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Learner Interaction Patterns and Student Perceptions toward using Selected Tools in an Online Course Management System

Aruna Sai Kuna
Iowa State University

Learner interaction patterns and student perceptions toward using selected tools in an online course management system

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Aruna Sai Kuna

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Gregory S. Miller, Major Professor
Ann Thompson
Wade Miller
Robert Martin
Mack Shelley

Iowa State University

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CHAPTER 1

INTRODUCTION

The exponential growth of educational technologies has encouraged educational institutions to experiment with alternatives to the traditional classroom teaching methods (Favettoet et al., 2003). The interactive educational technologies include computer-generated simulations, videodiscs, CD-ROM, internet and the World Wide Web (Cavanaugh, 2001). Among these, web-based online learning has emerged as a preferred avenue for teaching and learning at a distance (Hurt, 2005). The rate of adoption of web technology in higher education has been increasing due to its flexible learning environment where learners can collaborate and communicate regardless of specific time and location (Kundi & Nawaz, 2010).

Allen and Seaman (2007) reported that nearly twenty percent of United States higher education students were taking at least one online course in the fall of 2006. Many higher education institutions are offering online courses via Web-based Course Tools (WebCT) to the target audience/learners. According to WebCT, "It is the most popular Web course platform in higher education today. The Web-enabled e-Learning technology reaches across the globe connecting millions of users, over 3,400 colleges and universities in over 80 countries" (WebCT, 2008). WebCT has been gaining popularity due to its various course management tools, including course content searches, discussion board, chat room, private e-mail and calendar (Marsha, Price and McFadden, 2000). These tools can facilitate a variety of interactions among students, instructors and content (Bonk, 1999).

Learner Interaction Patterns

Learner interactions play a critical role in the learning process. Ritchie and Hoffman (1997) reported that purposeful interaction increases learners' knowledge. Learning interactions are categorized into four types: Learner-Content, Learner-Instructor, Learner-Learner, and Learner-Interface (Moore, 1989; Hillman et al., 1994; Moore and Kearsley, 1996). However, the first three are most often used to evaluate learning interactions.

1. Learner-content interactions: This reveals how learners are using course material such as text, simulation, audio or video clips.

2. Learner-instructor interactions: This interaction shows how learners are approaching their instructor for subject matter queries. Moore (1989) recognized that these learner-instructor interactions are highly desirable for learners' academic success. In virtual mode, learner-instructor interactions can be in the form of e-mail or discussion board.

3. Learner-learner interactions: According to Dewey (1996), learning can be considered as a social and interpretive activity in which learners collaboratively construct explanations and understandings of materials and phenomena within their environment. In distance mode, learner-learner interactions can be in the form of e-mail, chat or discussion board.

Online course management system is designed in such a way that some course tools can support more than one type of interaction (Miller, 2008). The following table reveals online course tools and their contribution to different types of learning interactions.

Table 1

Online Course Features and Their Contribution to Different Types of Learning Interactions

Online Course Features	*Interaction Type*
Course Content page	LC
Announcements	LC
Syllabus	LC
Assessments	LC
Calendar	LC
Chat page	LL, LI
Discussions	LL, LI, LC
Mail Page	LL, LI
Web Links	LC

Note: LC = Learner-Content; LI = Learner-Instructor; LL = Learner-Learner

A study conducted with psychology students revealed that students who visited content pages more frequently showed greater academic performance than students who visited less frequently (Heffiner & Stanley, 2005). Likewise, Garrison (1990) found that students who had interacted regularly with their instructors showed higher academic performance than students who interacted less. Garrison also explained that learners' interaction with their peers is another important factor to determine their academic performance in online learning and found that learner-learner interactions positively correlated with students' academic performance.

Miller (2008) found an association between learner interaction patterns and their academic performance. He explained that students who interacted more frequently with content, other learners and with the instructors attained greater academic performance in a single online course than students who interacted less frequently. He further explained that checking e-mail messages, reading discussion posts, visiting content pages and monitoring the course calendar were strongly associated with student performance. However, another study found that there was no significant relationship between students' learning interaction patterns and their academic performance (Shih & Gamon, 2002).

Use of online course management systems in education is a newly developing area. Only a few studies have addressed the association of learner interaction patterns and academic performance, and the results from these studies are inconclusive. Further extensive and in-depth research is needed to understand the relationship between student interaction patterns and academic performance. Therefore, one research question addressed by this study was "Are students' interaction patterns associated with academic performance in online graduate level courses?"

Learner Perceptions toward Using Online Course Tools

Studying the use of online course tools from the students' perspective is crucial for educators and instructional designers to tailor their courses more effectively and to increase students' course satisfaction (Morss, 1999). Research by Mende (1999) and Morss (1999) revealed that students engaged in online learning at the post-secondary level have positive learning experiences. They further reported that flexible interactions and ease of use were the advantages of online learning. Lai (2004) examined the responses of 140 students enrolled in

either partially online or entirely online courses to understand the effectiveness of online course interface design, and found the navigation of the courses was easy and students were pleased with the online course design. Morss's (1999) study on students' perceptions of online course management systems reported that the online environment helped students to concentrate and learn the subject faster.

Online learning provides secured Web-enabled learning communication tools to facilitate interaction between faculty and students (Morss, 1999). LaMaster and Morley's (1999) research on the use of Bulletin Board for collaboration among pre-service teachers, mentor physical educators, and university professors revealed that collaboration via online was both meaningful and enjoyable. Bodomoo and Hu (2008) reported that the discussion board was the most important tool embedded in the online course platform that can be exploited for achieving interactivity and it gives students an opportunity to engage in a reflective dialogue. LeRouge, Blanton, and Kittner (2002) found e-mail and discussion boards can facilitate student collaborative projects and enhance student learning outcomes. Lesta (2003) studied students' perceptions on online course tools and he reported that the calendar function was the most frequently used tool in the online courseware package, followed by bulletin board/discussion board, chat room and assignment.

Alexander (1995) and Parson (1998) found that implementing a Web-technology or any new technology requires an evaluation study by educators. At Iowa State University, the use of online learning has become common place to support both on- and off-campus credit and non-credit activities (Schmidt, 2004). Studying the use of online course tools from the students' perceptive is crucial for understanding how students learn with the new technology.

By collecting students' opinions on online course tools, educators can tailor their course more effectively. However, there are few studies available to elucidate learner perceptions regarding online course management tools. Karl & James (2006) reported that online learning educators need more understanding of how students perceive and react to online course tools to enhance learning. Therefore, one research question addressed by this study was "Which online course management tools were perceived by students to be most useful in learning?"

Purpose and Objectives

The purpose of this study was to identify the association between students' interaction patterns and their academic performance in online graduate courses delivered by the Department of Agricultural Education and Studies at Iowa State University. In addition, the study sought to determine which online course tools were perceived by students to be most useful in learning. This study was guided by the following objectives.

1. Identify students' demographic characteristics, including age, gender, academic classification, job/employment status, undergraduate grade point average and academic major.
2. Determine student interaction patterns in five online graduate courses.
3. Predict students' academic performance in online graduate courses using student interaction patterns and demographic characteristics.
4. Identify online course management tools perceived by students to be most useful in learning.

Significance of the Study

Research on exploring the association between students' interaction patterns and their academic performance may provide recommendations for students, educators and instructional designers for better designing and implementing online courses. However, few studies are available in this area and the results from these studies are inconclusive. The dearth of studies reflects the need for additional research. Outcomes of the present study could yield a significant contribution in this research area and may provide information for future researchers who want to understand the association between learner interaction patterns and learning outcomes. Furthermore, this study may be useful for future researchers who want to replicate the study across a greater number and variety of courses. Studying learner perceptions regarding the use of online course tools is crucial for educators to design their course more effectively.

Limitations/Delimitations

1. This study was restricted to graduate students who were enrolled in five online courses in the Department of Agricultural Education and Studies at Iowa State University.

2. The study did not measure all possible interactions and it is possible that students may use their textbook or communicate with their peers and instructor outside of online course.

3. Focus group interviews were conducted with student volunteers.

Definition of Terms

Traditional classroom: The traditional classroom is defined as face-to-face instruction occurring in a typical classroom, given and presided over by one instructor in the traditional lecture method.

Distance learning: In distance learning the teacher and students are physically separated, and technology (i.e., radio, television, video, satellite and internet) is used to bridge the instructional gap (Sengel, 2005).

Online learning: Online learning is associated with content readily accessible on a computer. The content may be on the Web or the Internet, or simply installed on a CD-ROM or the computer hard disk (Tsai & Machado, 2002).

Web-based learning: Web-based learning is associated with learning materials delivered via a Web browser (Tsai & Machado, 2002).

Learner interaction patterns: Learner interaction patterns indicate how often students access different functions in an online course and how long students used the courseware.

Academic performance: Student achievement refers to the final grade (A, B, C, or D) received by a student participant and given by the instructor for the registered course.

Online course management systems: Provide a platform for instructors to access a set of tools that allows relatively easy creation of online course content and subsequently teaching and management of the course, including various interactions with students taking the course.

CHAPTER 2

REVIEW OF LITERATURE

The review of literature explores the evolution of educational approaches from traditional classroom to web-based learning. This chapter also reviews students' interaction patterns and their perceptions regarding online course tools. This chapter is divided into three sections: (1) evolution of Web-based learning, (2) learner perceptions about online course tools, and (3) learner interaction patterns and demographics to predict students' academic performance.

Evolution of Web-Based Learning

Growing global demand for higher education (Brandenburg, et al., 2008) has been encouraging the academic community to explore and adopt new educational approaches. The introduction of distance learning in higher education has opened an avenue to connect faculty and students from different geographical regions and time zones. The advent of the Internet has provided an opportunity to offer distance education online, which has many advantages over traditional classroom instruction (Draves, 2002). The application of internet and other contemporary technologies in education have changed the educational process, especially in higher education, from traditional classroom to Web-based learning (Wellburn, 1996). The National Center for Education Statistics reported that approximately 89 percent of public 4-year institutions, 53 percent of private not-for-profit institutions, and 70 percent of private for-profit 4-year institutions were offering distance education programs in 2006-2007 (NCES, 2008).

1. Traditional classroom

The traditional classroom is defined as the "normative" teaching style in which students are in a classroom environment and listen to a teacher, with face-to-face interactions (Ramage, 2002). The academic world assumes that traditional education is the ideal mode of educational delivery and serves as the gold standard against which all forms of alternative education are evaluated (Diaz, 2000). However, Garrison (2000) reported that the traditional lecture mode of delivery has medium levels of student-teacher interaction, low levels of student-student interaction and medium to low levels of student-content interaction. Moreover, the traditional classroom approach fails to satisfy the educational demands of students who have job and family commitments.

2. Distance Learning

Distance learning differs, by definition, from traditional classroom teaching in that teacher and students are physically separated and technology (i.e., radio, television, video, satellite and internet) is used to bridge the instructional gap (Sengel, 2005). The United States Distance Learning Association (USDLA) defined distance learning as "the acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies and other forms of learning at a distance" (Hoyle, 2008). The language and terms used to describe distance learning activities can still be confusing, and there are geographical differences in usage. Among the more commonly used terms related to distance learning are: correspondence education, home study, independent study, external studies, continuing education, distance teaching, self-instruction, adult education, technology-based or -mediated education, learner-centered education, open learning, open access, flexible

learning and distributed learning. Even though distance learning takes many forms, it has proven to be an effective method of education delivery to meet the growing needs of students (Welcott, 2003) who have job or family responsibilities and desire to continue their studies.

Moore and Kearsley (2005) reported that distance education has had a historical transformation in terms of the modes of communication and delivery. The introduction of correspondence classes in higher education was the beginning of distance education (Verduin & Clark, 1991). Teachers sent the course materials through postal services to their students, allowing students to study at their home or work. The students completed their homework and independent study assigned by the instructor and sent them back within a given timeframe for grading (Mood, 1995). The idea of a correspondent college offering degrees and diplomas was first conceptualized by the Chautauqua Correspondence College in the United States in 1881 (Moore, 1989). This idea attracted the attention of students who desired to continue their studies alongside of their job and family responsibilities. In 1910, the number of correspondence schools reached 200 (Garrison, 1989). These schools inspired similar initiatives around the world (Moore & Kearsley, 1996).

The introduction of technology in distance education opened up opportunities to use radio, television, and video cassette for delivering distance courses to students. The radio was used as a medium for delivering audio-courses when the Salt Lake City University obtained the first radio education license, and the first suggestions regarding the methods of teaching by radio were developed after 1921 in Romania (Pasc & Popentiu, 2007). In the late 1950's and early 1960's, television production technology was used as a medium for distance education, in which master teachers conducted widely broad cast classes (Cambre, 1991).

McKune (1997) reported that students started attending college level TV courses.TV courses allowed students to learn at their own pace and provided both audio and visual information. The video cassettes became useful offline course materials for both instructors and students (Porter, 1997). Although radio and television became popular, distance education researchers identified disadvantages and limitations, such as limited student and instructor interaction and limited coverage area from the transmission tower (Brey, 1991). For instance, Culnan and Markus (1987) reported that television technology could not facilitate face-to-face interaction and Gutenko (1991) argued that television was unable to accurately convey the mood of a traditional class setting. Gunawardena (1994) discussed drawbacks resulting when the audio-video technology is not used efficiently. One such drawback is students' discomfort with the technology.

Distance education researchers in later years invented several theories and concepts. Some researchers explained the concepts of existing systems in their studies of the United Kingdom's Open University, Vancouver's Open Learning Agency, Norway's NKS and NKI Distance Education organizations, Florida's Nova University, the University of South Africa distance learning program, the Televised Japanese Language Program at North Carolina State University, the US. Federal government's Star Schools Program and India's IGNOU distance learning programs. Some researchers made an attempt to look at design considerations of distance learning programs, including interactivity (Porter, 1994), active learning (Savery & Duffy, 1995), visual imagery (Ravitch, 1987), and effective communication (Horton, 1994).Others discussed the challenges of methods and strategies of distance learning programs, such as implementation strategies (Sherry & Morse, 1995), media-based

challenges (Sherry & Morse, 1995), partnerships and teamwork (Apple Computers Organization, 1992) operational issues (Talab & Newhouse, 1993; Schlosser & Anderson, 1994); and technology adoption and management and policy issues (Holloway & Ohler, 1991).

3. Online Distance Learning

By definition, "Online learning is associated with content readily accessible on a computer. The content may be on the Web or the Internet, or simply installed on a CD-ROM or the computer hard disk" (Tsai & Machado, 2002). The concept behind online distance education is to provide flexible and optimal learning for students anytime, anywhere, and by any path (Persin, 2002). The advent of Internet technologies and a variety of modalities such as audio-conferencing, video-conferencing, and computer assisted interaction made distance education available online. Draves (2000) reported that the Internet brought dramatic changes in the educational paradigm by replacing the traditional classroom and allowing students to learn anytime and anywhere from different people all over the world. Lynch (2002) discussed the advantages of the computer-based Internet learning environments, which include: (1) online learning environments can be formed to save travel expenses and time for both students and instructors, (2) the course content can be made available to students at all locations without time constraints, (3) instructors can enhance the students' learning environments by designing and developing course materials for different learning styles, (4) both instructors and students can get more time for interactions through electronic email, the discussion board, or the other tools, and (5) effective lifelong learning environments can be constructed. In 2004 Lynch found that online distance learning environments can provide

better assistance to online students with the help of effective networks, knowledgeable instructors, good staff support, and excellent learning materials compared to the traditional classroom environment. Teleconferencing and desktop videoconferencing distance education techniques can provide face-to-face interactions and give a feel of the traditional classroom for both instructors and students (Porter, 1997). As a comparison with traditional education, online distance education was found to be effective provided the technology is appropriate to the task and curriculum (Clark, 1991). However, Beard and Harper (2004) reported that some students learn best from direct interaction with their instructors, and distance education often prohibits this interaction. Neuman and Shachar (2003) examined 86 studies (representing more than 15,000 students), comparing traditional and online classes between the years of 1990-2002; they reported that one-third of the studies came to negative conclusions about online courses (that is, traditional instruction out-performed online classes), while two-thirds of the studies came to positive conclusions about online classes.

4. Web-Based Learning

By definition, "Web-based learning is associated with learning materials delivered in a Web browser, including when the materials are packaged on CD-ROM or other media" Tsai & Machado (2002).Web-based learning overcomes barriers of physical distance and time. It lowers institutional or organizational costs, increases student enrollment, offers flexibility by allowing access to course information at any time or place, promotes individualized learning, and reaches students who are unable to attend class because of time or distance constraints. For instance, Valentine (2002) reported that delivering education to students that are unable to attend classes because of distance increases the institution's

enrollment numbers without increasing the overhead. With these advantages, Web-based learning is quickly changing the face of higher education (Truluck, 2007). Moreover, teaching and learning tools in the form of Web-based learning have altered the higher education paradigm and have encouraged the academic community to adopt the World Wide Web as one of the preferred delivery methods for learning activities.

The application of Web technology in higher education has influenced learning behavior by providing an effective learning environment that encourages more active participation, offering opportunities for responsive feedback and individual involvement, and promoting teamwork through collaborative learning (Gilliver, Randall, & Pok, 1998). Edelson (1998) found that the participation in Web-based higher education courses in 1996 was estimated to be 1 million students and projected to be 3 million by 2000. According to Allen & Seaman (2007) almost 3.5 million students (20 percent) were taking one or more online courses in the fall of 2006 in the United States. Taylor (2002) found that universities, continuing education institutions and commercial organizations were turning to Web-based education for valid reasons. In 2000, Berge, et al., stated "For maximum effectiveness, training and learning opportunities must go to the students and arrive just-in-time. Demographics no longer allow instructors to insist on "my place at my pace" totally online Web-based courses offer benefits for learners & trainers/ instructors alike" (p.35).

Cavanaugh (2005) conducted a study to compare the time spent on teaching an online course and teaching a course in a face-to-face traditional class with the same instructor. Cavanaugh found that the amount of time spent teaching online was over twice the amount of time spent teaching in-class. He further stated that the amount of time spent on teaching a

Web-based course is directly proportional to the number of students enrolled for the course. The major difference in additional time spent in a Web-based course is due to communication with the students. Barr and Tagg (1995) stated "Whenever Web technology is used in educational settings, it is vital to reflect on how this affects students, faculty members, courses and institutions".

Although there are many advantages of Web-based learning, the researchers found many challenges need to be addressed. The geographical difference between the instructor and learner can affect the learner's achievement and retention (Moore, 1993) and Greenberg (1998) found that the successes of Web-based practices are mostly dependent on the instructor's capability and creativity. Palloff and Pratt (2000) stated that the instructors need to be well trained in using the technology and organizing and delivering the material. Carr (2005) reported that course completion rates were higher in traditional face-to-face courses than in online course settings. Nash (2005) found that the students who dropped their courses were more likely to have the assumptions that online courses would be less difficult than face-to-face courses. According to Cook (2007), the online course class size should always be proportional to the server capacity and bandwidth, otherwise even minor problems can be a serious impediment, decreasing satisfaction and course participation and increasing cognitive load, which in turn impedes learning.

Considering these advantages and limitations, universities need to consider certain critical factors to achieve success in implementing Web-based courses. Schrum and Hong (2002) suggested seven dimensions related to student success in web-based learning: (1) access to tools, (2) technology experience, (3) learning preferences, (4) study habits and

skills, (5) student goals, (6) lifestyle factors, and (7) personal traits and characteristics. A study on access to tools (Irons, et al., 2002) reported that students in urban settings were more likely to express satisfaction with their learning experience because they have better access to technology (e.g., faster internet technology) compared to students in non-urban settings. Studies show that computer experience or skills have little impact on learning performance, although they might affect the level of satisfaction (Sturgill et al., 1999; Swan et al., 2000; Fredericksen et al., 2000). Research results on the other dimensions reported mixed and inconsistent results (Blum, 1999; Swan et al., 2000; Kearsley, 2000; Fredericksen et al., 2000; Karuppan, 2001).

Learner Perceptions about Online Course Tools

Online course management system is a platform-independent system with a variety of tools and features, including course content searches, discussion board, chat room, private e-mail, conferencing system, student homepages, student management, student progress tracking, access control, navigation tools, auto-marked quizzes, course calendar, and grade maintenance and distribution (Marsh, Price & McFadden, 2000). Online course tools are categorized into four types: (1) educational tools that facilitate learning, communication and collaboration, (2) content building utilities for organizing course material, (3) administrative utilities for managing courses, and (4) design utilities for constructing courses (WebCT, 2009). These tools facilitate a variety of interactions among students, instructors, and content (Bonk, 1999*).* These tools integrated with in online course systems to support collaborative learning, knowledge building, and multiple representations of ideas and knowledge structure (LaMaster, 1999; Morss, 1999).

Online course management system provides many effective course designing tools for developing online courses (Goldberg, 1997). Robertson and Klotz (2001) reported that several online course features can help online educators to develop effective online courses in higher education. Lai (2004) examined the responses of 140 students enrolled in courses either partially online or entirely online to understand the effectiveness of online course interface design, and found the navigation of the courses was easy and students were pleased with online courseware design. Moore's (1999) study on students' reactions to online courses reported that the online environment helped students to concentrate and learn a subject faster. Kendall's (2001) study on using online course systems for a community information module found correlations between students' levels of class participation and earned grades.

Online learning provides secured Web-enabled learning communication tools to facilitate interaction between faculty and students (Morss, 1999). LaMaster and Morley's (1999) research on the use of online Bulletin Board for collaboration among pre-service teachers, mentor physical educators, and university professors revealed that online learning is both meaningful and enjoyable. LeRouge, Blanton, and Kittner (2002) found e-mail and discussion board can facilitate collaborative student projects and enhance student learning outcomes. Lesta (2003) reported that the Calendar function was the most frequently used tool in online courseware package, followed by Bulletin board, Chat room and Assignment.

The survey on student perspectives conducted by Mende (1999) and Morss (1999) revealed that the student had positive learning experiences with online learning at the post-secondary and undergraduate levels and that flexible interactions and ease of use were the advantages of online learning. However, Alexander (1995) and Parson (1998) found that

implementing a Web-technology or any new technology requires an evaluation study by educators to understand how students learn with new technology.

Interaction Patterns and Demographics to Predict Student Academic Performance

Interaction is one of the central issues in distance education (Jackson, 1994). According to Harasim (1990), interaction is an important component in any learning experience because it encourages reflection and discussion. Since learning is a social activity that requires interaction with the instructor, among students and with the course content, many researchers and distance education workers agreed that interaction is the critical factor that facilitates learning in distance education (Lynch, 2002; Freed, 2004). Interaction makes online learning effective.

Distance educators have classified interactions in distance learning in many different ways. Although there are many classifications available, the classification suggested by Moore (1989) has been widely recognized. According to Moore, there are three types of interaction: (1) interaction between learner and learner, (2) interaction between learner and instructor, and (3) interaction between learner and content. Later, Hillman et al., (1994) recognized that the Interaction between learner and interface also plays an important role in the distance learning environment. In 1996, Moore and Kearsley reported that the learning interaction can be categorized into four types: Learner-Content, Learner-Instructor, Learner-Learner, and Learner-Interface; however, the first three are most often used to evaluate learning interactions.

1. Learner–Content

Interaction contributes to enhanced communication, improved teaching, and an increased level of student interest in content. Here the content is specific to course material and/or non-course material, such as the learner searching the Web for information relevant to their learning task or interacting with a virtual lecture. This sort of interaction forms the basis of all educational process (Moore, 1989). Design and development of course content in different technical forms and use of multimedia enhances the interactivity and effectiveness of interaction. For instance, Mayer (2001) and Faraday and Sutcliffe (1997) found combining more than one technical format and presentation medium can enhance learning in comparison with using one alone.

2. Learner–Instructor

According to Miller, King and Doerfert (1996), students desire personal contact and interaction with their instructor and peers, along with a superior quality of content and technology support. Moore (1989) considered this type of interaction to be highly desirable. It can take several forms, including one-to-one, many-to-one, or one-to-many. Garrison (1990) found some learners who interacted regularly with their instructors were more motivated and had a better learning experience. A study conducted by Rodriguez (1995) revealed that students and professors recognized the importance of interaction in distance learning (Rodriguez, 1995).

4. Learner-Learner

Learner-learner interaction happens in several ways within the course environment. Interaction with peers helps the learner to understand the course content (Dewey, 1996). These interactions can take place via email, discussion boards, videoconferencing, audio conferencing, or chatting. Garrison (1990) reported that learners who interact on a regular basis with other learners were more motivated and participated actively in their learning. According to Freed (2004), interaction between instructors and learners, and learners and learners has remained as the biggest barrier in the online distance learning environment. It is crucial for online distance learning educators to design and develop a learning environment to promote learner-instructor, learner-content, and learner-learner interactions (Anderson and Garrison, 1997; Garrison and Cleveland-Innes, 2005). Olson and Wisher (2002) observed the difficulties of many students, who lack high-speed computers and Internet connections, to respond promptly during interaction. Ko and Rossen (2001) noted that if the class size is too small, engaging students in interaction is more difficult.

Learner Interaction Patterns to Predict Student Academic Performance

Web technology in recent years has been used for learner interaction (Nielsen NetRatings, 2002; McGraw-Hill, 2002) to enhance the learning process. Many researchers studied learner interactions in several ways, including learners' access to learning resources (Jung & Leeme, 1999) and flexibility and the learning process (Naidu, 1997). However, there is still much research required (Hase & Ellis, 2001) to understand the role of learner interaction patterns in predicting student academic performance.

The term "learning patterns" has been used in the Web-based learning environment to describe how often students access different functions, and how long students use the courseware (Shih et al., 1998). June, Choi and Leem (2002) found that learner interaction pattern is one of the factors that influences learning effectiveness. Henley (2003) conducted a study on dental students, in which he provided supplemental quizzes on an online course website for students' access. He found that students' use of quizzes was high (90%) in the beginning of the semester. As the semester progressed, students' accesses to the quizzes were recorded less (50% during the final week). At the end of the semester he found that students who accessed the quizzes more often earned higher grades than students who accessed the quizzes less often. Stith (2000) conducted a study on students enrolled in a Web-based developmental biology course, and reported equivocal findings between website usage and course performance. Although total page hits did not correlate with final grade, the number of articles students read on the website bulletin board showed a consistent positive relationship with grades earned in the course. Similarly, Goolkasian, et al., (2003) did not find any systematic relationship between final course grade and time spent viewing the course website. However, Wang and Newlin (2000) examined interactions of psychology students who enrolled in a psychology research methods course taught entirely on the Web. They found that final course grades were predicted by the number of times a students' accessed the homepage, as well as personality variables (i.e. cognition and internal locus control).

Demographics to Predict Student Academic Performance

In addition to student interaction patterns, there are other important demographic variables that have been previously shown to influence learner academic performance. These factors include gender, age, and previous academic performance (as determined by GPA).

Gender-based differences in education have been recognized as an important focus for research (Yukselturk & Bulut, 2009), but there are conflicting views about the nature and impact of these differences. The American Association of Universities noted that ‘girls are under-represented and are lower performers in math, science and technology subjects (Gunn et al., 2003, p. 15). However, Alstete and Beutell (2004) argued that women generally outperform men in online classes. Similarly, Price (2006) found that online female students are confident independent learners who are academically engaged and outperformed their male counterparts online.

Age is another predictor of student achievement in online courses. Hoskins and Hooff (2005) reported that older students performing better than younger students. Similarly, a study by Alstete and Beutell (2004) also found student age to be a significant variable, with older students more likely to use discussion boards and tending to achieve better grades in online courses.

Previous academic performance has often been used as a potential predictor of future academic success, and grade point average (GPA) continues to be the single best predictor of student academic success in both face-to-face and online courses (Osborn, 2001). Sulaiman and Mohezar (2006) reported undergraduate GPA was the most significant predictor of

eventual graduate success in a Masters of Business Administration (MBA) program, while gender, age, ethnicity, and work experience had no effect on graduate-level success. Brookshire and Palocsay (2005) studied factors that impact performance of students in an undergraduate management science course and found that previous academic performance (GPA) had the strongest correlation with performance.

CHAPTER 3

METHODS AND PROCEDURES

Research Design

This study utilized both quantitative and qualitative research methods. For objectives one, two and three, quantitative research methods were employed. For objective four, focus group interviews were conducted based on guidelines established by Krueger (1988).

Subjects or Data Source

The population (N= 76) for the quantitative study consisted of graduate students who were enrolled in online courses in the Department of Agricultural Education and Studies (AGEDS) during Fall 2009 and Spring 2010. The Department of Agricultural Education and Studies(AGEDS) offers six online graduate courses each year, including AGEDS 510, AGEDS 520, AGEDS 524, AGEDS 533, AGEDS 550, and AGEDS 593E. All the 6 courses were taught by six different instructors who use different instructional approaches. It is possible to enroll a student in more than one graduate online course offered by the department. However, the study considered each of the learning situations as unique due to the variety of constructs and instructor approaches. Therefore, each enrollment in each course was treated as a separate case. The same student may appear as more than one case. The frame was collected from the course instructors.

The population (N=32) for the qualitative study consisted of online graduate students who were enrolled in AGEDS 510 and AGEDS 533. Six students were enrolled in both the AGEDS 510 and AGEDS 533. The total population considered for the qualitative study was

32 (N=32). AGEDS 510 and AGEDS 533 were offered during Spring 2010. These two courses were selected purposively because of the instructor's support for conducting interviews and students' experience in using online course tools. Participants were recruited via email. All students who agreed to participate voluntarily in focus group interviews were included as final participants (N =12). Four focus groups were conducted and each group consisted of three participants.

Instrumentation

Quantitative procedures

Learning management systems collect data on the extent to which students interact with content, other learners and the instructor. These interactions can be extracted by using the "student tracking" tool. The tracking tool records and stores the number of times a student visits content pages, discussion boards to post or read messages, web-links, chat page, mail page, calendar and grade pages. Online tracking is assumed to be a reliable tool for consistently and accurately recording students' interaction patterns based on the number of hits on specific areas/pages of the course website.

Students' demographic information, including age, gender, academic classification, job/ employment status, undergraduate grade point average (GPA) and academic major, were obtained from the Director of Graduate Education in the Department of Agricultural Education and Studies. Out of 76 students, twelve students demographic information were not available in the records. So, total 64 students' demographic information was collected. Course grades were collected from the course instructor's records.

Qualitative procedures

Four focus group sessions were held and three students participated in each interview. Each interview lasted from 30 to 50 minutes. Six main questions were designed and used to elicit responses from participants in identifying which online course tools were most useful in contributing to learning in online courses. The content validity of the questions was established by a panel of experts who had both knowledge of and experience with online courses. These experts included two professors from the Department of Agricultural Education and Studies and one professor from the Department of Curriculum and Instructional Technology at Iowa State University. The researcher prepared a questionnaire and sent it to the selected faculty for validation. A document was attached along with the questionnaire. In the document the panel was asked to review the questionnaire and indicate whether the questions should be retained as is or modified. The panel members were also asked to write any suggestions directly on the questionnaire and to indicate whether the questionnaire was content and face valid. Comments made by the panel of experts were used to revise the draft questionnaire and submitted again for their review. All panel members concluded that the final questionnaire was content and face valid. A pilot test was conducted with three students of distance courses who were not included in this study. The purpose of the pilot test was to check the appropriateness and practicability of the data collection methods. Students in the pilot test revealed that the tool was convenient and simple to access for interviews. Based on the results of the pilot test, the researcher selected a simulcast telephone conference interview as the communication medium for conducting the focus group interviews.

Data Collection

Upon receiving Institutional Review Board approval, the researcher contacted all online graduate course instructors in the Department of Agricultural Education and Studies, explained the purpose of the research and asked permission to access their students' interaction data and grades. The researcher also contacted the Director of Graduate Education in the Department of AGEDS and asked him to provide demographic information on graduate students enrolled in online courses during Fall 2009 and Spring 2010. The researcher assured all course instructors and the Director of Graduate Education in the Department of Agricultural Education and Studies (AGEDS) that this research has minimal risk and the information collected from courses would be kept confidential.

The procedure for gathering the interaction data in an online course and transferring that data into Excel was explained and demonstrated for each instructor. The researcher assisted instructors in collecting and assembling the data file. Instructors were asked to provide grades of students in an Excel sheet along with the interaction data. After entering the data into the Excel sheet, student names were replaced by code numbers; the same code number was used to collect student demographics from the Director of Graduate Education in AGEDS. Students who were enrolled in more than one online course were assigned the same code number. The code numbers were used to link demographic data with students' interactions and grades. The list of code numbers and student names were only available to the researcher, the instructor, and the Director of Graduate Education in AGEDS. The names of the participants were not identified against the data, and students identifiers/names were

discarded after creating the data file in Excel. The analysis and subsequent reports did not include information linking specific data to a particular student.

For conducting focus group interviews, the researcher used the Wimba tool in an online course. The researcher contacted the instructors of AGEDS 510 and AGEDS 533, explained the purpose of the research and asked their permission to conduct focus group interviews in their course. The course instructors sent an introduction letter to all students to explain the purpose of the research and to encourage them to participate. Next, the researcher contacted (via e-mail) all students who were enrolled in AGEDS 510 and AGEDS 533 courses. The e-mail explained the purpose and procedures for conducting the focus group interviews and asked students to participate. The participants were assured that this research has minimal risk and the data collected would be kept confidential. A doodle link was attached to the e-mail to determine participants' available dates and times. One week after the initial e-mail, the researcher sent a first reminder to non-respondents explaining that their response is important for this study. After ten days, a second reminder was sent to non-respondents. Ten days later, a final reminder was sent to participants who had not responded to the previous e-mails. The first two reminders were e-mail follow-ups and the final reminder was a personal phone contact. Students who were willing to participate in a focus group were sent an e-mail informing them of the date and time for attending the interview. The researcher also provided a simulcast phone number and pin number for students to participate in the interview. Along with this e-mail a consent document was attached. Participants were asked to read carefully and sent the signed consent document back to the

researcher via e-mail. One day before the scheduled session, an e-mail follow-up reminder was sent to the participants.

Focus group interviews began with a review of online course tools by the researcher. The researcher used guiding questions to provide a structure for the interview process. Where appropriate, other emergent questions were used to probe students for additional information. The focus groups were facilitated by the researcher and were audio recorded. Throughout the interview process students were identified by their first names. Later in the transcription process their names were replaced by codes. The list of code numbers and student names were only available to the researcher.

Data Analysis

The quantitative and qualitative components of the data were analyzed separately. The SPSS/PC 16 for Windows software program was used to analyze the quantitative data. Descriptive statistics such as frequencies, percentages, means, standard deviations and Eta co-efficient were used to summarize the data. Step-wise regression analysis was conducted to identify interaction patterns that could predict students' academic performance in online courses. Before step-wise regression was conducted, intercorrelations were computed among all dependent and independent variables.

The qualitative data were analyzed through content analysis. The audio taped interviews were transcribed verbatim by the researcher. Transcripts were used for subsequent data analysis. Rabiee (2004) explained that data analysis of focus group interview data involves a number of stages, including examining, categorizing, and tabulating or

recombining the evidence. In the examination stage, the researcher reviews the data by listening to the tapes and reading the transcribed scripts. The thematic framework was developed based on careful examination of the data. The framework was developed by writing memos in the margin of the text in the form of short phrases, ideas and concepts arising from the data. At this stage, descriptive statements were formed based on the data. In the next stage, the researcher managed the data through indexing and charting into a tabular form. This is an important step in reducing the data and integrating it in a meaningful way.

CHAPTER 4

FINDINGS

This chapter presents results from this study in two sections. Section one includes quantitative data on student demographics and students' interaction patterns in five online graduate courses. In addition, this section explains predictive factors of students' academic performance using student interaction patterns and demographic characteristics. Section Two presents qualitative results on online course management tools that were perceived by students to be most useful in learning. To report the findings, the terms "students", "respondents" and "participants" are used interchangeably.

SECTION I: QUANTITATIVE DATA

Demographic Characteristics

This section describes demographic characteristics of students who participated in this study. The participants consisted of 76 students from five web-based courses. The demographic characteristics included in this study were: gender, age, academic classification, job/employment status, undergraduate grade point average and academic major.

Table 2 shows that 54.7% (*n*=35) of the students were female and 45.3% (*n*=29) were male. Ninety-eight percent (*n*=63) of the students were pursuing a master's degree and only one (1.6%) student was pursuing a Ph.D. degree.

Thirty-five percent (n=23) of participants were fulltime Graduate Students, followed by Agriculture Teachers 29.6% (*n*=19), Research Assistants/Associates 7.8% (*n* = 5), Inventory Lead 3.1% (*n*=2), Office Managers 3.1% (*n*=2), County Extension Directors 3.1%

(*n*=2), Animal Care Inspectors 3.1% (*n*=2), Customer Care Coordinator 1.6% (n=1), Sales Representative 1.6% (n=1), Outreach & Research Coordinator1.6% (n=1), Pig CHAMP Tech Support 1.6% (n=1), Program Advisor at Iowa State University 1.6% (n=1), Agriculture Careers Employee 1.6% (n=1), State 4-H Youth Specialist 1.6% (n=1), and Associate Professor 1.6% (n=1).

Of the respondents, 42.2% (*n* = 27) had an undergraduate major in Agricultural Education, followed by Animal Science 20.3% (*n*=13), Agricultural Business 10.9% (*n* =7), Horticulture 7.8% (n = 5), Natural Resources 3.1% (*n*=2), Elementary Education 3.1% (*n*=2), Physical Education 3.1% (*n*=2), Public Service and Administration 3.1% (*n*=2), Journalism 1.6% (n=1), Fisheries and Wildlife Sciences 1.6% (n=1), Distributed Studies 1.6% (n=1), and Dairy Science 1.6% (n=1).

Table 3 shows that the mean age for the participants involved in this study was 31.23 years (*SD* = 8.97), ranging from minimum age of 22 years to a maximum of 54 years. The mean undergraduate GPA for the participants was 3.11 (*SD* = .35). The highest undergraduate GPA was 3.79 and the lowest was 2.22.

Table 2

Frequencies and Percentages for Selected Demographic Variables (n=64)

Variables	*F*	*%*
Gender		
Female	35	54.7
Male	29	45.3
Academic Classification		
MS/MAG	63	98.4
Ph.D.	1	1.6
Employment Title		
Student (Graduate)	23	35.8
Agriculture Teachers	19	29.6
Research Assistant/Associate	5	7.8
Inventory Lead	2	3.1
Office Manager	2	3.1
County Extension Director	2	3.1
Animal Care Inspector	2	3.1
Customer Care Coordinator	1	1.6
Sales Representative	1	1.6
Outreach & Research Coordinator	1	1.6
Pig CHAMP Tech Support	1	1.6
Program Advisor, Iowa State University	1	1.6
Agriculture Careers Employee	1	1.6
State 4-H youth Specialist	1	1.6
Associate Professor (Community College)	1	1.6
Others (Work for ADM)	1	1.6
Undergraduate Major		
Agricultural Education	27	42.2
Animal Science	13	20.3

Table 1 (Continued)

Variables	*f*	*%*
Agricultural Business	7	0.9
Horticulture	5	7.8
Natural Resources	2	3.1
Elementary Education	2	3.1
Physical Education	2	3.1
Public Service & Administration	2	3.1
Journalism	1	1.6
Fisheries & Wildlife Sciences	1	1.6
Distributed Studies	1	1.6
Dairy Science	1	1.6

Table 3

Means and Standard Deviations for Age and Undergraduate Grade Point Average

Variables	*N*	*Mean*	*SD*	*Minimum*	*Maximum*
Age	64	31.23	8.97	22	54
Undergraduate GPA	64	3.11	.35	2.22	3.79

Student Interaction Patterns

This section reports the student interaction data recorded by online course management system. The interactions included in this study were: number of threaded discussions read, number of content folders viewed, number of files viewed, total online sessions, total time logged-on in minutes, number of calendar views, number of Web-links viewed, number of mail messages read, number of discussions posted, total time logged into

assessment, number of assignments read,]number of mail messages posted, total time spent with the assignment tool, number of assessments begun, number of assessments ended, number of chats entered and number of assignment submissions. Means, standard deviations, and minimum and maximum scores were used to summarize student interactions.

Table 4 shows that the most frequent learner interactions were number of threaded discussions read (M=2349.77, SD = 4287.92), followed by number of content folders viewed (M = 236.70, SD = 112.47) and number of files viewed (M = 120.54, SD = 115.04). The mean for threaded discussion read was very high (n=2349.77); this may have resulted from students opening all threaded discussions using the compile messages function whenever they visited the discussion section. It is also evident from the results that students tended to read messages (mail messages read, M =29.36, SD = 28.82; discussions read, M =2349.77, SD =4287.92) more than post messages (mail messages posted, M = 7.71, SD = 6.79; discussion posted, M = 27.97, SD = 17.72). The least frequent interactions included assignment submissions (M = 3.22, SD = 3.00), chats entered (M = 4.29, SD = 7.96) assessments begun (M = 5.74, SD = 5.58), assessments ended (M = 5.21, SD = 5.52) and mail messages posted (M = 7.71, SD = 6.79). There was a small difference observed between the number of assessments begun and the number of assessments ended; the reason might be that some assessments were started but not submitted due to technical errors/internet connectivity problems. Online course systems do not count these assessments as completed.

Table 4

Students' interactions recorded in five online graduate courses (n=76)

Variables	*Mean*	*SD*	*Minimum*	*Maximum*
Threaded Discussion Read[1]	2349.77	4287.92	20.00	22613.00
Content Folders Viewed	236.70	112.47	37.00	547.00
Files Viewed	120.54	115.04	3.00	454.00
Total Sessions	120.54	61.83	23.00	274.00
Total Time	48.58	29.48	12.14	163.18
Calendar Views	37.67	53.82	1.00	344.00
Web-Links Viewed	35.04	45.44	.00	201.00
Mail Messages Read	29.36	28.82	.00	154.00
Discussions Posted	27.97	17.72	9.00	91.00
Assessment Time	25.76	35.86	.00	169.37
Assignments Read	13.39	16.97	.00	106.00
Mail Messages Posted	7.71	6.79	.00	31.00
Assignment Time	6.96	15.32	.00	99.33
Assessments Begun[2]	5.74	5.58	.00	15.00
Assessments Ended[2]	5.21	5.52	.00	15.00
Chats Entered	4.29	7.96	.00	53.00
Assignment Submissions	3.22	3.00	.00	7.00

Note. 1. Average mean of discussions read is high, and 2. A slight mean difference between assessments begun and ended was observed.

[1]The mean for threaded discussion read was very high (n=2349.77); this may have resulted from students opening all threaded discussions using the compile messages function whenever they visited the discussion section.

[2]A small mean difference was observed between the number of assessments begun and the number of assessments ended; the reason might be that some assessments were started but not submitted due to technical errors/internet connectivity problems.

Table 5 summarizes the association between students' academic grades in a course and number of students' interactions recorded by online course management systems. Students' interactions were categorized based on the three types of interaction that were identified by Moore (1989). Students who earned a grade of A or A^- or B^+, B or B^- interacted more frequently than students with grades<B^- in several areas, including discussions read, content folders viewed, total sessions, mail messages read, discussions posted, assessment time, assessments began and assessments ended. Participants in each grade category had equal amounts of interaction in the areas of total time logged on in minutes and number of mail messages posted. Students who earned a grade of < B^- interacted more in the areas of number of files viewed, number of Web-links viewed, number of assignments read, total time spent with assignment tool and number of chats entered.

The Eta coefficient was used to determine the association between students' grades in a course and their interactions within the online course management system. Eta coefficient has the ability to measure the relationship when one of the measures is nominal and the other is interval. This statistic is interpreted similar to the Pearson correlations. Davis' (1971) conventions were used to describe magnitude of the relationships: .01 to .09 = negligible association, 0.10 to 0.29 = low association, 0.30 to 0.49 = moderate association, 0.50 to 0.69 = substantial association, 0.70 or higher = very high association. There was not a significant association found between grades in a course and the interaction variables except assignments read, and total time spent with assignment tool. Assignments read (η=.34*), and total time spent with assignment tool (η=.32*) had a moderate association with grade in course. For significant results, Tukey's HSD Post-hoc test was conducted to determine how the groups A or A^-, B^+, B or B^- and < B^-differ from each other. Students who earned a grade

of <B^- read significantly more assignments and spent significantly more time with the assignment tool than did students who earned a grade of A or A^- or students who earned a grade of B^+, B, or B^-.

Table 5

Association between Students' Academic Grade in Course and Learner Interactions Recorded by Online Course Management Systems

Variables	*Interaction*	*A or A⁻ (n=52) M (SD)*	*B⁺, B or B⁻ (n=20) M (SD)*	*< B⁻ (n=4) M(SD)*	η
Threaded Discussion Read[1]	LC,LI,LL	2371(4778)	2554(3254)	1056(1417)	.07
Content Folders Viewed	LC	251(121)	206(86)	201(84)	.19
Files Viewed	LC	106(109)	153(117)	154(176)	.19
Total Sessions	LC,LI,LL	124(66)	120(47)	74(42)	.18
Total Time (Hours)	LC,LI,LL	49(32)	48(24)	48(19)	.00
Calendar Views	LC	30(47)	57(69)	38(34)	.22
Web-Links Viewed	LC	42(49)	16(27)	46(51)	.25
Mail Messages Read	LI,LL	33(32)	24(20)	16(18)	.18
Discussions Posted	LC,LI,LL	30(19)	25(14)	18(9)	.19
Assessment Time (Hours)	LC	30(40)	19(25)	7(14)	.17
Assignments Read	LC	14(13)	8(13)	35(48)	.34*
Mail Messages Posted	LI,LL	8(7)	8(6)	8(11)	.03
Assignment Time (Hours)	LC	7(12)	3(10)	27(49)	.32*
Assessments Began	LC	6(6)	6(5)	2(5)	.15
Assessments Ended	LC	6(6)	5(5)	1(2)	.18
Chats Entered	LI,LL	4(6)	4(12)	6(10)	.03
Assignment Submissions	LC	4(3)	2(3)	4(3)	.021

Note. LC = Learner-Content; LI= Learner-Instructor; LL = Learner-Learner. *$P < .05$

[1]The mean for threaded discussions read very high (n=2349.77); this may have resulted from students opening all threaded discussions using the compile messages function whenever they visited the discussion section.

Table 6 *Intercorrelations among Dependent and Independent Variables*

	Age	UGP	ToS	SeT	MiR	MiS	DiR	DiP	ClV	CtE	AsB	AsE	AsT	AgR	AgS	AgT	WV	CaV	FiV	GPA
Age	1.00																			
UGP	-.32*	1.00																		
ToS	-.08	.31*	1.00																	
SeT	-.12	.24*	.60*	1.00																
MiR	.15	.01	.08	-.18	1.00															
MiS	.16	-.19	.18	.02	.54*	1.00														
DiR	-.06	.11	.32*	-.04	.18	-.04	1.00													
DiP	.16	-.00	.00	-.09	.36*	-.14	.04	1.00												
ClV	.19	-.13	.26	.06	-.00	.27*	.05	-.14	1.00											
CtE	.00	-.03	.08	.07	.09	-.03	-.05	.24*	-.08	1.00										
AsB	.19	.05	-.06	-.38*	**.77***	.28*	.24*	.51*	.00	-.00	1.00									
AsE	.16	.03	-.12	-.37*	**.79***	.20	.24*	.55*	-.08	.04	**.97***	1.00								
AsT	.14	.04	.07	-.23*	**.79***	.35*	.27*	.29	-.07	-.06	.75*	.75*	1.00							
AgR	-.03	-.12	-.00	.27*	-.31*	-.24*	-.20	-.14	-.16	.46*	-.54*	-.47*	-.32*	1.00						
AgS	-.08	-.05	-.04	.29*	-.44*	-.44*	-.24*	-.09	-.27	.22*	-.70*	-.60*	-.46*	.70*	1.00					
AgT	-.09	-.06	-.02	.19	-.22*	-.17	-.11	-.13	-.08	.40*	-.40*	-.32*	-.25*	**.82***	.42*	1.00				
WV	-.07	.04	.14	.45*	-.45*	-.47*	-.11	.08	-.16	.40*	-.60*	-.54*	-.42*	.69*	**.78***	.43*	1.00			
CoV	-.06	.11	.63*	.60*	.18	.34*	-.06	-.09	-.12	.09	-.19	-.21*	.03	.30*	.30*	.16	.23*	1.00		
FlV	-.12	.19	.38*	.27*	-.41*	.10	.16	.27*	.23*	-.13	-.27*	-.40*	-.25*	-.18	.29*	-.07	.03	.05	1.00	
GPA	-.06	.27*	.18	.05	.16	-.02	.05	.23*	-.13	-.03	.14	.17	.15	-.06	.14	.12	-.12	.21*	-.16	1.00

Note: UGP=Undergraduate Grade Point Average, ToS=Number of Total Sessions, SeT=Total time logged on in hours, MiR=Number of Mail Messages Read, MiS=Number of Mail Messages Sent, DiR=Number of Discussions Read, Dip=Number of Discussions Posted, ClV=Number of Calendar Views, CtE=Number of Chats Entered, AsB=Number of Assessments Begun, AsE=Number of Assessments Ended, AsT=Assessment Time, AgR=Number ofs Read, AgS=Number of Assignments Submitted, AgT=Total Time Spent with the Assignment Tool, WV= Number of Web-links Viewed, CoV=Number of Content folders viewed, FlV=Number of Files Viewed, GPA=Grade in Course. *Significant Correlation ($p < .05$)

Predicting Students' Academic Performance using Interaction Patterns and Demographics

The intercorrelations matrix provides pair-wise correlations between variables. All nominal variables (gender, academic classification, employment title, and undergraduate major) were excluded from calculating intercorrelations. The intercorrelations (Table 6) show that collinearity was present between the variables of number of assessment began and number of assessment ended (r =.97); number of assignments read and time logged into assessment (r = .82). Multicollinearity is a problem if the correlation coefficient of two variables is very high (0.80) or perfect (Davis, 1971). When two variables are highly correlated, they are basically measuring the same phenomena. Dropping one of the two variables can reduce the effect of multicollinearity. However, none of these variables were used in stepwise regression analysis because of their negligible association with grade in course (GPA). Grade in course (GPA) was significantly correlated with undergraduate grade point average (UGP), r = 0.27; number of discussions posted (r = 21), number of content folders viewed (r = 0.21). Therefore, these variables were included in the stepwise regression analysis.

Forward stepwise regression was conducted to determine the extent to which independent variables were able to predict students' academic performance. The stepwise analysis automatically selects independent variables to include in the regression model based on the variable's individual contribution to the variability in the dependent variable (Cohen et al., 2003).

Table 7 shows that undergraduate grade point average made a significant contribution to the variability in a student's course grade. Undergraduate grade point average uniquely accounted for 7.3% (R^2 = .073) of the variability. No other independent variables explained a significant proportion of the variability in grade in course beyond that already explained by undergraduate grade point average.

There are probably other predictors that could explain the unpredicted variance in the model. In my opinion, self-regulatory behavior and individual learning styles might explain the unpredicted variance. Online learning is a self-paced learning environment, where students need to self-motivate and self-monitor their learning in order to achieve academic success. Similarly, each student has different learning style preferences and behaves differently in the way they perceive, interact, and respond to the learning environment.

Table 7

Stepwise Regression of Student Course Grade (GPA) on Selected Independent Variables (n=64)

Variable	R^2	*Adjusted* R^2	R^2 *Change*	*P*
Undergraduate grade point average	. 073	.058	. 073	.031

Note: **p*<.05. Regression included independent variables of undergraduate grade point average (r=0.27; number of discussions posted (r =21), number of content folders viewed (r = 0.21)

A scatter plot was created to show the association between a student's course grade and undergraduate grade point average scores. The X-axis represents undergraduate grade

point average scores and the Y-axis represents student's grade in course. The scatter plot reveals that there is a positive association between student's grade in course and their undergraduate grade point average scores.

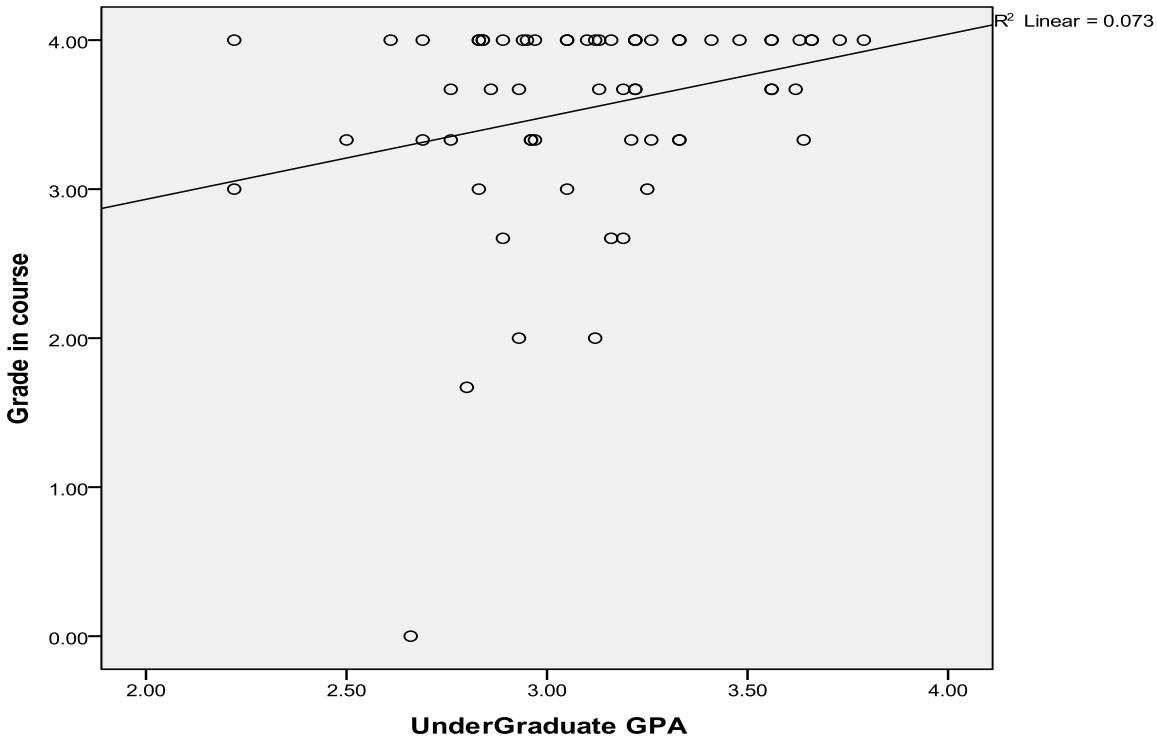

Figure1: Association between student's grade in course (GPA) and undergraduate grade point average.

SECTION II: QUALITATIVE DATA

This section provides descriptive data on online course tools that were perceived by students to be most useful for learning. Focus group interviews with students in online courses were the only source of data for this section. For this section, content analysis was conducted and the results of the qualitative data were presented in narrative, numerical and table form. This section begins with a description of the participants, followed by the answers

to the six focus group interview questions, often in the words of student participants themselves. Each statement is referenced back to the student who made the statement by a code number. Student codes include S1 through S12.

Description of Participants

The participants in this qualitative study consisted of 12 students from two online courses (AGEDS 510 and AGEDS 533). Of the students who participated in the focus group interviews, 58.3% (*n* =7) were female and 41.7% (*n* =5) were male. Fifty percent (n=6) of the participants were fulltime graduate students followed by Agriculture Teachers 33.3% (*n*=4), Program Advisor at Iowa State University 8.3% (n=1), and Extension Directors 8.3% (*n*=1).

Of the participants, 50.0% (n=6) had an undergraduate major in Animal Science followed by Agricultural Education 33.3% (n=4), Horticulture 8.3% (n=1), and Agricultural Business 8.3% (n=1). The mean age for the participants involved in the focus group interviews was 30.83 years (*SD* = 9.03), ranging from minimum age of 23 years to a maximum of 52 years. The mean undergraduate grade point average for the participants involved in the focus groups was 3.11 (*SD* = .38), ranging from minimum undergraduate GPA of 2.69 to a maximum of 3.78.

All the participants in the study were distance students in a graduate level program and had experience using online course tools. In the online course from which they were selected to participate, 58.3% (n=7) of participants had earned a grade of A, 8.3% (n=1) had earned a grade of A^-, 25.1% (n=3) had earned a grade of B^+, and 8.3% (n=1) had earned a grade of B in their present graduate course.

The participants were asked six interview questions:

a. Which online course tools are most useful for learning? Why?
b. Which online course tools are least useful for learning? Why?
c. Which online course tools do you use most often? Why?
d. Which online course tools do you use least often? Why?
e. Which online course tools are missing in your course? Why would these tools be important for learning?
f. What additional suggestions do you have for improving the functions of online course management systems?

Focus Group Interview Question. 1

Which online course tools are most useful for learning? Why?

The first question asked in each of the focus groups was "Which online course tools are most useful for learning?" Participants typically identified the discussion tool as the most useful learning tool, followed by content files and the grade tool.

Discussion tool

Almost all the participants (S1,S2,S3,S4,S5,S6,S7,S9,S10,S11,S12) agreed that discussion is the most useful tool for learning. One of the participants (S5) said, "I think the discussion tool helped me a lot to know or getting to know other people's perceptions and ideas and what other people are thinking in the class". Participants believed that discussions helped students to interact more in online courses: "I think discussion is the place where we can share information, in terms of tools, probably one of the top tools for me" (S2); "I like to

read discussion posts from my class, especially in a distance class, it's kind of getting to know your class, what they are thinking, and I can catch up from my peers" (S11). Though students agreed discussion is the most useful tool for learning, they suspect that discussions posted in that section are not always authentic: "Probably discussion is the most useful tool for my learning. Because I learn better working with people, but I don't think discussions on online course are always authentic. I feel here you are just answering what the professor is asking from you, you are not necessarily addressing things that you have questions about or you really thought interesting. Soon you post what you need and you can cross off your list instead of actually contributing or learning from the whole group" (S1); "Basically what we did in the spring class was just answering the questions the professor had for us, maybe we could expand the discussions with more learner-generated questions and get the professor involved by posing questions in the discussion" (S3). In addition, students (S8, S11) would like to see some content posted in relation to the specific discussion topic: "I guess I always like the instructor to post different PowerPoint presentations, videos and directions in the content area" (S8).

Other Responses

Other common responses to the first question were content files and grades**.** Of the students, five participants (S2, S6, S7, S9, S12) said that content files are useful for learning:"I would say the most useful learning tool probably comes to content, just to get information, lectures, PowerPoint presentation" (S5). Another participant said "I think content and quiz are pretty good tools for learning" (S7); "The assignment tool is probably

useful for me, if nothing else has been much of the content distributed to us" (S2). This reveals that students are considering content folders for learning.

Of the students, three participants (S1, S11, S12) explained that checking grades is useful for learning: "Checking grades are helpful for me, because all of your scores are displayed, you are kind of learning where you stand in the class" (S11); "My grades tool is useful for me, because this is the place where you want to know where you are at, where you stand" (S1).

Focus Group Interview Question # 2

Which online course tools are least useful for learning? Why?

Participants mentioned various tools when asked "Which online course tools are least useful for learning?" The most commonly reported tool was the mail function. Other least-used tools reported were roster and my notes.

Mail function

Most of the participants (S1,S2,S4,S5,S6,S8,S9,S11,S12) explained that the mail function is the least useful tool for learning: "Mail function is a hassle to use. In my view we can exchange emails through other mails. I check frequently my other emails; it is more convenient for me." (S1). Participants (S2, S4, S11) considered the mail function to be more like an organizational tool than a learning tool: "I think I simply prefer to have mail correspondence through other regular email" (S4); "I just don't use mail function, I prefer to use regular email, if we don't use it I don't think we get the full potential of the tool" (S8);

"It kind of varies with the instructor, how they want to be contacted, for me mail box is kind of an account to manage with that" (S12). One participant said "I don't think or really notice that it is there, not all of my instructors of online course use it and it would be nice that every instructor use tools consistently" (S6). This information reveals that students feel the mail function is not very useful for learning.

Other Responses

Some of the participants felt that the roster and my notes tools were the least useful tools for learning. Of the students, 6 students (S3, S4,S5,S7,S10,S12) explained that they prefer to access the roster in the beginning of the semester to see who is their class: "I don't know roster kind of useful for learning. I thought kind of interesting, I mean this is the way you go for and get some information about other folks in the class, not probably useful for learning" (S2). On the other hand, students really don't bother to see who is there in the class: "Roster probably tells you who is in the class. To me, being a distant learning student, it doesn't really matter to me" (S9).

Only two participants (S5, S11) revealed that my notes is the least useful learning tool: "I think I never used it and I don't know its purpose for learning" (S5); "I don't use my notes and Web-links much unless if the instructor put something in there and students need to look at them" (S11).

Focus Group Interview Question # 3

Which online course tools do you use most often? Why?

In the third question, each of the focus groups participants was asked "Which online course tools do you use most often?" Most of the participants revealed that discussion is the most frequently used tool in online learning. The other most often used tools reported were the content folder and calendar.

Discussion

The majority of students (S1,S2,S3,S4,S5,S7,S8,S10,S11,S12) responded by talking about discussion as the most often used tool in online courses: "When I log in to an online course, I always check the discussion first because it has the most action. That is where something new gets posted" (S1). Participants felt that use of online tools often depends on how the instructor designs a particular course: "I guess an online course system is a reflection of how the professor is using it. If all my assignments were posted in assignment page I will use it most. If all my assignments were posted in discussion then I will use discussion the most" (S1). Another student said "I used discussion the most because every week we are required to read and post other people's posts" (S7). Students said the course that they took was designed based on discussion section. All the assignments were posted in discussion section and it counts as the maximum percentage of their grade: "I guess I used discussion the most because we have discussion assignment and that was a big chunk of our grade" (S1). Overall, students felt that use of online course tools depends on how the professor decided to design and organize content of the course.

Other Responses

Other common responses (S6,S12) to the question were the content folder and calendar: “I would say content folder is the most often used tool, just to get lectures, class information and PowerPoint presentations” (S6). One student said “I use calendar to map out what I have to do in the class and also to check how the class is organized and know what’s coming up” (S12).

Focus Group Interview Question # 4

Which online course tools do you use least often? Why?

Participants were asked “Which online course tools do you use least often?” Most of the participants found it difficult to determine which online course tools are used least often. Students said that they did not remember some of the online course tools and they don’t know how to use those tools. After a short review of online course tools, participants identified chat is the least often used tool, followed by roster and mail function.

Chat Function

The chat function is the least often used tool for many students. Participants (S1, S2, S3, S7,S10,S11,S12) said “I never used chat function in online courses” (S10). Students would like to see chat used more in online courses. Students suggested that instructors should design the course in such a way that it encourages students to use the chat function: “I would really love to see chat used more. Actually chat discussion initiates more informal discussions which help us to get first-hand information. I personally feel that chat had more

potential kind of fit for students" (S1). Students were excited to see Wimba and chat involved as communication tools for group projects: "I think using chat is a little bit advanced, I mean to link up with Wimba or use Wimba tool for group gatherings would be more useful for students to communicate and to work on group projects" (S3).

Other Responses

Other common responses for the least used online course tools were roster and mail function. Of the participants, four (S3,S7,S8,S10) expressed that they checked the roster at the beginning of the class to know which of their peers was in the class: "I don't tend to use roster except at the beginning of the class, just to have background of the class room. That's all about I use them for, I never used them after that" (S3). Mail function is another tool student's use least often. Students prefer to use their regular email for communication, which is more convenient and accessible for them: "Checking different kinds of emails is kind of difficult for me" (S7).

Focus Group Interview Question # 5

Which online course tools are missing in your course? Why would these tools be important for learning?

The fifth question each of the focus group participants were asked was "Which online course tools are missing in your course? Why would these tools be important for learning?" Participants expressed that their previous course instructors had used/managed almost all the tools efficiently: "I think our instructor used pretty much all the tools, even chat and roster, also I think he used every tool efficiently" (S5). Another participant said "I think our

instructor used every tool very well, it seems like it's not missing anything" (S9). However, some students felt that they wanted to see chat function used more in online courses: "I think using chat a little bit would be useful for students. For example, in our project group we had more experienced teachers. We are interested to learn interesting things from them. If we schedule a light chat, especially with some of these experienced teachers, I think we would gain a lot. So it might be something to look at in future" (S3).

Focus Group Interview Question # 6

What additional suggestions do you have for improving the functions of online courses?

Participants in the focus group were asked for additional suggestions to improve the functions of online courses. Of the students, seven participants said that they don't have any suggestions. The other participants (S1, S3, S4, S9, S10, S12) suggested three recommendations:

- One of the recommendations was content download. Students (S1, S3, S4, S10) expressed that they want the lectures to be in a downloadable format for Ipods/MP3 players: "It would be nice if we would download the lectures and be able to listen to them when we are on the go. I don't know if that kind of feature is available in online courses or not. But that would be beneficial, especially for students. Since it is a distance learning class, we could download in Ipod or even MP3 players when we are out of computer" (S1). On the other hand, students liked the idea but were comfortable with present online course features: "I like the idea, but honestly it is

not for me, because I don't use that technology. But I am sure a lot of people will like to use it for convenience" (S4).

- Another recommendation suggested by one of the participants was to have safe assign in online courses to check possible plagiarism in the content: "I like to see safe assign in online courses, I mean able to check the possible plagiarism in the content. I have taken a few web courses in another program, they have it" (S9).
- The final recommendation suggested by another participant was that instructors should properly integrate offsite Web-links within online courses. When students click the link in online courses it should redirect the browser to log in to those sites without any problem: "The most recent class I had in which we have to use offsite links, I don't know whether it is my computer or in the online course, the links didn't work necessarily. Every time I have to log in to an offsite website which is completely separate. So, it would be nice to have a direct link within online courses" (S12).

Table 8 *Summary of students' perceptions towards using selected tools in an online course management system*

S.No	***Interview Questions***	***Student's Perceptions***
a.	Most useful online course tools for learning	Discussions → Sharing information and get different perceptions Content Files → Used to access lectures, Power Point presentations Grades → To check grades to see where students stand in a class
b.	Least useful online course tools for learning	Mail function → Mail only delivers information not useful for learning Roster → Used beginning of the course to see who is there in the class My notes → Never used for learning
c.	Most often used online course tools	Discussions → Assignments were placed in discussion; it's a big piece of their grade. Content files → To access lectures, other content, and power point slides Calendar → To check how the class is organized &know what's coming-up
d.	Least often used online course tools	Chat function → Chat used more, because it initiates informal discussions which helps to get first-hand information Roster → Checks only beginning of the semester to see who is in class Mail function → Prefer to use regular email
e.	Missing tools in online course management systems	None of the tools → Course instructors used all online course tools efficiently Chat function → Chat tool needs to use more to learn information from peers
f.	Additional Suggestions to improve online course management functions	Content download in → It helps students to listen and use content while they are on go Ipods/MP3 players etc. Have safe assign → To check the possible plagiarism in the content Integrate offsite links → Have direct access to use other web-links with in online course

CHAPTER 5

DISCUSSION, CONCLUSIONS & RECOMMENDATIONS

The purpose of this study was to determine the association between students' interaction patterns and their academic performance in online graduate courses delivered by the Department of Agricultural Education and Studies at Iowa State University. The study was guided by the following objectives:

1. Identify students' demographic characteristics, including age, gender, academic classification, job/employment status, undergraduate grade point average and academic major.
2. Determine students' interaction patterns in five online graduate courses.
3. Predict students' academic performance in online courses using students' interaction patterns and demographic characteristics.
4. Identify online course tools perceived by students to be most useful in learning.

Objective 1: Students' Demographic Characteristics

The demographic characteristics included in this study were gender, age, academic classification, job/employment status, undergraduate grade point average and academic major. Of the 76 students from five online courses, 54.7% (*n*=35) of the students were female and 45.3% (*n*=29) were male. Ninety-eight percent (*n* = 63) of the students were pursuing a master's degree; only one (1.6%) student was pursuing a Ph.D. degree. Thirty-five percent (n = 23) of the students were full-time graduate students. Agriculture teachers made up the second largest group 29.6% (*n*=19), followed by Research Assistant/Associate 7.8% (*n* = 5),

Invent Lead 3.1% (*n* =2), Office Manager 3.1% (*n*=2), County Extension Director 3.1% (*n*=2), Animal Care Inspector 3.1% (*n*=2), Customer Care Coordinator 1.6% (n=1), Sales Representative 1.6% (n=1), Outreach and Research Coordinator1.6% (n=1), Pig CHAMP Tech Support 1.6% (n=1), Program Advisor at Iowa State University 1.6% (n=1), Ag Career Employee 1.6% (n=1), State 4-H Youth Specialist 1.6% (n=1), and Associate Professor 1.6% (n=1). Of the respondents, 42.2% (*n* = 27) had an undergraduate major in Agricultural Education, followed by Animal Science 20.3% (*n*=13), Agricultural Business 10.9% (*n* =7), Horticulture 7.8% (n = 5), Natural Resources 3.1% (*n*=2), Elementary Education 3.1% (*n*=2), Physical Education 3.1% (*n*=2), Public Service and Administration 3.1% (*n*=2), Journalism 1.6% (n=1), Fisheries & Wildlife Sciences 1.6% (n=1), Distributed Studies 1.6% (n=1), and Dairy Science 1.6% (n=1).

The mean age of the participants involved in this study was 31.23 years (*SD* = 8.97), ranging from a minimum age of 22 years to a maximum of 54 years. The mean undergraduate GPA for the participants was 3.11 (*SD* = .35). The highest undergraduate GPA reported by respondents was 3.79 and the lowest was 2.22.

Objective 2: Student Interaction Patterns in Five Online Graduate Courses

The study revealed that students' most frequent type of online course interaction was reading threaded discussions. The reason could be that the discussion board provides a communicative forum where students could work collaboratively and share thoughts and ideas (Burgess, 2007). This finding was consistent with Phillips' (2006) study on "Tools used in learning management systems: analysis of online course usage logs", he noted that students most frequently interacted in online courses by reading discussion posts.

This study also revealed that students spend much more time on reading messages than posting messages. Students might be interested to see what their peers are thinking. Moreover posting a discussion requires students to spend a significant amount of time to think and compile the message. This finding is consistent with Johnson (2005), he noted that students spend much more time on reading discussions than posting discussions.

Assignment submissions were the least frequently occurring interaction within online courses. This is true even though almost every course has an assignment section. The reason could be that some course instructors gave flexibility to students in submitting their assignments through other means of communication. Zhang and Bhattacharya (2008) confirmed that in online courses, with the increase in the number of channels of communication, students prefer to submit their assignments through other options. Phillips (2006) reported that out of 156 courses only 38 courses used the assignment submissions activity in online courses due to issues related to electronic marking.

One interesting finding was a slight difference between the number of assessments begun and ended. The reason could be that some students might have started assessments and were not able to submit them due to technical errors/internet connectivity problems. It is also possible that some students might be taking their first online course and may need time to adjust to the new technology. Kamel (2009) revealed that 47% of students experienced technical problems while accessing online courses. David (2003) reported that half of the students (51.6%) experienced technical difficulties with online courses during the first two weeks of the semester.

Objective 3: Predicting Student Academic Performance in Online Courses Using Student Interaction Patterns and Demographic Characteristics

The association between student academic grade in a course and number of student interactions recorded by online course management systems revealed that students who earned grades equal to or greater than B-interacted more frequently than students with grades<B- in the areas of discussions read, content folder viewed and total sessions. Heffiner and Cohen (2005) obtained similar findings; students who interacted more frequently with Web-based course materials consistently obtained higher course grades. Likewise, Coldwell et al., (2008) found that students with greater participation in the online learning environment (OLE) achieved higher grades than those who participated to a lesser extent. In contrast, Golkasian et al., (2005) found that course usage and student performance were not related. In general, it is assumed that when students are on online course, they are spending a lot of time on learning. However, it is possible that students may open online course and refer to outside resources like text books or printed materials.

Study found that assignments read, and total time spent with assignment tool had a moderate association with grade in course. This appears that learner-content interaction had an influence on student's grade in course. The results have consistent with Heffiner and Stanley, (2005), he reported that learner-content interactions have an influence on students' academic grades. None of the other variables had a significant association with grade in a course. The reason for getting non significant association with most of the interaction variables could be that very low sample size in $<B^-$ group. It is interesting to study in future

that still low number of students will fall under the category of <B- and how they interact with online course tools.

Stepwise regression analysis was employed to determine the extent to which independent variables were able to predict student academic performance. Student undergraduate GPA explained a significant proportion (7.3%) of the variability in student academic grade in a course. However, 92.7% of the variability was not explained. The results agree with Beaudoin (2003), who found that performance does not easily correlate with participation, although he found that students who participated more frequently achieved higher results.

Objective 4: Online Course Tools Perceived by Students to be Most Useful in Learning

The focus group interviews of selected participants revealed that discussion and content file tools were most useful and most frequently used online course tools for learning. An online course management system has nearly 20 different tools that are designed to create effective and efficient learning experience for students. One consistently mentioned essential factor for student learning is the engagement between students and the material to be mastered in discussions (Johnstone, 2002). Similarly, Burgess (2007) stated that the discussion tool provides a communicative forum where students could work collaboratively and share thoughts and ideas. By using the discussion board tool, students benefit in many ways: 1) "think time" before responding, 2) the opportunity to respond thoughtfully without interruptions, 3) opportunities to read other classmates' responses and think about them before responding, and 4) opportunities to converse with fellow classmates without limits (Lindsey, 2000, p. 4). Online systems make courses more student-centered by opening a

forum for discussion between students where they can share their opinions and ideas with the class (Kamel, 2009). The content files were the next most frequently used tool by online students. Phillips (2006) reported that content files are the second most highly used online course tool, as instructors post their course content in the content folder in the form of Word and PDF formats.

According to the focus group participants, the e-mail was the least useful learning tool followed by roster. Participants felt that the e-mail function was more like an organizational tool than a learning tool. Students prefer to have e-mail correspondence through regular e-mail. Coopman (2009) reported that e-mail was seldom used by students, as instructors rarely send regular instructions and assignments through these tools. Participants said that the roster is least useful and lest often used learning tool. Most of the students used roster in the beginning of the course to see which of their peers are in the class.

Participants said that the least often used tool was chat. Students would like to see chat used more in online courses. One student said "Chat discussion initiates more informal discussions, which help to get first-hand information". Yohen, et al., (2004) reported that the online course publishing tools (such as content page and syllabus) are the most used tools, while interactive tools (such as chat and email) were seldom used.

Students were asked which online course tools were missing in their course, and most of the students felt that their instructors used every tool efficiently. One student said "I think our instructor used pretty much all tools"; however, some students preferred to see chat to be used more in online courses.

When participants were asked to provide additional suggestions to improve online course functions, half of the participants (n =6) said that they don't have any suggestions. Another half of the participants (n =6) students provided three recommendations:

- One of the recommendations was content download. Students would like lectures to be in a downloadable format for IPods/MP3 players. One participant said "It would be nice if we would download the lecture and be able to listen to them when we are on the go." The study by Racthamand Zhang (2006), "Podcasting in academia: a new knowledge management paradigm within the academic setting", reported that podcasting provides a new approach in file distribution and content management of IT artifacts such as Wiki and WebCT. Instructors can post pod-casted lectures and assignments on their course Web pages, and students can store this information into their portables devices such as Ipods/Mp3 players.
- Another recommendation was including the safe assign feature in online courses to check possible plagiarism in the content: "I like to see safe assign in online courses, I mean, to check the possible plagiarism in the content. Scherbinin and Butakov (2009) reported that educational organizations have to subscribe to the plagiarism services and directly plug-in to the course management systems like WebCT, Moodle and ANGEL.
- The final recommendation was that instructors should properly integrate off-site Web-links within online courses. When students click the link in online courses, it should redirect them directly to the site without any problem. Instructors might sometimes want to provide a link to an article within online courses or Library

reserves, a web page, a Power Point presentation, and a hyperlinked Microsoft Word document. Providing a persistent working link is important, which helps students not to end up with frustrating, Library Home (2007).

Conclusions

The following conclusions are based on the findings of the study:

1. Students who participated in the study were mainly pursuing a master's degree in Agricultural Education and their employment was in an agriculture-related field.
2. The most frequent student interaction within the online course management system was reading discussion posts.
3. The least frequent student interaction within the online course management system was assignment submissions.
4. Students who interacted more frequently within the online course management system had higher grades in their online course than students who interacted less frequently.
5. The single best predictor of student academic performance in online graduate courses in Agricultural Education was undergraduate grade point average.
6. Online learners believed that discussion and content file tools were the most useful tools for learning.
7. Online learners believed that e-mail and the roster were the least useful online course tools for learning.
8. Online learners are interested in having content downloadable to devices such as IPods and MP3 players.

Recommendations

Recommendations for Practice:

The following recommendations were drawn from this study

- Instructors need to be trained to explore all online course tools, with a specific aim of encouraging student-centered learning.
- Educators and instructional material designers need to understand learner interaction patterns and learning outcomes in order to better design and implement online courses.
- Instructors should use online course tracking information to assess and monitor students' interactions within the course and adjust teaching methods accordingly to promote effective learning.

Recommendations for Research:

The following recommendations were drawn from this study

- This study focused only on Agricultural Education online courses. The study should be expanded by including courses in other disciplines.
- The study conducted focus group interviews with a limited number of students who were enrolled in two online courses. Additional focus group interviews with more participants are recommended to understand students' perceptions about online course tools.
- As students become more experienced in online learning, their perceptions toward usage of online course tools may change. Further research is required in this area which will likely yield additional insights to educators and instructional designers

about where, when, and how to apply online course tools most effectively to meet the evolving needs of learners.

Implications for Agricultural Education

The purpose of this study was to identify the association between student interaction patterns and academic performance in online graduate courses delivered by the Department of Agricultural Education and Studies at Iowa State University. The findings have implications for Agricultural Education instructors and instructional designers for better designing and implementing online courses. Understanding student interactions gives feedback to instructors to understand overall student performance and behavior in an online course. The present study found discussions read and content folders viewed were the two interactions that had a significant correlation with grade. By monitoring student progress in these areas, instructors can know whether the students have studied the appropriate learning resources, practiced the online exercises, or collaborated with their colleagues in their projects.

Further, the study focused on understanding student perceptions about use of online course tools. Findings from this study could be used in improving design and delivery of online courses in Agricultural Education. Student perceptions of an online course management system would help the Department of Agricultural Education to identify what resources need to be allocated to support online learning programs in the form of technical support for students, course development support for faculty, and investing in learning management software or collaboration software.

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APPENDIX A: INSTITUTIONAL REVIEW BOARD STUDY APPROVALS

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

Date: 5/6/2010

To: Kuna Aruna Sai
223 Curtiss Hall

CC: Dr. Gregory Scott Miller
206 E Curtiss Hall

From: Office for Responsible Research

Title: Learner Interaction Patterns and Student Perceptions toward using WebCT Tools in Online Graduate Courses

IRB Num: 10-116

Submission Type: New **Exemption Date:** 5/6/2010

The project referenced above has undergone review by the Institutional Review Board (IRB) and has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b). The IRB determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as proposed in the IRB application**, including obtaining and documenting informed consent if you have stated in your application that you will do so or if required by the IRB.
- **Any modification of this research should be submitted to the IRB on a Continuing Review and/or Modification form, prior to making any changes**, to determine if the project still meets the federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

Please be sure to **use only the approved study materials** in your research, including the **recruitment materials and informed consent documents that have the IRB approval stamp.**

Please note that you must submit all research involving human participants for review by the IRB. **Only the IRB may make the determination of exemption,** even if you conduct a study in the future that is exactly like this study.

For IRB Use Only		
	Review Date: May 6, 2010	IRB ID: 10-116
	Approval Date: May 6, 2010	Length of Approval: n/a
	Approval Expiration Date: n/a	FULL Committee Review:
	EXEMPT per 45 CFR 46.101(b): 1+2 Date: 5/6/10	Minimal Risk: ✓
	EXPEDITED per 45 CFR 46.110(b)	More than Minimal Risks:
	Category _____, Letter _____	Project Closed Date:

INSTITUTIONAL REVIEW BOARD (IRB)
Application for Approval of Research Involving Humans

IRB
MAR 0 9 2010

SECTION I: GENERAL INFORMATION

Principal Investigator (PI): Kuna Aruna Sai	Phone: 813-465-9697	Fax: 515-294-0530
Degrees: M.Sc., (Ag.)	Correspondence Address: 223 Curtiss Hall, College of Agriculture and Life Sciences, Iowa State University, Ames, IA - 50011	
Department: Agricultural Education and Studies	Email Address: askuna@iastate.edu	
Center/Institute: Iowa State University	College: College of Agriculture and Life Sciences	
PI Level: ☐ Faculty ☐ Staff ☐ Postdoctoral ☒ Graduate Student ☐ Undergraduate Student		
Alternate Contact Person: Dr. Gregory Scott Miller	Email Address: gsmiller@iastate.edu	
Correspondence Address: 206 E Curtiss Hall, College of Agriculture and Life Sciences, ISU, Ames -IA	Phone: 515-294-2583	
Title of Project: Learner Interaction Patterns and Student Perceptions toward using WebCT Tools in Online Graduate Courses		
Project Period (Include Start and End Date): [*mm/dd/yy*][3/15/10] to [*mm/yy/dd*][*5/9/11*]		

FOR STUDENT PROJECTS	
Name of Major Professor/Supervising Faculty: Dr. Gregory Scott Miller	Signature of Major Professor/Supervising Faculty:
Phone: 515-294-2583	Campus Address: 206 E Curtiss Hall
Department: Agricultural Education and Studies	Email Address: gsmiller@iastate.edu
Type of Project: (check all that apply) ☒ Research ☐ Thesis ☒ Dissertation ☐ Class project ☐ Independent Study (490, 590, Honors project) ☐ Other. Please specify: _____	

KEY PERSONNEL

List all members and relevant experience of the project personnel. This information is intended to inform the committee of the training and background related to the specific procedures that each person will perform on the project.

NAME & DEGREE(S)	SPECIFIC DUTIES ON PROJECT	TRAINING & EXPERIENCE RELATED TO PROCEDURES PERFORMED, DATE OF TRAINING
✓ Kuna Aruna Sai, M.Sc., (Ag.)	Write proposal, collect and analyze data, and publish results.	Completed ISU Human Subjects training in Spring 2008 2/5/08
✓ Dr. Gregory Scott Miller, Ph.D	Supervise the entire research process.	Completed ISU Human Subjects training in 2000. 10/17/09

To list additional personnel please attach separate sheet.

ASSURANCE

- I certify that the information provided in this application is complete and accurate and consistent with any proposal(s) submitted to external funding agencies.
- I agree to provide proper surveillance of this project to ensure that the rights and welfare of the human subject or welfare of animal subjects are protected. I will report any problems to the appropriate assurance review committee(s).
- I agree that I will not begin this project until receipt of official approval from all appropriate committee(s).
- I agree that modifications to the originally approved project will not take place without prior review and approval by the appropriate committee(s), and that all activities will be performed in accordance with all applicable federal, state, local and Iowa State University policies.

CONFLICT OF INTEREST

A conflict of interest can be defined as a set of conditions in which an investigator's or key personnel's judgment regarding a project (including human or animal subject welfare, integrity of the research) may be influenced by a secondary interest (e.g., the proposed project and/or a relationship with the sponsor). ISU's Conflict of Interest Policy requires that investigators and key personnel disclose any significant financial interests or relationships that may present an actual or potential conflict of interest. By signing this form below, you are certifying that all members of the research team, including yourself, have read and understand ISU's Conflict of Interest policy as addressed by the ISU Faculty Handbook (http://www.provost.iastate.edu/faculty) and have made all required disclosures.

☐ Yes ☒ No Do you or any member of your research team have an actual or potential conflict of interest?
☐ Yes ☐ No If yes, have the appropriate disclosure form(s) been completed?

SIGNATURES

3/09/10
Signature of Principal Investigator Date

3/9/2010
Signature of Department Chair Date

The Major Professor/Supervising Faculty member must sign the cover page in the section entitled "For Student Projects".

PLEASE NOTE: Any changes to an approved protocol must be submitted to the appropriate committee(s) before the changes may be implemented.

Please proceed to SECTION II.

ASSURANCE

- I certify that the information provided in this application is complete and accurate and consistent with any proposal(s) submitted to external funding agencies.
- I agree to provide proper surveillance of this project to ensure that the rights and welfare of the human subject or welfare of animal subjects are protected. I will report any problems to the appropriate assurance review committee(s).
- I agree that I will not begin this project until receipt of official approval from all appropriate committee(s).
- I agree that modifications to the originally approved project will not take place without prior review and approval by the appropriate committee(s), and that all activities will be performed in accordance with all applicable federal, state, local and Iowa State University policies.

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☐ Yes ☒ No Do you or any member of your research team have an actual or potential conflict of interest?
☐ Yes ☐ No If yes, have the appropriate disclosure form(s) been completed?

SIGNATURES

3/09/10
Signature of Principal Investigator Date

3/9/2010
Signature of Department Chair Date

The Major Professor/Supervising Faculty member must sign the cover page in the section entitled "For Student Projects".

PLEASE NOTE: Any changes to an approved protocol must be submitted to the appropriate committee(s) before the changes may be implemented.

Please proceed to SECTION II.

SECTION II: IRB SECTION - STUDY SPECIFIC INFORMATION

Please complete all of the following questions.

STUDY OBJECTIVES

Briefly explain in **language understandable to a layperson** the specific aim(s) of the study.

The purpose of this study is to identify the association between students' interaction patterns and their academic performance in online graduate courses delivered by the Department of Agricultural Education and Studies at Iowa State University. In addition, the study sought to determine which WebCT tools are perceived by students to be most useful in learning.

BENEFITS TO SOCIETY AND PARTICIPANTS

Explain in **language understandable to a layperson** how the information gained in this study will advance knowledge, and/or serve the good of society. Please also describe the direct benefits to research participants; if there are no direct benefits to participants, indicate that. **Note**: monetary compensation cannot be considered a benefit to participants.

The growing demand for distance education, and advances in technology have been influencing universities to practice web-based education. Researchers are also interested to identify different learning factors that can make delivery of Web-based education more meaningful. Distance education tools such as WebCT collects data on the extent to which students interact with course materials, with other students, and with the instructor. Research on exploring the association between students' interaction patterns and their academic performance may provide recommendations for students, educators and instructional designers for better designing and implementing online courses. Understanding students' perceptions about use of WebCT tools is useful for educators to alter their course more effectively. Participants will receive no compensation and the results may not be of direct benefit to them. However, students' in future online courses may benefit from the study.

PART A: PROJECT INVOLVEMENT

1) ☐ Yes ☒ No Is this project part of a Training, Center, Program Project Grant?
   Director Name: Overall IRB ID:
2) ☐ Yes ☒ No Is the purpose of this project to develop survey instruments?
3) ☐ Yes ☒ No Does this project involve an investigational new drug (IND)? Number:
4) ☐ Yes ☒ No Does this project involve an investigational device exemption (IDE)? Number:
5) ☒ Yes ☐ No Does this project involve existing data or records?
6) ☐ Yes ☒ No Does this project involve secondary analysis?
7) ☐ Yes ☒ No Does this project involve pathology or diagnostic specimens?
8) ☐ Yes ☒ No Does this project require approval from another institution? Please attach letters of approval.
9) ☐ Yes ☒ No Does this project involve DEXA/CT scans or X-rays?

PART B: MEDICAL HEALTH INFORMATION OR RECORDS

10) ☐ Yes ☒ No Does your project require the use of a health care provider's records concerning past, present, or future physical, dental, or mental health information about a subject? The Health Insurance Portability and Accountability Act established the conditions under which protected health information may be used or disclosed for research purposes. If your project will involve the use

of any past or present clinical information about someone, or if you will add clinical information to someone's treatment record (electronic or paper) during the study, you must complete and submit the Application for Use of Protected Health Information.

PART C: ANTICIPATED ENROLLMENT

Estimated number of participants to be enrolled in the study Total: 300 Males: 150 Females: 150	
Check if any enrolled participants are: ☐ Minors (Under 18) Age Range of Minors: ☐ Pregnant Women/Fetuses ☐ Cognitively Impaired ☐ Prisoners	Check below if this project involves either: ☐ Adults, non-students ☐ Minor ISU students ☒ ISU students 18 and older ☐ Other (explain)
List estimated percent of the anticipated enrollment that will be minorities *if known*:	
American Indian:	Alaskan Native:
Asian or Pacific Islander:	Black or African American:
Latino or Hispanic:	

PART D: PARTICIPANT SELECTION

Please use additional space as necessary to adequately answer each question.

11. Explain the procedures and rationale for selecting participants, including the inclusion and exclusion criteria (e.g., where will names come from, what persons will be included or excluded and why, etc.).

This study includes both quantitative and qualitative research methods.
The population (N= 300) for the quantitative study consist of graduate students who were enrolled in online courses in the Department of Agricultural Education and Studies (AGEDS) during Fall, 2009 and Spring 2010. The Department of AGEDS offers six online graduate courses each year including AGEDS 510, AGEDS 520, AGEDS 524, AGEDS 533, AGEDS 550, and AGEDS 593E. It is possible to enroll a student in more than one graduate online course offered by AGEDS. However, the study considers each of the learning situations as unique due to the variety of constructs and instructor approaches. Therefore each enrollment in each course is treated as a separate case. The same student may appear as more than one case. The frame will be collected from the course instructors. Students' demographic characteristics including age, gender, academic classification, job/employment status, undergraduate grade point average and academic major will be collected from the Director of Graduate Education in the Department of Agricultural Education and Studies.
The population (N=32) for the qualitative study consisted of graduate students who were enrolled in AGEDS 510 and AGEDS 533. The population frame will be collected from the course instructors. AGEDS 510 and AGEDS 533 are offering in Spring 2010.These two courses are selected purposively because of the instructor's support for conducting interviews and students' experience in using WebCT tools. Participants will be recruited via email. All students who will agree to participate voluntarily in focus group interviews will be included as final participants. Eight focus groups will be conducted, and each group consists of four participants.

12. Describe the procedures for contacting participants (e.g., letter, email, flyer, advertisements, phone call, etc.). Attach copies of any letters, scripts, flyers, or advertisements that will be used. Recruitment materials should include a statement of the voluntary and confidential nature of the research.

Learner interaction patterns will be extracted by using the WebCT "student tracking" tool. WebCT collect data on the extent to which students interact with content, other learners and the instructor. Students' demographic information including age, gender, academic classification, job/ employment status, undergraduate grade point average (GPA) and academic major will be obtained from the Director of Graduate Education in the Department of Agricultural Education and Studies. Course grades will be

collected from the course instructor's records.
Participants for focus group interview will be recruited via email. First, the selected course instructors will send an introduction letter to all students to explain the purpose of the research and to encourage them to participate. Next, the researcher will contact all students who were enrolled in AGEDS 510 and AGEDS 533 courses via e-mail. The e-mail explains the purpose and procedures for conducting the focus group interviews and asks students to participate. The participants will be assured that this research has minimal risk and the data collected would be kept confidential. A doodle link will be attached to the e-mail to determine participants' available dates and times. One week after the initial e-mail the researcher will send a first reminder to non-respondents explaining that their response is important for this study. After ten days second reminder will be sent to non-respondents. Ten days later final reminder will be sent to participants who were not responded to the previous e-mails. The first two reminders are e-mail follow-ups and the final reminder will be a personal phone contact. Students who are willing to participate in a focus group session will be sent an e-mail informing them of the date and time for attending the interview. The researcher will also provide a simulcast phone number and pin number for students to participate in the interview. One day before the scheduled session an e-mail follow-up reminder will send to the participants.

PART E: RESEARCH PLAN

Include sufficient detail for IRB review of this project independent of the grant, protocol, or other documents.

13. The information needed here is similar to that in the "methods" or "procedures" sections of a research proposal—it should describe the flow of events that will occur during your interactions with subjects. Please describe in detail your plans for collecting data from participants, including all procedures, tasks, or interventions participants will be asked to complete during the research (e.g., random assignment, any conditions or treatment groups into which participants will be divided, mail survey or interview procedures, sensors to be worn, amount of blood drawn, etc.) . This information is intended to inform the committee of the procedures used in the study and their potential risk. Please do not respond with "see attached" or "not applicable."

Upon receiving Institutional Review Board approval, the researcher will contact all online graduate course instructors in the Department of Agricultural Education and Studies and explain the purpose of the research and ask permission to access their students' interaction data and grades. The researcher will also contact the Director of Graduate Education in the Department of AGEDS and ask him to provide demographic information of graduate students enrolled in online courses during Fall, 2009 and Spring 2010. The researcher will assure all course instructors and the Director of Graduate Education in AGEDS that this research has minimal risk and the information collected from courses would be kept confidential.
The procedure for gathering the interaction WebCT data and transferring that data into excel will be explained and demonstrated for each instructor. The researcher will assist instructors in collecting and assembling the data file. Instructors will be asked to provide grades of students in an excel sheet along with the interaction data. After entering the data into the excel sheet student names will be replaced by code numbers, the same code number will be used to collect student demographics from the Director of Graduate Education in AGEDS. Students who will enroll in more than one WebCT courses will be assigned the same code number. The code numbers will be used to link demographic data with students' interactions and grades. The list of code numbers and student names will only available to the researcher, the instructor, and the Director of Graduate Education in AGEDS. The name of the participants will not be identified against the data and students identifiers/names will be discarded after creating the data file in Excel. The analysis and eventual reports will not include information linking specific data to a particular student.
For conducting focus group interviews, the researcher will use the Wimba tool in WebCT. The researcher will contact the instructors of AGEDS 510 and AGEDS 533, and explain the purpose of the research and ask their permission to conduct focus group interviews in their course. The course instructors will send an introduction letter to all students to explain the purpose of the research and to encourage them to participate. Next, the researcher will contact all students who were enrolled in AGEDS 510 and AGEDS 533 courses via e-mail. The e-mail explains the purpose and procedures for conducting the focus group interviews and asks students to participate. The participants will be assured that this research has minimal risk and the data collected would be kept confidential. A doodle link will be attached to the e-mail to determine participants' available dates and times. One week after the initial e-mail researcher will send a first reminder to non-respondents explaining that their response is important for this study.

After ten days second reminder will be sent to non-respondents. Ten days later final reminder will be sent to participants who were not responded to the previous e-mails. The first two reminders are e-mail follow-ups and the final reminder will be a personal phone contact. Students who are willing to participate in a focus group session will be sent an e-mail informing them of the date and time for attending the interview. The researcher will also provide a simulcast phone number and pin number for students to participate in the interview. One day before the scheduled session an e-mail follow-up reminder will send to the participants. Focus group interviews will begin with a review of WebCT tools by the researcher. The researcher will use guiding questions to provide a structure for the interview process. Where appropriate, other emergent questions will be used to probe students for additional information. The focus groups will be facilitated by the researcher and audio recorded. Throughout the interview process students will be identified by their first names. Later in the transcription process their names will be replaced by codes. The list of code numbers and student names will only available to the researcher.

14. For studies involving pathology/diagnostic specimens, indicate whether specimens will be collected prospectively and/or already exist "on the shelf" at the time of submission of this review form. If prospective, describe specimen procurement procedures; indicate whether any additional medical information about the subject is being gathered, and whether specimens are linked at any time by code number to the participant's identity. If this question is not applicable, please type N/A in the response cell.

N/A

15. For studies involving deception or where information is intentionally withheld from participants, such as the full purpose of the study, please explain how persons will be deceived or what information will be withheld. Additionally, a waiver of the applicable elements of consent will be needed. Please complete the "Waiver of Elements of Consent" form (available at the IRB website). If this question is not applicable, please type N/A in the response cell.

N/A

PART F: CONSENT PROCESS

A copy of any translated informed consent documents and an English version should be submitted with the application. Provide the name of the individual who translated the consent documents, their qualifications for translating documents, and in particular informed consent documents, below.

If the consent process does not include documented consent, a waiver of documentation of consent must be requested. If any information about the study is intentionally withheld or misleading (i.e., deception is used), a waiver of the elements of consent must be requested. Forms for requesting waivers are available at the IRB website.

16. Describe the consent process for adult participants (those who are age 18 and older).

I respectfully request a waiver of documented consent for collecting data on students' demographic information, interaction patterns and their grades. I do not propose to seek any of this information directly from students. WebCT stores all student interaction data in the students tracking files. I will retrieve this stored information for this research. Students' demographic information will be obtained from the Director of Graduate Education in the department of Agricultural Education and Studies. Course performance grades and percentages of the students will be collected from the course instructor's records. A data file for analysis will be created from the existing data. This file will contain no student identifiers. The analysis and eventual reports will not include any information that could link specific data to a partiular student. For conducting focus group interviews the researcher will use a letter of introduction containing the elements of consent.

17. If your study involves minor children, please explain how parental consent will be obtained prior to enrollment of the minor(s).

N/A

18. Please explain how assent will be obtained from minors (younger than 18 years of age), prior to their enrollment. Also, please explain if the assent process will be documented (*e.g., a simplified version of the consent form, combined with the parental informed consent document).* According to the federal regulations assent "...means a child's affirmative agreement to participate in research. Mere failure to object should not, absent affirmative agreement, be construed as assent."

N/A

PART G: DATA ANALYSIS

19. Describe how the data will be analyzed (*e.g. statistical methodology, statistical evaluation, statistical measures used to evaluate results*).

The quantitative and qualitative components of the data will be analyzed separately.
The SPSS/PC 16 for windows software program will be used to analyze the quantitative data. Descriptive statistics such as frequencies, percentages, means, and standard deviations will be used to summarize the data. Step-wise regression analysis will be conducted to identify interaction patterns that could predict students' academic performance in online courses. Before step-wise regression will be conducted, intercorrelations are computed among all dependent and independent variables.
The qualitative data will be analyzed through content analysis. The audio taped interviews are transcribed verbatim by the researcher. Transcripts will be used for subsequent data analysis. Rabiee (2004) explained that data analysis of focus group interview data involves a number of stages. These include examining, categorizing and tabulating or recombining the evidence. In the examination stage, the researcher reviews the data by listening to the tapes and reading the transcribed scripts. The thematic framework will be developed based on the careful examination of the data. The framework will be developed by writing memos in the margin of the text in the form of short phrases, ideas and concepts arising from the data. At this stage descriptive statements will be formed based on the data. In the next stage, the researcher will manage the data through indexing and charting into a tabular form. This is one of the important steps to reduce the data and integrate it in a meaningful way.

PART H: RISKS

The concept of risk goes beyond physical risk and includes risks to participants' dignity and self-respect as well as psychological, emotional, legal, social or financial risk.

20. ☐ Yes ☒ No Is the ***probability*** of the harm or discomfort anticipated in the proposed research greater than that encountered ordinarily in daily life or during the performance of routine physical or psychological examinations or tests?

21. ☐ Yes ☒ No Is the ***magnitude*** of the harm or discomfort greater than that encountered ordinarily in daily life, or during the performance of routine physical or psychological examinations or tests?

22. Describe any risks or discomforts to the participants and how they will be minimized and precautions taken. Do ***not*** respond with N/A. If you believe that there will not be risk or discomfort to participants, you must explain why.

The anticipated risk or discomfort involved in this study is minimal.The analysis of data generated in these courses will begin only after all student identifiers are removed. The analysis and eventual reports will not include any information linking specific data to a particular student.

23. If this study involves vulnerable populations, including minors, pregnant women, prisoners, the cognitively impaired, or those educationally or economically disadvantaged, what additional protections will be provided to minimize risks?

N/A

PART I: COMPENSATION

24. ☐ Yes ☒ No Will participants receive compensation for their participation? If yes, please explain.

Do not make the payment an inducement, only a compensation for expenses and inconvenience. If a person is to receive money or another token of appreciation for their participation, explain when it will be given and any conditions of full or partial payment. (E.g., volunteers will receive $5.00 for each of the five visits in the study or a total of $25.00 if he/she completes the study. If a participant withdraws from participation, they will receive $5.00 for each of the visits completed.) It is considered undue influence to make completion of the study the basis for compensation.

N/A

PART J: CONFIDENTIALITY

25. Describe below the methods that will be used to ensure the confidentiality of data obtained. (For example, who has access to the data, where the data will be stored, security measures for web-based surveys and computer storage, how long data or specimens will be retained, anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased, etc.)

Only the researchers will have acess to the data. The names of the participants will not be identified against the data. student identifiers will be replaced by code numbers . The code numbers and student names will be available only with concerned persons including the researcher, the instructor and the Director of Graduate Education in AGEDS. The name of the participants will not be identified against the data and students identifiers/names will be discarded after creating a file in the excel sheet. The data file will be stored at the principal investigators' password protected office computer. The analysis and eventual reports will not included information linking specific data to a particular student.

PART K: REGISTRY PROJECTS

26. To be considered a registry: (1) the individuals must have a common condition or demonstrate common responses to questions; (2) the individuals in the registry might be contacted in the future; and (3) the names/data of the individuals in the registry might be used by investigators other than the one maintaining the registry.

☐ Yes ☒ No Does this project establish a registry?

If "yes," please provide the registry name below.

Checklist for Attachments

Listed below are the types of documents that should be submitted for IRB review. Please check and attach the documents that are applicable for your study:

☐ A copy of the informed consent document **OR** ☒ Letter of introduction containing the elements of consent
☐ A copy of the assent form if minors will be enrolled
☐ Letter of approval from cooperating organizations or institutions allowing you to conduct research at their facility
☐ Data-gathering instruments (including surveys)
☒ Recruitment fliers, phone scripts, or any other documents or materials participants will see or hear

The original signed copy of the application form and one set of accompanying materials should be submitted for review. **Federal regulations require that one copy of the grant application or proposal be submitted for comparison with the application for approval.**

FOR IRB USE ONLY:

Action by the Institutional Review Board (IRB):

☐ Project approved. Date: _____
☑ Project is exempt. Date: 5/6/10
☐ Project not approved. Date: _____
☐ IRB approval is not required. Date: _____
  ☐ Project is not research according to the federal definition.
  ☐ Project does not include human subjects as defined by the federal regulations.

Kelly A Aguilar
IRB Approval Signature

May 6, 2010
Date

Aruna Sai Kuna

10-116 IRB

Regarding the student demographic information, grade point average, etc., in what form will you be receiving this data? Will it have identifiers attached when you receive it from the Director of Graduate Education, or will you be removing them?

- Upon receiving Institutional Review Board approval, I will contact all online graduate course instructors in the Department of Agricultural Education and Studies and will ask permission to access their students' interaction data and grades.
- I will also contact the Director of Graduate Education in the Department of AGEDS and ask him to provide demographic information of graduate students enrolled in online courses during Fall, 2009 and Spring 2010.
- The researcher will assure all course instructors and the Director of Graduate Education in AGEDS that this research has minimal risk and the information collected from courses would be kept confidential.
- Instructors will be asked to provide grades of students in an excel sheet along with the interaction data. After entering the data into the excel sheet student names will be replaced by code numbers.
- The same code number will be used to collect student demographics from the Director of Graduate Education in AGEDS. There will be no student identifier names attached when I receive data from the Director of Graduate Education in AGEDS.
- The code numbers will be used to link demographic data with students' interactions and grades.
- The list of code numbers and student names will only available to the researcher, the instructor, and the Director of Graduate Education in AGEDS.
- The name of the participants will not be identified against the data and students identifiers/names will be discarded after creating the data file in Excel. The analysis and eventual reports did not include information linking specific data to a particular student.

Aruna Sai Kuna, 3/08/2010

Focus Group Interview Questions

Objective 4: Identify WebCT tools which were perceived by students to be most useful in learning?

a. Which WebCT tools are most useful for learning? Why?

b. Which WebCT tools are least useful for learning? Why?

c. Which WebCT tools do you use most often? Why?

d. Which WebCT tools do you use least often? Why?

e. Which WebCT tools are missing in your course? Why would these tools be important for learning?

f. What additional suggestions do you have for improving the functions of WebCT?

FIRST CONTACT – PRENOTICE (Introduction from the Instructor)
E-mail

Date

Dear Student,

We are constantly looking for ways to improve online courses in Agricultural Education and Studies (AGEDS). In this process student perceptions provide valuable insights to enhance online learning.

Aruna Sai Kuna is conducting a study titled "Learner Perceptions Towards Using WebCT Tools in Online Courses". She will be conducting interviews of students enrolled in AGEDS graduate courses this semester. I endorse this study and encourage you to participate, however you may choose not to participate. Choosing not to participate would not count against you in anyway.

Aruna will contact you soon with details on how you can participate. I hope you decide to take part in the interview because your views about online learning are very important.

Please contact me if you have questions.

Sincerely,

Name of the course instructor (Designation)
Dept. of Agricultural Education and Studies
Iowa State University of Science and technology
Curtiss Hall, Room #
Ames, IA. 50011

ISU IRB # 1 10-116
EXEMPT DATE: 6 May 2010

SECOND CONTACT – INFORMATION LETTER **(Introduction from the researcher)**
E-mail

Date

Dear Student,

I am planning to conduct focus group interviews of graduate students enrolled in online courses in the College of Agriculture and Life Sciences at Iowa State University (ISU) in order to gather data on student perceptions about WebCT tools. The results of the interviews may be used by educators to select appropriate WebCT tools and design their courses more effectively.

You were selected to participate in this study because you are enrolled in either Spring or Summer 2010 courses in the College of Agriculture and Life Sciences. For participating in one of the interviews, please provide your available dates and times at the Doodle link below; http://doodle.com/xxxxxxxxxxxxby x/x/2010. Upon receiving your available times and dates, I will provide you with detailed instructions on how to participate in the focus group interview session.

If you have any questions about this study, please call me at 813-465-9697 or send an email to askuna@iastate.edu. If you have any questions about the rights of research subjects or research related injury, please contact the IRB Administrator, IRB@iastate.edu or Director, Office of Responsible Research, 515-294-3115, 1138 Pearson Hall, Ames, IA 50011.

I have attached a copy of an informed consent document along with this email. Please read it carefully. If you are willing to participate in the study, please type your name in the "participant signature area" and e-mail back to me. Keep a copy for your record purpose.

Thank you very much for helping with this important study.

Sincerely,
Aruna Sai Kuna (Ph.D Student); Dr. Greg Miller (Professor in AGEDS)
Dept. of Agricultural Education and Studies
Iowa State University of Science and technology
Curtiss Hall, Room # 223, Ames, IA. 50011

Aruna Sai Kuna, 3/08/2010

THIRD CONTACT – REMINDER (If Needed)
E-mail

Date

Dear Student,

A few days ago I sent you an email requesting your participation in a focus group interview designed to gather data that will be useful in enhancing online learning.

If you have already responded to the doodle link, please accept my sincere thanks. If not please do so today. I am grateful for your help because it is only by asking students like you that I can achieve my goal of strengthening WebCT tools to enhance online learning.

The doodle link is; http://doodle.com/xxxxxxxxxxxxx

If you have any questions about this study, please call me at 813-465-9697 or send an email to askuna@iastate.edu. If you have any questions about the rights of research subjects or research related injury, please contact the IRB Administrator, IRB@iastate.edu or Director, Office of Responsible Research, 515-294-3115; 1138 Pearson Hall; Ames; IA 50011.

Sincerely,

Aruna Sai Kuna (Ph.D Student); Dr. Greg Miller (Professor in AGEDS)

Dept. of Agricultural Education and Studies
Iowa State University of Science and technology
Curtiss Hall, Room # 223
Ames, IA. 50011

ISU IRB # 1 10-116
EXEMPT DATE: 6 May 2010

Aruna Sai Kuna, 3/08/2010

FOURTH CONTACT – SECOND REMINDER (If Needed)

E-mail

Date

Dear Student,

A few days ago I sent an email to you seeking your participation in a focus group interview. The purpose of this interview is to gather data that will be useful for improving online learning. To the best of my knowledge, you have not yet provided your available dates and times in Doodle. Because you are a graduate student enrolled in an online Agricultural Education course, your response is very important to ensure accurate results.

The focus groups will be facilitated by me and audio recorded. The audio record will be erased at the end of this study. During the interview process your first name will be used and later a code number assigned to it for data analysis. The list of code number and your name are only available to the researcher. Your answers will remain confidential. Protecting confidentiality of your answers is very important to me and to Iowa State University.

I would urge you to participate in the study by providing your dates and times in the doodle link http://doodle.com/xxxxxxxxxxxx

If you have any questions about this study, please call me at 813-465-9697 or send an email to askuna@iastate.edu. If you have any questions about the rights of research subjects or research related injury, please contact the IRB Administrator, IRB@iastate.edu or Director, Office of Responsible Research, 515-294-3115, 1138 Pearson Hall, Ames, IA 50011.

Sincerely,

Aruna Sai Kuna (Ph.D Student); Dr. Greg Miller (Professor in AGEDS)

Dept. of Agricultural Education and Studies
Iowa State University of Science and technology
Curtiss Hall, Room # 223
Ames, IA. 50011

FIFTH CONTACT –FINAL REMINDER (If Needed)
Phone Script

Date

INTRODUCTION

Hello. This is ARUNA calling from Iowa State University's Agricultural Education and Studies Department. May I speak to **[participant's name]?**

I am trying to schedule focus group interviews of graduate students in Agricultural Education at Iowa State University (ISU) to gather data on student perceptions of WebCT tools. The results of the interview will be useful for educators to select appropriate WebCT tools in online learning. Your response is very important. You can help us very much with improving online courses. You were selected to participate in this study because you are enrolled in either AGEDS 510 or AGEDS 533 this semester. Participation in the interview will last for 30 to 50 minutes in a telephone conference. There is no cost associated with this call. Are you interested in participating in the interview? (If so……)

Before we proceed, let me share some additional information

Your choice to participate is voluntary. If you do choose to participate, you may stop at anytime without penalty or negative consequences. The focus groups will be facilitated by me and audio recorded. The audio record will be erased at the end of this study. Throughout the interview process you will be identified by your first name. Later in the transcription process your name will be replaced by a code. The code number and your name are only available to me. The information you provide in the interview will be completely confidential. There are no direct benefits from and no foreseeable risks at this time from participating in this study. Your participation is very much appreciated. Are you still willing to participate? (If so……..)

Are you available on these dates and times?

[Schedule day and time on spreadsheet, thank them for their cooperation]

Let me share some contact information in case you have any questions or concerns

If you have any questions about this study, please call me at 813-465-9697 or send an email to askuna@iastate.edu. If you have any questions about the rights of research subjects or research related injury, please contact the IRB Administrator, IRB@iastate.edu or Director, Office of Responsible Research, 515-294-3115; 1138 Pearson Hall, Ames, IA 50011.

Aruna Sai Kuna, 3/08/2010

Instructions for participating in the Focus Group Interview
E-mail

Date

Dear Student,

Thank you for volunteering to participate in a focus group interview about WebCT tools. Your interview will take place on ---------- (date), at --------- (time). At ------ (time) dial xxx-xxx-xxx (the phone number). Once you dial this number your will be asked for a pin number enter this pin number #----------. Your participation in this focus group discussion will last for about 30 to 50 minutes. During the interview you will be asked a series of questions about using WebCT tools in online learning. Your honest opinions will be much appreciated.

If you have any questions about this study, please call me at 813-465-9697 or send an email to askuna@iastate.edu.

Sincerely,

Sincerely,

Aruna Sai Kuna (Ph.D Student); Dr. Greg Miller (Professor in AGEDS)

Dept. of Agricultural Education and Studies
Iowa State University of Science and technology
Curtiss Hall, Room # 223
Ames, IA. 50011

Aruna Sai Kuna, 3/08/2010

Reminder for Participation in Focus Group Interviews
E-mail

Date

Dear Student,

Thank you for volunteering to participate in a focus group interview. This is a gentle reminder of your participation in a focus group interview scheduled on date ------ at ----(time), dial ------- (phone #) when prompted enter the following pin number --------. Once you enter this pin number you will be connected to the group like a conference call. There is no cost associated with this call other than the minutes used under your calling plan.

If you have any questions, please call me at 813-465-9697 or send an email to askuna@iastate.edu.

Sincerely,

Aruna Sai Kuna (Ph.D Student); Dr. Greg Miller (Professor in AGEDS)

Dept. of Agricultural Education and Studies
Iowa State University of Science and technology
Curtiss Hall, Room # 223
Ames, IA. 50011

ISU IRB # 1 10-116
EXEMPT DATE: 6 May 2010

INFORMED CONSENT DOCUMENT

Title of Study: Student Perceptions toward using WebCT Tools in Online Graduate Courses.

Investigators:
Kuna Aruna Sai, Ph. D Student, Department of Agricultural Education and Studies, ISU
Dr. Gregory Scott Miller, Ph.D, Department of Agricultural Education and Studies, ISU

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to determine which WebCT tools are perceived by students to be most useful in learning. You are being invited to participate in this study because you were/are enrolled in either Spring or Summer 2010 distance education courses in the College of Agriculture and Life Sciences. Spring, 2010 courses include AGEDS 510 and AGEDS 533, and summer, 2010 courses include AGRON 514, FSHN 521, FSHN 523 and FSHN 528.

DESCRIPTION OF PROCEDURES

If you agree to participate, you will be asked to take part in a focus group interview. Focus group interviews will begin with a review of WebCT tools by the researcher. You will be asked a series of questions about WebCT tools. The interview session will be conducted by telephone conference. You will be provided a phone number and a pin number. Once you dial these numbers you will be connected to the group. Participation in the interview will last for 30 to 50 minutes. The focus groups will be facilitated by the researcher and audio recorded. Throughout the interview process students will be identified by their first names. Later in the transcription process their names will be replaced by codes. The list of code numbers and student names will only available to the researcher. You may be assured that your responses will remain completely confidential. The audio record will be erased after the recordings have been transcribed and checked for accuracy.

RISKS

There are no foreseeable risks at this time from participating in this study.

BENEFITS

If you decide to participate in this study there be not be direct benefits to you. However, students' in future online courses may benefit from the study. Understanding students' perceptions about use of WebCT tools may help educators improve their online courses.

ISU IRB # 1 10-116
EXEMPT DATE: 6 May 2010

COSTS AND COMPENSATION

You will not have any costs from participating in this study. You will not be compensated for participating in this study.

PARTICIPANT RIGHTS

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled.

CONFIDENTIALITY

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis.

In the interview process you will be identified by your first name. Later in the transcription process your name will be replaced by a code. The code number and your name are only available to the researcher. The list of names and codes will be destroyed after the recordings have been transcribed and checked for accuracy. The data file will be stored at the principal investigators' password protected office computer. The analysis and eventual reports will not include information linking specific data to a particular student. If the results are published, your identity will remain confidential.

QUESTIONS OR PROBLEMS

You are encouraged to ask questions at any time during this study.

- For further information about the study, please call me at 813-465-9697 or send an email to askuna@iastate.edu or my supervisor Dr. Greg Miller, gsmiller@iastate.edu, 515-294-2583
- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office for Responsible Research, Iowa State University, Ames, Iowa 50011.

****

PARTICIPANT SIGNATURE

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document, and that your questions have been satisfactorily answered. Please print a copy of this document for your records.

Participant's Name (printed) _____

_____ _____

Participant's Signature) (Date)

IRB ID# 10-116

REQUEST FOR WAIVER OF DOCUMENTATION OF CONSENT

Principal Investigator Name:	Aruna Sai Kuna
Phone Number:	813-465-9697
Email Address:	askuna@iastate.edu
Title of Study:	Learner Interaction patterns and Student Perceptions toward using WebCT Tools in Online Graduate Courses

Iowa State University's Institutional Review Board (IRB) may waive the requirement for obtaining a signed informed consent document from each research participant if the investigator can provide specific reasons that the research meets regulatory criteria. *The IRB will make the final determination as to whether or not a waiver is appropriate based on the information provided by the investigator.*

Please note: A waiver of documentation of consent only means you do not need to have participants sign a document prior to their participation. Participants must still be given an opportunity to give consent to participate in the research and must be provided sufficient information upon which they can base their decision. A waiver of documentation is not a waiver of the consent process.

Please describe with details specific to your research how your research study satisfies the criteria listed in either #1 or #2 (a) and (b) below. The space will expand as you type.

1. The only record linking the subject and the research would be the consent document, and the principal risk would be potential harm resulting from a breach of confidentiality.
Justification:
2. (a) The research presents no more than minimal risk of harm to subjects.
Justification: I respectfully request a waiver of documented consent for collecting data on students' demographic information, interaction patterns and their grades. I do not propose to seek any of this information directly from students. I will retrive data from stored records. A data file for analysis will be created from the existing data. The name of the participants will not be identified against the data and students identifiers/names will be discarded after creating a data file. The data file will be stored at the principal investigators' password protected office computer. The analysis and eventual reports will not include information linking specific data to a particular student.
(b) And, involves no procedures for which written consent is normally required outside of the research context.
Justification: I do not propose to seek any of this information directly from students. WebCT stores all student interaction data in the students tracking files. I will retrieve this stored information for this research. Students' demographic information will be obtained from the Director of Graduate Education in the department of Agricultural Education and Studies. Course

grades will be collected from the course instructor's records. All of the information that I plan to collect currently exists and is routinely available to faculty and staff. I simply wish to pull this data together and analyze it for the purpose examining relationships between student demographics, their interaction patterns, and their performance in online courses. Gaining access to this information for legitimate educational purposes would not require written consent outside of the research context

APPENDIX B: INSTITUTIONAL REVIEW BOARD PROTOCAL AMENDMENT

PROTOCOL AMENDMENT FOR PERSONNEL CHANGES ONLY

Institutional Review Board

RECEIVED
JAN 14 2011
By IRB

1. ADMINISTRATIVE

[General Instructions: Email the completed form to IRB@iastate.edu or mail it to IRB Administrator in 1138 Pearson Hall.]

Protocol Number: 10-116	Protocol Title: Learner Interaction Patterns and Student Perceptions towards Using WebCT Tools in Online Graduate Courses		
Principal Investigator: Kuna Aruna Sai	**Phone:** 515-708-7113	**Fax:** 515-294-0530	**E-mail:** askuna@iastate.edu

2. CHANGES IN NAMED PERSONNEL

[Refers to anyone who: obtains information about living individuals by intervening or interacting with them for research purposes; obtains identifiable private information about living individuals for research purposes; obtains the voluntary informed consent of individuals to be subjects in research, and studying, interpreting, or analyzing identifiable private information or data for research purposes. Changes in the principal investigator for a research study must be submitted on a new application.]

Person/s Deleted:

Person/s Added	Human Subject Training Date	Describe the individual's duties on the project and their expertise/qualifications and training related to those duties.	
		Project Duties	Specific Training & Expertise [outline expertise/qualifications to conduct protocol related activities]
√ Thomas Paulsen	8/27/2004	Verify/proof read focus group interview findings by comparing with the actual statements provided by participants in the interview transcripts.	Took qualitative research methods course (ResEv 580) and had expertise in reporting qualitative research findings. Proficiency in English. Lecturer in the Department of Agricultural Education and Studies

If you don't know your training date, contact the Office for Responsible Research for assistance.

OFFICE USE ONLY

APPROVAL SIGNATURE

☑ **All training requirements have been met.**

Kerry A Jacobs

IRB Reviewer Signature

January 14, 2011

Date

APPENDIX C: GUIDELINES TO PANEL OF EXPERTS

Panel of Expert Guidelines for the Focus Group Questionnaire Titled "Student Perceptions toward using Online Graduate Courses"

The objective of this study is to:

Identify online course tools which are perceived by students to be most useful in learning.

Please review all questions on the questionnaire and indicate whether each question should be (1) retained as is, (2) modified and retained, or (3) deleted. Please base your assessment on whether the questions are:

- Relevant to the objective of the study
- Clear and concise
- Free of technical jargon

Please write any suggestions directly on the questionnaire. After you have finished reviewing questionnaire, please circle one of the following responses:

A. The questionnaire is content and face valid
B. The questionnaire will be content and face valid after making the changes that I have recommended
C. The questionnaire is not content valid for the following reasons:

APPENDIX D: APPROVED FOCUS GROUP QUESTIONNAIRE

FOCUS GROUP QUESTIONNAIRE

a. Which online course tools are most useful for learning? Why?

b. Which online course tools are least useful for learning? Why?

c. Which online course tools do you use most often? Why?

d. Which online course tools do you use least often? Why?

e. Which online course tools are missing in your course? Why would these tools be important for learning?

f. What additional suggestions do you have for improving the functions of online course management systems?