID-enhancing features was sent to the students in the experimental group.
Chapter 4: Results

Introduction

The study investigated whether the identity-enhanced forum had significant influence on students’ online discussion participation, quality, and satisfaction. This chapter answers the research questions listed below.

1. Does the use of identity enhancement features in an online discussion forum enhance learner participation?

2. Does gender influence learners’ participation in an identity-enhanced online discussion forum?

3. Does the use of identity enhancement features in an online discussion forum improve the quality of discussion?

4. Does gender influence learners’ discussion quality in an identity-enhanced online discussion forum?

5. Does the use of identity enhancement features in an online discussion forum improve students’ sense of satisfaction in participating in online discussion?

6. Does gender influence learners’ sense of satisfaction in an identity-enhanced online discussion forum?
The results and findings of the study were based on the analysis of the data collected from six classes of two major Midwestern universities in the United States during spring semester of 2007. At the beginning of the semester, there were three instructors and their 10 classes, which included 202 students, who agree to participate in the research. During the semester, however, one instructor and four classes could not meet the requirements of the research design and withdrew, leaving two instructors and their six classes, which included altogether 124 students, who went through the whole experiment.

Among those who went through the experiment, one participating instructor taught four sections of an introductory course in instructional technology. The other instructor taught two sections of an introductory philosophy course. Among those classes that participated in the research, three classes were assigned to the experimental group and three classes were assigned to the comparison group. The comparison group used the forum with common features while the experimental group used the forum with identity enhanced features.

Three measures of data were collected and analyzed using the statistical software, SPSS version 11.5 version. The first measure of data was automatically collected by the forum system during the semester. The second measure of data was
collected at the end of the semester from a survey which was administered to all the students. The third measure of data was derived from a survey which was administered only to the students who were in the experimental group.

The first measure of data was used to answer the first six research questions, which included six hypotheses. The second measure of data was used to answer research questions from seventh to ninth, which included the other three hypotheses. The third measure of data was used for further analysis. The results of the analysis are presented in the following sections: research findings from the first measure of data, research findings from the second measure of data, and further findings.

*Research Findings from the First Measure of Data*

The first measure of data was used to answer the first six research questions.

Six hypotheses developed from the first six research questions are:

1. **Ho1:** Group main effect 1: There is no significant difference in online discussion participation between the group with identity enhancement features and the group without identity enhancement features.

2. **Ho2:** Group main effect 2: There is no significant difference in discussion participation between males and females.

3. **Ho3:** Group X gender interaction effect: There is no interaction effect on
discussion participation between genders and treatments.

4. Ho4: Group main effect 1: There is no significant difference in online
discussion quality between the group with identity enhancement features
and the group without identity enhancement features.

5. Ho5: Group main effect 2: There is no significant difference in discussion
quality between males and females.

6. Ho6: Group X gender interaction effect: There is no interaction effect of
discussion quality between genders and treatments.

In order to test the research hypothesis, the data were divided into two subsets.
One subset contained two factors, group and gender, and one dependent variable,
participation points. The other subset included the same two factors but with rating
points as its dependent variable. This subset of data was used to investigate the
relations between the ID-enhanced forum and discussion quality. Both subsets were
analyzed by using two-way ANOVA statistical method. The statistical analyses of
both sets are listed below:

Identity-Enhanced Forum and Discussion Participation

This section contained the demographic information, descriptive information,
and testing hypothesis. Three items for participants’ demographic information were
name of school, class, and gender. Thirty-eight percent of the participants who took
the basic philosophy course were from one university and 62% of the participants
who took the basic instructional technology course were from the other university.

Each class size ranged from 18 to 25. The data in Table 1 show that the comparison
group contained 64 students and the experimental group contained 60 students. 34.7%
of the participants were male and 65.3% of the participants were female (added).

Table 1

*Frequency and Percentage of Participants’ Gender in each Group*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Comparison group</th>
<th>Experimental Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>22 (51%)</td>
<td>21 (49%)</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>(34.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>42 (51%)</td>
<td>39 (39%)</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>(65.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>64 (51%)</td>
<td>60 (49%)</td>
<td>124</td>
</tr>
</tbody>
</table>
Table 2 illustrates students’ behaviors of posting comments and giving ratings.

In both groups, students’ participation points were much higher than their rating points (M=109.96 for participation points and M=3.98 for rating points in the comparison group, and M=217.62 for participation points and 1.33 for rating points in the experimental group).

Table 2

<table>
<thead>
<tr>
<th></th>
<th>Comparison Group</th>
<th></th>
<th>Experimental Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Var.</td>
<td>M</td>
</tr>
<tr>
<td>Rating Points</td>
<td>3.98</td>
<td>7.621</td>
<td>58.08</td>
<td>1.33</td>
</tr>
<tr>
<td>Participation Points</td>
<td>109.96</td>
<td>86.91</td>
<td>7552.99</td>
<td>217.62</td>
</tr>
</tbody>
</table>
In fact, 5.6% of participants did not post comments while 81.5% of participants did not receive rating points (Table 3). According to the forum design, students’ rating points were obtained by peers’ rating. Since it was possible that one student rated more than one peer’s paper, the real percentage of students who rated others’ papers could be even less than the percentage stated above.

Table 3

*Students Who Did Not Obtain Participation Points or Rating Points*

<table>
<thead>
<tr>
<th></th>
<th>Comparison Group</th>
<th>Experimental Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation Points = 0</td>
<td>7 (5.6%)</td>
<td>0 (0%)</td>
<td>7 (5.6%)</td>
</tr>
<tr>
<td>Rating Points = 0</td>
<td>48 (38.7%)</td>
<td>53 (42.7%)</td>
<td>101 (81.5%)</td>
</tr>
</tbody>
</table>

Three assumptions for the analysis of variance were tested for this analysis. These assumptions relate to (1) normality, (2) homogeneity of variance, and (3) independency. For the normality assumption, the dependent variable should be normally distributed in each category of the independent variables. Kolmogorov-Smirnov and Q-Q test were used to test normality of the samples in each category. Table 4 shows that three out of four categories of samples match the test of
normal distribution. The only category of the sample that violated the normality test, $p < .05$, male students in the comparison group, contained 22 students. According to Green and Salkind (2003), a sample size of 15 per group might be sufficiently large to yield fairly a accurate $p$ value. From Figure 1, the points on the Q-Q plot formed a linear pattern roughly clustered around a straight line. Therefore, normality was assumed.
Table 4

Tests of Normality of Participation Points in each Category

<table>
<thead>
<tr>
<th>Gender</th>
<th>Kolmogorov-Smirnov(a)</th>
<th>Statistic</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparison group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>.20</td>
<td>22</td>
<td>.02</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>.13</td>
<td>42</td>
<td>.08</td>
</tr>
<tr>
<td>Experimental group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>.18</td>
<td>21</td>
<td>.06</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>.13</td>
<td>39</td>
<td>.11</td>
</tr>
</tbody>
</table>

Figure 1. Normality test for dependent variable: Participation Points
Levene's test of homogeneity of variance was computed by SPSS to test the assumption that each category of the independent variable, participation points, had the same variance. The result in Table 5 shows that the significance level was >.05, which indicated that homogeneity could be assumed.

Table 5

*Levene’s Test for Homogeneity of Variances with Participation Points as Dependent Variable*

<table>
<thead>
<tr>
<th>Levene’s F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>.86</td>
<td>3</td>
<td>120</td>
<td>.47</td>
</tr>
</tbody>
</table>

The third assumption was independence. This study used what would be considered convenience sampling because all the subjects were selected based on their enrollment in classes which required online discussion. Although discussion activities in the study might cause students’ behaviors to be dependent on each other, the intraclass correlation coefficient in Table 6 below shows that the evidence of violation of independence was not significant. Therefore, independence was assumed.
Since three assumptions of two-way ANOVA were met, a 2 x 2 ANOVA was conducted to analyze the effects of group and gender on discussion participation. The means and standard deviations for rating points as a function of the two factors are presented in Table 7. The results of the ANOVA indicate no significant interaction between different groups and gender, F(1, 120) = 30.34, p = .57, partial η² = .20. For main effects, the ANOVA indicated significant main effects for different groups, F(1, 120) = 30.34, p < .01, partial η² = .20, and for genders, F(1, 120) = 4.63, p < .05, partial η² = .03. The group main effect had stronger influences (partial η² = .20) on participation than the gender main effect (partial η² = .03).

Table 6

Intraclass Correlation Coefficients

<table>
<thead>
<tr>
<th>Measure</th>
<th>ICC</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value</td>
<td>Lower Bound</td>
</tr>
<tr>
<td>Single Rater</td>
<td>-.001</td>
<td>-.18</td>
</tr>
<tr>
<td>Average of Raters*</td>
<td>-.002</td>
<td>-.43</td>
</tr>
</tbody>
</table>

Degrees of freedom for F-tests are 123 and 123. Test Value = 0.
Table 7

*Two-Way ANOVA with Participation Points as Dependent Variable*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
<th>Partial η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP</td>
<td>306962.59</td>
<td>1</td>
<td>306962.59</td>
<td>30.34</td>
<td>.000</td>
<td>.20</td>
</tr>
<tr>
<td>GENDER</td>
<td>46879.49</td>
<td>1</td>
<td>46879.49</td>
<td>4.63</td>
<td>.03</td>
<td>.04</td>
</tr>
<tr>
<td>GROUP * GENDER</td>
<td>3329.66</td>
<td>1</td>
<td>3329.67</td>
<td>.33</td>
<td>.57</td>
<td>.003</td>
</tr>
<tr>
<td>GENDER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>1214046.15</td>
<td>120</td>
<td>10117.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>1622546.01</td>
<td>123</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The statistics above answered the first three hypotheses. First, there was a significant difference in online discussion participation between the group with identity enhancement features and the group with no identity enhancement features. Students who used the ID-enhanced forum obtained higher participation points.

Second, there was a significant difference in discussion participation between males and females. Female students obtained higher participation points. Third, there was no interaction effect on discussion participation between genders and treatments.

Identity-Enhanced Forum and Discussion Quality

The analysis here shared the same demographic information as the analysis above. The description of the analysis is also the same as in the in last section. The difference is that this analysis used rating points as the dependent variable for a two-way ANOVA.

Again, three assumptions for the analysis of variance were tested. The Kolmogorov-Smirnov test and Q-Q test were used to test normality of the samples in each category. Table 8 shows that none of the categories met the assumption of normality. Levene's test of homogeneity of variance was also computed and the result in Table 9 shows that this assumption was violated as well. According to Stevens (1999), when the assumptions of the two-way ANOVA were violated, the actual \( \alpha \)
will be larger than nominal $\alpha$.

Table 8

*Kolmogorov-Smirnov(a) Tests of Normality*

<table>
<thead>
<tr>
<th>Gender</th>
<th>comparison group</th>
<th>Experimental group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Rating Points</td>
<td>Male</td>
<td>.52</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>.40</td>
</tr>
</tbody>
</table>

Table 9

*Levene's Test of Homogeneity with Rating Points as Dependent Variable*

<table>
<thead>
<tr>
<th>Levene's F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.73</td>
<td>3</td>
<td>120</td>
<td>.00</td>
</tr>
</tbody>
</table>

Since the assumptions of the two-way ANOVA were violated, the measures of rating points were not adequate for analysis by using two-way ANOVA. In addition, we kept in mind that out of 124 students, 101 received zero rating points from their
peers. The situation will be discussed in the next chapter.

Research Findings from the Second Measure of Data

This section describes the statistical analysis of the data collected from the survey sent to all the students at the end of the spring semester of 2007. Out of 124 students, 117 responses were received. These data were used to analyze whether the forum embedded with ID-enhancing features produced higher student satisfaction.

Identity-Enhanced Forum and Satisfaction

There are demographic information, descriptive analysis, assumption examination, and statistical analysis included in this section. The demographic information is listed in Table 10 below:

Table 10

Demographic Information from the Survey of Satisfaction

<table>
<thead>
<tr>
<th>Gender</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>Comparison group</td>
<td>19</td>
</tr>
<tr>
<td>Experimental group</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
</tr>
</tbody>
</table>
The survey contained five satisfaction items (Table 11) with a five-point Likert scale, and the level of options ranged from strongly agree (5) to strongly disagree (1).

The index of students’ sense of satisfaction with the discussion forum was the average of the questions.

Table 11

*Survey of Students’ Sense of Satisfaction*

<table>
<thead>
<tr>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1: I like the function provided in the forum for students' identity presentation</td>
</tr>
<tr>
<td>Q2: I like the function provided in the forum for students to monitor their progress.</td>
</tr>
<tr>
<td>Q3: Features in the forum encourage me to participate in discussion.</td>
</tr>
<tr>
<td><em>Q4: The forum is too complicated to use.</em></td>
</tr>
<tr>
<td>Q5: I am satisfied with the overall function provided by the forum in this course.</td>
</tr>
</tbody>
</table>

* indicates negative statement

To examine the internal consistency of the survey, Cronbach’s alpha was applied to the data. The result in Table 12 showed that the reliability alpha = .78, which is considered adequate.
Table 12

*Reliability Test for the Survey of Students’ Sense of Satisfaction*

<table>
<thead>
<tr>
<th>Item</th>
<th>Scale Mean if Item Deleted</th>
<th>Scale Variance if Item Deleted</th>
<th>Corrected Item-Total Correlation</th>
<th>Alpha if Item Deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>9.97</td>
<td>7.60</td>
<td>.41</td>
<td>.76</td>
</tr>
<tr>
<td>Q2</td>
<td>10.30</td>
<td>6.42</td>
<td>.63</td>
<td>.71</td>
</tr>
<tr>
<td>Q3</td>
<td>10.01</td>
<td>6.37</td>
<td>.54</td>
<td>.74</td>
</tr>
<tr>
<td>Q4</td>
<td>10.05</td>
<td>6.10</td>
<td>.48</td>
<td>.77</td>
</tr>
<tr>
<td>Q5</td>
<td>10.14</td>
<td>6.08</td>
<td>.74</td>
<td>.67</td>
</tr>
</tbody>
</table>

Alpha = .78

The histograms below illustrate the distribution of students’ sense of satisfaction. Figure 2 presents the distribution of satisfaction for the comparison group.

The histogram was nearly a normal distribution with a little bit of negative skewness.
Figure 2. Histogram for satisfaction in comparison group
Figure 3 below presents the distribution of satisfaction for the experimental group. The histogram presents a larger negative skewness indicating that students in experimental group gave positive feedback indicating satisfaction.

![Histogram for satisfaction in experiment group](image)

*Figure 3. Histogram for satisfaction in experiment group*

In order to test whether the forum used in the experimental group produced a higher sense of satisfaction than the forum used in the comparison group, a two-way ANOVA was used for analysis. The first assumption of two-way ANOVA is normality.

Table 13 of Kolmogorov-Smirnov test below showed that the normality was
moderately violated. The Levene's test in Table 14 indicated that the homogeneity assumption was met. According to the discussion of assumptions in the previous section in this chapter, the assumptions of two-way ANOVA were not violated and thus a two-way ANOVA was conducted for students’ sense of satisfaction.

Table 13

*Kolmogorov-Smirnov(a) Tests of Normality*

<table>
<thead>
<tr>
<th></th>
<th>Comparison group</th>
<th></th>
<th></th>
<th></th>
<th>Experimental group</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gender</td>
<td>Statistic</td>
<td>df</td>
<td>Sig.</td>
<td>Gender</td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Sense of satisfaction</td>
<td>Male</td>
<td>.17</td>
<td>19</td>
<td>.16</td>
<td>.22</td>
<td>20</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>.13</td>
<td>38</td>
<td>.11</td>
<td>.19</td>
<td>39</td>
<td>.001</td>
</tr>
</tbody>
</table>

Table 14

*Levene's Test of Equality of Error Variances*

<table>
<thead>
<tr>
<th></th>
<th>Levene's F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.30</td>
<td>3</td>
<td>112</td>
<td>.08</td>
</tr>
</tbody>
</table>
The results of the ANOVA shown in Table 15 indicate no significant interaction between the two different forums and gender, $F(1, 112) = .008, p = .93$, partial $\eta^2 = 0$. For main effects, the ANOVA indicated significant main effects for different groups, $F(1, 112) = 12.39, p < .01$, partial $\eta^2 = .1$, but no significant main effect for gender, $F(1, 112) = .21, p = .65$, partial $\eta^2 = .002$. The results showed that students who used forums embedded with ID-enhancing features did report higher satisfaction.

Table 15

Two Way ANOVA with Satisfaction as Dependent Variable

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
<th>Partial $\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP</td>
<td></td>
<td>4.32</td>
<td>1</td>
<td>4.32</td>
<td>12.39</td>
<td>.001</td>
<td>.100</td>
</tr>
<tr>
<td>GENDER</td>
<td></td>
<td>.072</td>
<td>1</td>
<td>.072</td>
<td>.21</td>
<td>.651</td>
<td>.002</td>
</tr>
<tr>
<td>GROUP *</td>
<td></td>
<td>.003</td>
<td>1</td>
<td>.003</td>
<td>.008</td>
<td>.93</td>
<td>.000</td>
</tr>
<tr>
<td>GENDER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As discussed above, students who used the ID-enhanced forum had a higher
level of participation and reported higher satisfaction. Female students participated more in online discussion, which was consistent with previous studies (Im & Lee, 2003; Pickner & Mehlberg, 2001). There was no evidence that a different forum design and gender will influence the discussion quality. However, the ID-enhanced forum did generate a higher sense of satisfaction regardless of gender.

**Research Findings from the Third Measure of Data**

Since the ID-enhanced forum did influence students’ discussion participation, a survey that investigated students’ perceptions about identity-enhancing features was administered at the end of semester only to the students in the experimental group. The survey contained five items of demographic information, four items related to ID-enhancing features with five-point Likert scale and three open-ended questions. Selected findings of this data analysis are divided into three sections: demographic information, differential preference of each ID-enhancing features, and open-ended questions.

**Demographic Information**

The first part of the survey was demographic information. The sample consisted of 60 participants in the experimental group, of whom 95% had ages from 19 to 21 (Table 16). There were approximately 66.7% female (Table 10) students and
90% Caucasian (Table 17). 36.7% of the participants sometimes or often played video
games (Table 18) and 46.7% had experienced an online discussion before the
experiment (Table 19). Although the instructors announced several times the
availability of creating personal avatars and signatures, and although interactive
tutorials were provided for the students, only 11.7% created their signatures and 15%
changed their avatars (Table 20).

Table 16

Frequencies and Percentages of Students’ Ages

<table>
<thead>
<tr>
<th>Year of Birth</th>
<th>Frequency</th>
<th>%</th>
<th>% accumulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>29</td>
<td>48.3</td>
<td>48.3</td>
</tr>
<tr>
<td>1987</td>
<td>19</td>
<td>31.7</td>
<td>80.0</td>
</tr>
<tr>
<td>1986</td>
<td>8</td>
<td>13.3</td>
<td>93.3</td>
</tr>
<tr>
<td>1985</td>
<td>1</td>
<td>1.7</td>
<td>95.0</td>
</tr>
<tr>
<td>1984</td>
<td>2</td>
<td>3.3</td>
<td>98.3</td>
</tr>
<tr>
<td>1962</td>
<td>1</td>
<td>1.7</td>
<td>100.0</td>
</tr>
</tbody>
</table>
### Table 17

**Frequencies and Percentages of Ethnicity**

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td>Caucasian</td>
<td>54</td>
<td>90.0</td>
</tr>
<tr>
<td>Hispanics</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>Asian</td>
<td>2</td>
<td>3.3</td>
</tr>
</tbody>
</table>

### Table 18

**Frequencies and Percentages of Game Experiences**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>%</th>
<th>% Accumulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very often</td>
<td>6</td>
<td>10.0</td>
</tr>
<tr>
<td>Sometimes</td>
<td>16</td>
<td>26.7</td>
</tr>
<tr>
<td>Seldom</td>
<td>22</td>
<td>36.7</td>
</tr>
<tr>
<td>Never</td>
<td>15</td>
<td>25.0</td>
</tr>
<tr>
<td>Data Missing</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100.00</td>
</tr>
</tbody>
</table>
Table 19

*Frequencies and Percentages of Online Discussion Experiences*

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>28</td>
<td>46.7</td>
</tr>
<tr>
<td>No</td>
<td>32</td>
<td>53.3</td>
</tr>
</tbody>
</table>

Table 20

*Frequencies and Percentages of Students’ Use of Avatars and Signatures in the Forum*

<table>
<thead>
<tr>
<th>Did you use avatar?</th>
<th>Yes (15%)</th>
<th>No (85%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you use signature?</td>
<td>7 (11.67%)</td>
<td>53 (88.3%)</td>
</tr>
</tbody>
</table>
Differential Preference of each ID-Enhancing Features

This section investigated students’ perception of each ID-enhancing feature. The data used for this analysis was a five-item Likert scale with options ranging from strongly agree (5) to strongly disagree (1). Garson (2006) mentioned that in some situations, deletion of missing data might invite bias into the study. There were only a few missing items in the data. Before analyzing the data, the researcher replaced the missing data by the group mean.

The survey questions administered to the students of the experimental group are listed in Appendix C. The summary of these findings begins with descriptive statistics, from Table 21 to Table 24, for each ID-enhancing feature. Following are the Mann-Whitney U tests and Wilcoxon signed-rank tests to investigate whether students had differential favor for each ID-enhancing feature and whether students with different experiences will have differential liking for each ID-enhancing feature. From the descriptive tables below, we found that very few people responded with “Strongly Disagree.” Students’ responses to avatar and signature items presented a more moderate attitude, mode = 3 and median = 3.00, while their responses to point system and rankings presented a more positive attitude, mode = 4 and median = 4.00.
Table 21

*Item Response: Q1. I Like the Idea of Using Avatar*

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>DA</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>N</td>
<td>30</td>
<td>50.0</td>
</tr>
<tr>
<td>A</td>
<td>21</td>
<td>35.0</td>
</tr>
<tr>
<td>SA</td>
<td>5</td>
<td>8.3</td>
</tr>
<tr>
<td>Missing Data</td>
<td>1</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Table 22

*Item Response: Q1. I Like the Idea of Using Signature.*

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>DA</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>N</td>
<td>42</td>
<td>70.0</td>
</tr>
<tr>
<td>A</td>
<td>14</td>
<td>23.3</td>
</tr>
<tr>
<td>SA</td>
<td>2</td>
<td>3.3</td>
</tr>
</tbody>
</table>
Table 23


<table>
<thead>
<tr>
<th>Item Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>Neutral</td>
<td>12</td>
<td>20.0</td>
</tr>
<tr>
<td>Agree</td>
<td>38</td>
<td>63.3</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>8</td>
<td>13.3</td>
</tr>
</tbody>
</table>

Table 24


<table>
<thead>
<tr>
<th>Item Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>DA</td>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td>N</td>
<td>10</td>
<td>16.7</td>
</tr>
<tr>
<td>A</td>
<td>37</td>
<td>61.7</td>
</tr>
<tr>
<td>SA</td>
<td>9</td>
<td>15.0</td>
</tr>
</tbody>
</table>
In order to investigate whether students had significant differential liking for each ID-enhancing feature, a Friedman Test was conducted to investigate whether there were significant differences of medians when students were asked if they like the idea of using avatars, signatures, points and ranking in the online discussion forum.

The results in Table 25 showed the differences were significant, \( \chi^2 (3, N=59) = 44.56, p<.01 \), and the Kendall coefficient of concordance of .25 indicated fairly strong differences among the four ID-enhancing features (Table 26).

Table 25

*The Results of Friedman Test*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>59</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>44.56</td>
</tr>
<tr>
<td>df</td>
<td>3</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.00</td>
</tr>
</tbody>
</table>
Follow-up pairwise comparisons were conducted using a Wilcoxon test and controlling for Type I errors across these comparisons at the .05 level using the LSD procedure. The results in Table 27 showed that the median liking value for the point system was significantly greater than the median liking value for avatar, $p<.01$, and the median liking value for signature, $p<.01$, but the median liking value for point system did not differ significantly from the median liking value for rankings, $p=.67$.

The median liking value for rankings was significantly greater than median liking value for avatar, $p<.01$, and the median liking value for signature, $p<.01$. The median liking value for avatar was significantly greater than median liking value for signature with $p <.01$.

Based on the findings above, we concluded that students had differential liking for each ID-enhancing feature. Students appreciated the point system and rankings the most and with a rather similar attitude. Students’ second favorite was avatars.
Signatures was their last choice.

Table 27

*Multiple Comparisons Using Wilcoxon Test on Four ID-Enhancing Features*

<table>
<thead>
<tr>
<th></th>
<th>Z</th>
<th>Asymp. Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like the idea of using signature. - I like the idea of using avatar.</td>
<td>-2.43(a)</td>
<td>.015</td>
</tr>
<tr>
<td>I like the idea of using points. - I like the idea of using avatar.</td>
<td>-3.34(b)</td>
<td>.001</td>
</tr>
<tr>
<td>I like the idea of using rankings. - I like the idea of using avatar.</td>
<td>-3.08(b)</td>
<td>.002</td>
</tr>
<tr>
<td>I like the idea of using points. - I like the idea of using signature.</td>
<td>-5.03(b)</td>
<td>.000</td>
</tr>
<tr>
<td>I like the idea of using rankings. - I like the idea of using signature.</td>
<td>-4.48(b)</td>
<td>.000</td>
</tr>
<tr>
<td>I like the idea of using rankings. - I like the idea of using points.</td>
<td>-.428(a)</td>
<td>.669</td>
</tr>
</tbody>
</table>

a  Based on positive ranks.

b  Based on negative ranks.

c  Wilcoxon Signed Ranks Test
**Gender and ID-Enhancing Features**

In order to investigate whether different genders had different preference for the ID-enhancing features, several Mann-Whitney U tests were conducted to investigate whether female students would score lower, on the average, than males when asked if he or she liked the idea of using avatars, signatures, points, and rankings in the forum. The results are showed in Table 28 and Table 29. The results show that the tests for both avatars and rankings are in the expected direction and significant, $Z=-2.93$, $p<.05$ for avatars and $Z=-2.42$, $p<.05$ for rankings. Male students tended to like the idea of using avatars and rankings in the discussion forum more than female students. For the item “I like the idea of using avatar”, male students had the average rank of 38.30, while female students had an average rank of 25.74. For the item of “I like the idea of using rankings”, male students had the average rank of 37.23, while female students had an average rank of 27.14. The statistics found no significant differences by gender on the whether they liked points and signatures.
Table 28

*Mann-Whitney U Tests Ranks Table for : Gender vs. ID-Enhancing Features*

<table>
<thead>
<tr>
<th>Feature</th>
<th>Gender</th>
<th>N</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like the idea of using avatar.</td>
<td>Male</td>
<td>20</td>
<td>38.30</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>39</td>
<td>25.74</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>I like the idea of using signature.</td>
<td>Male</td>
<td>20</td>
<td>34.03</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>40</td>
<td>28.74</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>I like the idea of using points.</td>
<td>Male</td>
<td>20</td>
<td>33.00</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>40</td>
<td>29.25</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>I like the idea of using rankings.</td>
<td>Male</td>
<td>20</td>
<td>37.23</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>40</td>
<td>27.14</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>
Table 29

*Mann-Whitney U Tests: Gender vs. ID-enhancing Features*

<table>
<thead>
<tr>
<th></th>
<th>Mann-Whitney U</th>
<th>Asymp. Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like the idea of using avatar.</td>
<td>224.00</td>
<td>.003</td>
</tr>
<tr>
<td>I like the idea of using signature.</td>
<td>329.50</td>
<td>.17</td>
</tr>
<tr>
<td>I like the idea of using points.</td>
<td>350.00</td>
<td>.36</td>
</tr>
<tr>
<td>I like the idea of using rankings.</td>
<td>265.50</td>
<td>.02</td>
</tr>
</tbody>
</table>

*Gaming Experiences and ID-Enhancing Features*

In order to investigate whether students with gaming experiences had different preference for each ID-enhancing feature, several Mann-Whitney U tests were conducted to evaluate differences between students with different gaming experiences (sometimes or often vs. seldom or never) on their preference for each ID-enhancing feature. The tests were significant, $z = -3.07$, $p < .01$, for liking avatar and, $z = -2.10$, $p < .05$, for liking signature. There were no significant differences on the liking of ranking and points between students with different gaming experiences. The results are shown in Table 30 and Table 31.
<table>
<thead>
<tr>
<th></th>
<th>Mann-Whitney U</th>
<th>Asymp. Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like the idea of using avatar.</td>
<td>222.00</td>
<td>.002</td>
</tr>
<tr>
<td>I like the idea of using signature.</td>
<td>299.00</td>
<td>.036</td>
</tr>
<tr>
<td>I like the idea of using points.</td>
<td>389.00</td>
<td>.740</td>
</tr>
<tr>
<td>I like the idea of using rankings.</td>
<td>375.00</td>
<td>.562</td>
</tr>
</tbody>
</table>
Table 31

*Mann-Whitney Test Ranks: ID-enhancing Features vs. Gaming Experiences*

<table>
<thead>
<tr>
<th>Feature Description</th>
<th>Gaming Experiences</th>
<th>N</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like the idea of using avatar.</td>
<td>sometime or often</td>
<td>22</td>
<td>37.41</td>
</tr>
<tr>
<td></td>
<td>seldom or never</td>
<td>36</td>
<td>24.67</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>I like the idea of using signature.</td>
<td>sometime or often</td>
<td>22</td>
<td>34.91</td>
</tr>
<tr>
<td></td>
<td>seldom or never</td>
<td>37</td>
<td>27.08</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>I like the idea of using points.</td>
<td>sometime or often</td>
<td>22</td>
<td>30.82</td>
</tr>
<tr>
<td></td>
<td>seldom or never</td>
<td>37</td>
<td>29.51</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>I like the idea of using rankings.</td>
<td>sometime or often</td>
<td>22</td>
<td>31.45</td>
</tr>
<tr>
<td></td>
<td>seldom or never</td>
<td>37</td>
<td>29.14</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>59</td>
<td></td>
</tr>
</tbody>
</table>

In order to investigate if gender is related to gaming experiences, a 2X2

Chi-Square test was conducted where gaming experiences had two values, some or
more vs. less or never. The results showed that gender was related to gaming experiences. It showed that male students had more gaming experience than females, $p < .01$. This finding was consistent with the report of the ESA in 2005 (ESA, 2005).

The results are shown in Table 32 and Table 33.

Table 32

*Chi-Square Test: Gender vs. Gaming Experiences*

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>23.604</td>
<td>1</td>
<td>.000</td>
</tr>
<tr>
<td>Continuity Correction (a)</td>
<td>20.922</td>
<td>1</td>
<td>.000</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>24.432</td>
<td>1</td>
<td>.000</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>59</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 33

*Crosstabulation: Gender vs. Gaming Experiences*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Gaming Experiences</th>
<th>somtime or often</th>
<th>seldom or never</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td>16</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>6</td>
<td>33</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>22</td>
<td>37</td>
<td>59</td>
</tr>
</tbody>
</table>

*Online Discussion Experiences and ID-Enhancing Features*

In order to investigate whether students with different experiences of online discussion have different preference for each ID-enhancing feature, several Mann-Whitney U tests were conducted to evaluate differences between students with different online discussion experiences (yes and no) on their liking for each ID-enhancing feature. The tests were significant, $z = -2.32$, $p < .05$, for liking of avatars and $z = -2.07$, $p < .05$, for liking of signatures. Students with online discussion experiences preferred avatars and signatures more than students who did not have online discussion experiences. There were no significant differences on the liking of
point system and rankings between students with and without online learning experiences. The results are shown in Table 34 and Table 35.

Table 34

*Mann-Whitney Test: ID-Enhancing Features vs. Online Discussion Experiences*

<table>
<thead>
<tr>
<th>Feature</th>
<th>Mann-Whitney</th>
<th>Z</th>
<th>Asymp. Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like the idea of using avatar.</td>
<td>293.50</td>
<td>-2.32</td>
<td>.02</td>
</tr>
<tr>
<td>I like the idea of using signature.</td>
<td>336.00</td>
<td>-2.07</td>
<td>.04</td>
</tr>
<tr>
<td>I like the idea of using points.</td>
<td>356.00</td>
<td>-1.59</td>
<td>.11</td>
</tr>
<tr>
<td>I like the idea of using rankings.</td>
<td>385.50</td>
<td>-1.06</td>
<td>.29</td>
</tr>
</tbody>
</table>
Table 35

*Mann-Whitney Test Ranks: ID-Enhancing Features vs. Online Discussion Experiences*

<table>
<thead>
<tr>
<th>Have you ever experienced online discussion before?</th>
<th>N</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I like the idea of using avatar.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>27</td>
<td>35.13</td>
</tr>
<tr>
<td>No</td>
<td>32</td>
<td>25.67</td>
</tr>
<tr>
<td>Total</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td><strong>I like the idea of using signature.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>28</td>
<td>34.50</td>
</tr>
<tr>
<td>No</td>
<td>32</td>
<td>27.00</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td><strong>I like the idea of using points.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>28</td>
<td>33.79</td>
</tr>
<tr>
<td>No</td>
<td>32</td>
<td>27.63</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td><strong>I like the idea of using rankings.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>28</td>
<td>32.73</td>
</tr>
<tr>
<td>No</td>
<td>32</td>
<td>28.55</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

*Additional Findings on Students’ Sense of Satisfaction*

Table 36 below presents the descriptive information from the survey of students’ sense of satisfaction for the comparison group and the experimental group.

The mean and standard deviation of the satisfaction were $M = 3.26$ and $SD = 0.67$ for the comparison group, and were $M = 3.68$ and $SD = 0.50$ for the experimental group.
Among the survey questions, Q2, *I like the function provided in the forum for students to monitor their progress*, received the highest response, $M = 3.44$ for comparison group and 3.92 for experimental group. Q4, *The forum is easy to use*, received the most controversial responses, $SD = 1.15$ for the comparison group and 0.91 for the experimental group.

Table 36

*Descriptive Information of Students’ Sense of Satisfaction*

<table>
<thead>
<tr>
<th>Items</th>
<th>Comparison Group</th>
<th>Experimental Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>Q1</td>
<td>3.21</td>
<td>.70</td>
</tr>
<tr>
<td>Q2</td>
<td>3.44</td>
<td>.82</td>
</tr>
<tr>
<td>Q3</td>
<td>3.12</td>
<td>.97</td>
</tr>
<tr>
<td>Q4</td>
<td>3.28</td>
<td>1.15</td>
</tr>
<tr>
<td>Q5</td>
<td>3.26</td>
<td>.88</td>
</tr>
<tr>
<td>Total</td>
<td>3.26</td>
<td>.67</td>
</tr>
</tbody>
</table>

Since 3 is the mean scale of the survey of satisfaction, two one-sample t-tests
were used to verify if students’ satisfaction means were significantly different from 3 respectively. For the comparison group (see Table 37), with alpha set at .05, the one-sample t-test was significantly different from 3, $t(56) = 2.98$, $p=.004$. The effect size $d$ \textit{(Mean Difference/SD)} of .39 indicated a small effect. For the experimental group (see Table 38), with alpha set at .05, the one-sample t-test was significantly different from 3, $t(59) = 10.51$, $p < .01$. The effect size $d$ \textit{(Mean Difference/SD)} of 1.36 indicated a strong effect. Both groups showed that students responded positively to the forum they used.

Table 37

\textit{One-Sample t-Test for Comparison Group}

<table>
<thead>
<tr>
<th>Sense of satisfaction</th>
<th>t</th>
<th>df</th>
<th>(2-tailed)</th>
<th>Difference</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.98</td>
<td>56</td>
<td>.004</td>
<td>.26</td>
<td>.087</td>
<td>.44</td>
</tr>
</tbody>
</table>

Test Value = 3
Table 38

One-Sample t-Test for Experimental Group

<table>
<thead>
<tr>
<th>Sense of satisfaction</th>
<th>t</th>
<th>df</th>
<th>(2-tailed)</th>
<th>Difference</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense of satisfaction</td>
<td>10.51</td>
<td>59</td>
<td>.00</td>
<td>.68</td>
<td>.55</td>
<td>.81</td>
</tr>
</tbody>
</table>

Open-Ended Questions

The purpose of open-ended questions in the questionnaire was to allow the participants to freely address their comments regarding their perception of ID-enhancing features. Three questions were asked:

1. What do you think about your avatar and signature?

2. What do you think about rankings and point systems?

3. Rating others' points can help others earn points. Have you ever rated your classmates' posts? Why?
Open-Ended Answers for Avatars and Signatures

With regard to the question of students’ perception of avatars and signatures, students’ responses could be divided into two categories: negative responses and positive responses.

Negative responses: Some students thought avatars and signatures meant nothing to them. The reasons might be due to: 1) Students did not know what an avatar or signature is. For example: Case 52 “I do not know what that is.” 2) Students did not know how to make their own avatars or signatures, so it was meaningless to them. For example: Case 38: “I did not change mine, so it means nothing to me.” In other words, if students had made their personal avatars or signatures, it would mean something to them. 3) Students just ignored it. For example: Case 17: “not necessary.”

Positive responses: Some students thought avatars or signatures made the discussion environment more interesting. Some students wrote that avatars were cute, helpful, fun, and good to look. For example: Case 45: “I thought they were cute.” Although for some reasons, some of them did not make their own. For example: Case 55: “I didn't make one, although I did seriously consider it. I think it would be even more fun if people make their signatures.” In addition, students perceived avatars and
signatures as a help in representing themselves, showing personality, or distinguishing posters. For example: Case 13: “My avatar looks a lot like me that's why I chose it.”

Open-Ended Answers for Point System and Rankings

With regard to the question of students’ perception of rankings and point system, most of the students responded positively. However, there were still some students who thought differently. A variety of responses were divided into four categories as listed below:

Negative response: some students mentioned that they did not pay attention to it, did not like them, or did not think it helps. Some might even feel scary about it. For example: Case 56: “It could be scary for people who take their work seriously. Like if they get ranked last. They may take it personally.”

Encouraging participation: several students thought it provided more fun, competition, incentives, and encouragement for their participation. For example: Case 42: “good, encourages students to participate because adds a level of competition.”

For some special cases, it might be the only reason for him or her to participate. For example: Case: 25 “the only reason I participated.”

Monitoring: many students thought points and rankings were good for them to monitor their progress, to know where they stand, so they knew if they still needed to
exert more effort on discussion. For example: Case 11 “I like it, it let you know if you are doing well or if you need a little work.”

Open-Ended Answers for Low Rating

The third open-ended question was to investigate the reasons why students rarely rated peers’ articles. The responses of the students who did not rate could be categorized into two reasons. First, they did not know they could do it. Second, they did not know how to do it.

Summary

This chapter focused on the results of each research question. For online discussion participation, the forum embedded with ID-enhancing features did promote participation and increase students’ sense of satisfaction. However, due to the limitation of the course and time, there was no evidence whether the forum embedded with ID-enhancing features could improve discussion quality. Gender did affect discussion participation. Female students participated significantly more than male students. However, gender was not a factor in discussion quality or satisfaction.

For additional findings, male students significantly liked avatars and rankings more than female students did. Students with more game experience liked avatars and signatures more than the students with little game experience did. Students with
online discussion experience liked the idea of avatars and signatures more than
students with no online discussion experience did. The findings in the open-ended
questions were consistent with the literature analysis in Chapter 2: ID-enhancing
features did represent students’ personality and provided incentives for students to
participate in discussion and monitor their progress.
Chapter 5: Discussion and Recommendations

Introduction

This chapter begins with a summary of the study, followed by a discussion of the statistical findings from Chapter 4, conclusions, and recommendations.

Summary of the Study

This study investigated the influence of ID-enhancing features on online discussion participation, discussion quality, and satisfaction. An experiment was conducted in six classes, which included 124 students, at two Midwestern universities in the spring semester of 2007. The students were assigned to either the experimental group or the comparison group. The experimental group used a forum embedded with four ID-enhancing features: avatars, signatures, point system, and rankings. The comparison group used the same online discussion forum but with no ID-enhancing features. Students in both groups were required both to post their assigned papers and post comments on each others’ papers. Three measures of data were collected and analyzed.

The first measure of data included participation points and rating points. This data was used to answer the first six research questions:
1. Does the use of ID-enhancing features in an online discussion forum enhance learner participation?

2. Does gender influence learners’ participation in an identity-enhanced online discussion forum?

3. Is there an interactive effect of gender and discussion forum design on discussion participation?

4. Does the use of ID-enhancing features in an online discussion forum improve the quality of discussion?

5. Does gender influence learners’ discussion quality in an identity-enhanced online discussion forum?

6. Is there an interactive effect of gender and discussion forum design on discussion quality?

The second measure of data was collected from a survey sent to all the participants at the end of the semester. The survey was used to investigate students’ sense of satisfaction with the online discussion forum after they had used the forums both with and without ID-enhancing features. This data was used to answer the last three research questions:
7. Does the use of ID-enhancing features in an online discussion forum improve students’ sense of satisfaction in participating in online discussion?

8. Does gender influence learners’ sense of satisfaction in an identity-enhanced online discussion forum?

9. Is there an interactive effect of gender and discussion forum design on sense of satisfaction?

As the results indicated that ID-enhancing features did promote students’ online discussion participation, a further survey was sent to students in the experimental group to investigate how four ID-enhancing features influenced their participation. The data collected from the survey was used to answer further research questions:

1. Did students have differential preference on the four ID-enhancing features?

2. Did students with different backgrounds differ in their perceptions of the ID-enhancing features?

Discussion of Findings
The discussion that follows corresponds to the research questions and analysis in Chapter 4. It covers ID-enhanced forum vs. online discussion participation, ID-enhanced forum vs. online discussion quality, and ID-enhanced forum vs. sense of satisfaction. Following are further findings on ID-enhancing features in the experimental group.

**ID-Enhanced Forum vs. Online Discussion Participation**

The first to third research questions concerned whether students in the group using the forum with ID-enhancing features will have higher participation points, which depended on the number of posts and the number of words of students’ posts. A 2 x 2 ANVOA was conducted to evaluate the effects of two different forum designs and gender on the difference of students’ participation points during spring semester of 2007. The means and standard deviations for the differences of participation points as the function of two factors are presented in Table 8. The ANOVA indicated no significant interaction between forum design and gender but a significant main effect for forum design and gender.

The group main effect indicated that students who used the forum with ID-enhancing features tended to have greater discussion participation than students who used non-ID-enhanced forum. The gender main effect indicated that female
students tended to participate more in online discussion than male students. This result is consistent with other research results in the literature, namely that females are said to be more motivated to participate in asynchronous online discussion (Im & Lee, 2003; Pickner & Mehlberg, 2001).

**ID-Enhanced Forum vs. Online Discussion Quality**

The fourth to sixth research questions concerned whether the forum with ID-enhancing features will improve online discussion quality, which depended on peer ratings. Because of the low rating rate, all three assumptions of a two-way ANOVA were violated. Therefore, two-way ANOVA was not used to analyze this data.

As shown in Table 4, only a few students had received rating points from classmates or instructors. In other words, very few students participated in rating their peers’ papers. Although interactive tutorials had been given to students at the beginning of the semester and instructors had reminded students about peer rating during the semester, there were still not many students who participated in rating. In order to investigate the reasons students did not participate in rating, an open-ended question was included in the survey. From the answers, we found that students gave two reasons for their low rating rates. First, they did not think rating was necessary.
Second, they simply did not know how to rate.

However, other reasons for the low rating rate might be due to the nature of the courses and rating itself. Regarding the nature of the course, both participating instructors assigned two papers for their classes. It was not until approximately in the middle of the semester that students started to have something to write for their papers. They submitted their papers to the instructor first and then posted them to the forums after their papers were graded. Once they started to post their papers on the forum, half of the semester had already passed. Students might not have been able to spend much time reading all the papers and rating them especially when the final was approaching. This reason may cause a low rating rate. The other reason might be due to the nature of rating. Rating did not increase the points of the rater. Although in the open-ended questions some answered that they rated because they wanted their friends to get higher points, many others answered it was not necessary to increase others’ points. Therefore, this measure of data could not accurately reflect the real discussion quality.

**ID-Enhanced Forum vs. Sense of Satisfaction**

The fifth and sixth research questions concerned students’ sense of satisfaction with using each online discussion forum. A survey of satisfaction, which had
reliability = 0.77, was given to all students at the end of the semester. Both the comparison group and the experimental group gave positive feedback indicating satisfaction. Furthermore, a 2 x 2 ANVOA was conducted to evaluate the effects of two different forum designs and gender on students’ sense of satisfaction. The results presented in Table 20 indicated that there was a main effect for forum design. There were no significant interaction effects and no gender main effect. The results showed that students who used the forum embedded with ID-enhancing features reported a greater sense of satisfaction with the online discussion.

Further Findings on ID-Enhancing Features in the Experimental Group

Since the forum designed with ID-enhancing features could promote online discussion participation and increase satisfaction, further investigation on students’ perceptions of the four ID-enhancing features was conducted. A survey was sent to students in the experimental group at the end of the semester. The findings were divided into four sections: overall perception of the four ID-enhancing features, perceptions by gender, perceptions by different gaming experiences, and perceptions by different online learning experiences.

Overall perceptions of the four ID-enhancing features

The results showed that students have significant differential preferences for
the four ID-enhancing features. Among the four ID-features, students like the idea of using a point system as well as rankings in the online discussion forum most. The rest of the order of students’ liking of ID-enhancing features was avatars, then signatures. The reason might be that the rankings and point system were so intuitive that students did not need to do anything else besides posting articles. However, avatars and signatures required some computer skills and consideration to make one.

From the responses to the open-ended questions, it was found that regardless of their previous experience with video gaming and online discussion, most of the students easily understood and appreciated the monitoring function, competitive environment, and participation-encouraging elements that the point system and rankings provided. Since the students in the experimental group reported higher satisfaction from their forum, it is possible that the point system and rankings provided the elements for students’ satisfaction.

*Perceptions of students of different genders*

In the previous section, we found that there was no significant difference in students’ sense of satisfaction by gender. However, by investigating different genders’ liking of each ID-enhancing feature, we found that male students liked avatars and rankings more than female students. Several Mann-Whitney U tests were conducted
to investigate whether female students would score lower, on the average, than males when asked if he or she like the idea of using avatars, signatures, points, and rankings in the forum. The results showed that males liked both avatars and rankings significantly more than females. By using the Chi-squared test to investigate whether there was a relationship between gender and video gaming experiences, we found the results were consistent with the ESA reports in 2005: there were significantly more male video game players than female video game players. Actually, from Table 32, we also found that all the mean ranks of male students were higher than female students. Therefore, it is possible that gaming experience and gender have a positive relationship with students’ preference of avatars and signatures.

Perceptions of students with different gaming experiences

From the section above, one possible explanation for the gender differences for liking of ID-enhancing features came from students’ video gaming experiences. Therefore, a Mann-Whitney U test was conducted to evaluate differences between students with different gaming experiences (sometimes or often vs. seldom or never) on their liking of different ID-enhancing features. The results showed that students who sometimes or often played video games significantly liked avatars and signatures more than students who seldom or never played video games. We can infer that
because avatars and signatures play such an important role in video games, the
embedding of ID-enhancing features in the discussion forum might easily invite
students to a video-game-like discussion environment, and this provided students with
motivation and satisfaction.

Perceptions of students with different online discussion experiences

Furthermore, several Mann-Whitney U tests were conducted to evaluate
differences between students with different online discussion experiences (yes and no)
on their liking of different ID-enhancing features. The results found that students who
had online discussion experiences significantly liked avatars and signatures more than
students who had no online discussion experiences. It is possible that those students
appreciated avatars and signatures because they compared these features with their
previous online discussion experiences. As we have discussed in Chapter 2, online
discussion boards in educational settings commonly use only text to identify students’
identities. Avatars and signatures provided an alternative choice for students to
present themselves on the forum more uniquely. However, students who did not have
online discussion experience had little idea about how an avatar and signature might
make a difference. Therefore, avatars and signatures stand out as the favorites for
students who had online discussion experience.
Discussion for the low rankings of avatars and signatures

Another interesting result was that only 15% and 11% of students made their own avatars or signatures, respectively. However, 26.6% of students agreed or strongly agreed with the idea of using signatures and 43.3% of students agreed or strongly agreed with the idea of using avatars. Furthermore, students who had moderate gaming experiences and online discussion experiences favored avatars and signatures significantly more than students with no such experiences. Compared with these data, we expected that the percentage of students who made their own avatars and signatures should be higher. However, in fact, not many students made their own avatars and signatures.

From the open-ended responses, we knew that some students did really seriously consider making their own ones. We inferred that because the time students had spend on the forum was only around five weeks before the final, the limitation of the time and pressure from the final did not allow students to give too much attention to it. According to Gee (2003), the more one accepts a new role, the more one will commit oneself to the new identity. Therefore, if students had time to make their own avatars or signatures that were personal to them, they may be more likely to commit themselves to their new forum identities. Thus, students’ rating for avatars and
signatures would be higher.

Limitations of the Research

According to the discussion above, some limitations of the research were found. First, the research time was not long enough for students to be familiar with all the ID-enhancing features. If the time were extended, maybe there would be more students who use avatars and signatures to enhance their virtual identities. The second limitation is that the measure for rating points was not perfect. There should be a new design to motivate peer-assessment to improve the measurement of the discussion quality. Third, the discussion pattern might also limit students’ motivation to participate in discussion. In the research, the discussion took the form of students' commenting on each other’s papers. A different type of discussion, like topic discussion, might generate different discussion participation. All these are limitations of the research.

Conclusion

The findings of the study provided information of the effects of using forums embedded with avatars, signatures, point system, and ranking for online discussion. The results found that using an ID-enhanced forum can significantly promote online
discussion participation and increase satisfaction. The results also indicated significant gender differences in discussion participation but not in satisfaction. Female students were more motivated to participate than male students.

Concerning discussion quality, the peer-rating design for evaluating discussion quality still needs to be facilitated or refined. The discussion time for students was five weeks before the final which was too short and stressful. Students were not used to rating peers’ papers either. These reasons caused the peer-rating design for controlling discussion quality not to work well.

Among the ID-enhancing features, point system and rankings, which represented dynamic identity, were most accepted and favored by the students. The avatars and signatures, which represented students’ static identities, were students’ second and third preferences. There might be three reasons for this order.

The first reason might be the skills students need to implement the ID-enhancing features. Avatars and signatures required students to have computer skills and deeper consideration to make ones that were comfortable and favored by the students. However, the point system and ranking did not require that. Students obtained points and upgraded their ranks by just posting articles.
The second reason was students’ video gaming experiences. The results showed that students who had moderate video gaming experiences favored avatars and signatures more than students who did not have such experiences. Students who sometimes or often played video games are very familiar with the avatars and signatures. Students who are familiar with these game features may feel more comfortable when using an online discussion forum with these features in their school setting.

The third reason was students’ online discussion experiences. The results showed that students who had online discussion experience favored avatars and signatures more than students who did not have such experience. Students with online discussion experience might compare the current forum with their previous experiences and find the functions of avatars and signatures can better represent their identities.

As the number of video gamers increases and online learning becomes more popular, the number of students with video gaming experience and online discussion experience is expected to increase. Furthermore, since more students nowadays are digital natives (Prensky, 2001), computer skills may be less of a problem in the future and more students will comfortably accept and create personal avatars and signatures.
to represent them in online discussion.

**Recommendations**

Three recommendations are suggested:

First, instructional designers should consider the alternative design for discussion forums in educational settings. Higher participation can provide conditions for better discussion quality (Hammond, 2005; Rovai & Barnum, 2003). Since this study found that a forum embedded with ID-enhancing features promotes participation and increases satisfaction in online discussion, it is recommended that current discussion boards in educational setting be re-designed to embed these ID-enhancing features in order to promote participation and increase satisfaction.

Second, further study is needed to investigate the time needed for students to comfortably apply avatars and signatures as their personal representation. Commenting on posted assignments was the main focus of the discussion forum in this study. Further studies are suggested to extend the study time span and study courses that require more interactive discussion.

Third, a qualititative study is suggested to investigate discussion quality. The forum and research design for this study could only control the discussion quality to an extent. However, the approach to quantify the discussion quality did not succeed.
Qualitative methodology may be a more appropriate research design to investigate whether the ID-enhancing features also help in improving discussion quality.
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Appendix A: Point Systems, Rankings, and Medals

Point systems include participation point index, rating point index, quiz point index, and a supplementary medal system. TP means total points, which is the accumulation of PP, QP, and RP. QP means quiz points, which is used to monitor the quizzes the member has taken. PP means participation points, which is used to monitor the number of posts the member has posted. RP means rating points, which is derived from the posts rated by peers and instructor. Medal system is used as a supplement to the point system that gives a reward to a member for a special contribution that the point system could not define. Below are more detailed descriptions of each subsystem.

Participation points:

This index depends on the number of new topics the student has posted; the number of replies to the student's topics, the number of replies the student has made to others' topics, the word counts in the posts, and the number of private messages posted.

The Participation points = Amount of new topic * P₁ + Amount of reply for topic author * P₂ + Amount of reply * P₃ + Amount of character * P₄ + Amount of points earned per private message * P₅.
In order to prevent spam posts, the maximum amount of posts earned for each posting could be set to $P_6$. Here $P_1$, $P_2$, $P_3$, $P_4$, $P_5$, and $P_6$ are all customizable variables.

A main principle of setting the participation point systems is: Give more weight to the items that you think are important.

*Guidelines for the PP design:*

$P_1$ (Amount of new topic): New topic means opening a discussion topic. If more weight were given on this item, students will very likely be encouraged to post more questions. Usually the opening of a topic is the key element of starting a discussion. Therefore, this item is usually weighted most in PP. by default, $P_1$ is set to be 50 points.

$P_2$ (Amount of replies for topic author): It means many posts have replied to the topic. If more weight were given on this item, topics that invite discussion are encouraged. By default, $P_2$ is set to be 5 points.

$P_3$ (Amount of reply): It means the efforts a student made to participate in discussion by replying to others’ posts. By default, $P_3$ is set to be 10 points.

$P_4$ (Amount of characters): Word count of a post sometimes reflects the effort the author put into the post. By default, $P_4$ is set to be 0.1 points.

$P_5$ (Amount of points earned per private message): Encouraging informal
interaction. Place where students post their appreciations for others’ posts or helps. By default, $P_5$ is set to be 1 point.

$P_6$ (Maximum amount of points earned for each posting): It is for spam prevention. By default, $P_6$ is set to be 10.

Thus each opening topic with word count of 200 and 5 replies might be able to earn around 70-80 points.

Forum members could also report anonymously to the Accusation category or PM (send a private message to) the moderator if they think a certain post is spam. Whether the case is considered spam or not could be decided by the moderator or by a simple poll. The moderator could manually deduct points of the accused member if the accused post is considered abusive by the moderator or by the result of the poll.

The criteria of a spam post are given below.

1. Posts less than 15 characters.

2. Copy and paste other’s post or quoting other’s post without using the “quote function.”

3. Meaningless characters like repeatedly typing “thanks. Thanks. Thanks. Thanks. …”.

4. Flaming, malicious posts, or advertisements.
**Rating points:**

RP is an index of the quality of the post. Each post could be rated by peers or instructor. If a student considers the post is good, he or she could rate the post and this will make the post author gain points. Instructor could choose to rate or not rate students’ posts. The options of points of instructor or each student could rate are customizable. The total RP is the accumulation of all the points a student earned by peers’ and instructor’s rating.

**Guidelines of RP design**

1. RP is designed to control the quality of discussion. Each post, topic post and reply post alike, are ratable.

2. The options students could choose to rate each article depend on the size of the class. By default, if an opening topic could earn 50 points in a class size of 25 students, students have options of 0, 1, 2 to rate the post. Since an opening topic might earn around 70-80 points, a good quality post might also earn equal points.

3. When students are required to post their papers for only the instructor to grade, the RP system could then be set to “Rate first post only”. The instructor’s options could be set to be different from students’ options. By
default, instructor has options of 5, 10, 15, … to 100 points.

Quiz Points:

Quiz type includes True / False Quiz, Input Answer Quiz, and Multiple Choice Quiz. Quiz points depend on the number of the quiz the member takes and the correctness of the answers. For example, each correct answer earns Q1 points.

Total Points:

The equation of total point and other point systems is:

\[ TP = PP + QP + RP \]

Total point index is the accumulated result of students’ efforts. How students participate, do quizzes, how peers rate each other’s work, and how instructor rate each of their works, will influence students’ total point indexes.

Guidelines for Total Points

Depending on the instructor’s design, PP, QP, and RP could have different weights and influences on the TP. For example, if the discussion participation is to be emphasized, the instructor might decide that student could earn 50 points for each opening thread, 20 points for each replying post, etc. Therefore, the total PP a student could earn in each opening thread is at least 50 points. However, if each student could rate at most 2 RP on each post, and if there are only 25 students in a class, then each
post can get at most 50 RP. In this design, PP influences TP more than RP does.

Therefore, PP is more emphasized.

In another words, if each student could rate at most 10 RP on each post and if there are 25 students in the class, then each post can get at most 250 RP. In this design, RP influences more than PP does. Therefore, RP is more emphasized.

Many classes have no quiz now. If that’s the case, QP is zero and will have no influence on TP. TP is totally influenced by RP and PP.

*Ranks:*

When students’ total points reach a certain amount, they will be moved to the next rank to indicate their progress in a new stage in the course. Instructors could customize the numbers of ranks and the names of the ranks according to the characteristics of the courses. For example, in the pilot study, an instructor created a list of medical related ranks for her pre-health professions students: Candy Striper level for at least 0 points, Med Student level for at least 31 points, Intern level for at least 60 points, Resident level for at least 91 points, Surgeon level for at least 120 points, and Surgeon General level for 150 points.

*Medals:*

Medals are to reward contributions that are difficult to be valuated by points.
For example: special contribution in providing learning resources, enthusiastic in helping others learning, or diligent in doing quizzes. The names of the medals and the criteria of awarding the medals are customizable. For example, an instructor creates a medals list and its awarding criteria as listed below:

Contribution Medal: Provide valuable resources for learning. This medal is awarded by instructor.

Endeavor Medal: Good achievement in homework or quizzes. This medal is awarded by instructor.

Honor Medal: Zealous in helping others solving problems. This medal is awarded by instructor.
Appendix B: Questionnaire: Sense of Satisfaction of Using Forum

Dear Students (ITEC 19525: section 003, section 007)

Many thanks for taking your time to fill out this survey. This survey is used to explore the effects of functions like avatars, signatures, points, and rankings in the academic online discussion. Please be assured that your responses will be strictly confidential. This survey will take less than 10 minutes to complete. Thank you for your cooperation.

Survey: Discussion Board Survey

1. Year of Born : ______
2. Gender: □ Male □ Female
3. I like the function provided in the forum for student’s identity presentation.
   □ Strongly agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
4. I like the function provided in the forum for students to monitor their progress.
   □ Strongly agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
5. Features in the forum encourage me to participate in discussion.
   □ Strongly agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
6. The forum is too complicated to use.
   □ Strongly agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
7. I am satisfied with the overall function provided by the forum in this course.
   □ Strongly agree □ Agree □ Neutral □ Disagree □ Strongly Disagree
8. Other comments that are not listed in the questions above, please input here :
Appendix C: Further Survey on each identity-enhancing feature:

Follow up questions for experimental group

Dear Students (ITEC 19525: section 001, section 012)

Many thanks for taking your time to fill out this survey. This survey is used to explore the effects of functions like avatars, signatures, points, and rankings in the academic online discussion. Please be assured that your responses will be strictly confidential. This survey will take less than 10 minutes to complete. Thank you for your cooperation.

Survey: Discussion Board Survey

1. Year of Born: ______
2. Gender: ☐ Male ☐ Female
3. Ethnicity: ☐ African ☐ Caucasian ☐ Hispanics ☐ Asian ☐ Native American
4. I play video games ☐ very often ☐ some times ☐ seldom ☐ never
5. I have made my own signature in the forum: ☐ Yes ☐ No
6. I have selected my own avatar in the forum: ☐ Yes ☐ No
7. I like the function provided in the forum for student’s identity presentation. ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
8. I like the function provided in the forum for students to monitor their progress. ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
9. Features in the forum encourage me to participate in discussion. ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
10. The forum is too complicated to use. ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
11. I am satisfied with the overall function provided by the forum in this course. ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
12. I like the idea of using avatar. ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
13. I like the idea of using signature. ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
14. I like the idea of using points. ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
15. I like the idea of using rankings. ☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree
16. What do you think about your avatar and signature (what does your avatar or signature means to you?)

17. What do you think about ranking and point systems?

21. Rating others' posts can help others earn points. Have you ever rated your classmates' posts? Why?

18. Other comments that are not listed in the questions above, please input here :