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STUDENT AND INSTRUCTOR PERCEPTIONS OF FACTORS IMPORTANT FOR STUDENT SUCCESS IN ONLINE AND IN-PERSON ALGEBRA CLASSES AT SOMERSET COMMUNITY COLLEGE

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DISSERTATION

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Education in the College of Education at the University of Kentucky

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ABSTRACT OF DISSERTATION

STUDENT AND INSTRUCTOR PERCEPTIONS OF FACTORS IMPORTANT FOR STUDENT SUCCESS IN ONLINE AND IN-PERSON ALGEBRA CLASSES AT SOMERSET COMMUNITY COLLEGE

Online mathematics courses at Somerset Community College (SCC) have traditionally had a lower retention rate than their in-person counterparts. This study looked at online and in-person students at SCC in the courses *Intermediate Algebra* and *College Algebra*. Beginning of semester student demographics were considered to determine whether or not the online and in-person student populations were comparable. End of semester student demographics, retention rates, and grades on the final exams were examined to determine whether or not there were patterns among completer students. Finally, a survey was administered to students and instructors to determine their perceptions of several factors thought to influence student success and to determine areas of agreement and disagreement among these factors. Follow-up telephone interviews were given to instructors and students in order to identify areas that were not covered in the survey.

The results indicated that although online courses tended to attract older students, the online and in-person student groups were similar in terms of make-up. This was true both at the beginning and at the end of the semester. The in-person sections showed better results, both in terms of retention and grades on the final exams. The survey results were analyzed using Rasch analysis. This showed differences between students and instructors, most importantly in the areas of student self-efficacy behaviors and communication between instructor and student. These differences between students and instructors were generally exacerbated in the online sections indicating that these areas might have had an impact on the lower retention and grades of the online sections.

Keywords: Online mathematics, online mathematics retention rate, instructor perceptions, student perceptions, online success rate

____Richard Matika_____

_____11/15/2012_____

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Online delivery offers students the option of taking classes on their own schedule and from the comfort of their own homes. In addition to convenience issues, online courses allow students to pursue an education who might be unable to otherwise, thereby increasing student access to education. (Cohen & Brawer, 2008). Online classes eliminate transportation costs, potentially making them more cost efficient for the student (Ioakimidis, 2007). Online class delivery, therefore, has significant benefits for the student who is academically mature enough to deal with the isolation and autonomy of the online environment.

Online delivery is also cost effective for the college in certain situations. The major cost for online instruction is faculty (Smith & Mitry, 2008). With same sized enrollments, the cost of delivering online and in-person courses is approximately the same (Smith & Mitry, 2008). Somerset Community College (SCC) is a rural community college with a distributed campus. Its service area includes 11 counties with an area almost the size of the state of Connecticut with a population of just under a quarter of a million (Beaudoin, personal communication April 21, 2011; University of Kentucky, 2011; Wikipedia, 2012). The college, therefore, often has trouble with college level classes meeting class size requirements at some locations due to small enrollments. This leads to students not having the educational opportunities that they require. This lack of opportunity can be alleviated through the use of online courses. More students translates into more money for the college. This implies that online course delivery can help to

increase revenue at SCC. Given these facts, it is almost a given that online courses will continue to constitute a major portion of the mathematics offerings at SCC.

This study will consider the credit-bearing algebra courses offered at SCC. For the Spring 2012 semester, SCC is offering 12 sections of MT 120, Intermediate Algebra, in lecture format and 11 sections of MT 150, College Algebra, in lecture format (Somerset Community College, 2012). Simultaneously, the college is offering 3 sections of MT 120 and 4 sections of MT 150 online (Somerset Community College, 2012). This means that approximately 15% of the offerings of SCC's algebra sequence are online.

Problem Statement

In spite of the fact that approximately 15% of the algebra courses are offered online at SCC, there are no official guidelines, or best practices, for teaching mathematics courses online at SCC. There are training sessions available for Blackboard and the software publishers generally give several seminars per year on the use of their software, but there is no training in the pedagogy of online instruction. Instructors at SCC generally begin online teaching with little to no guidance. They are provided with a course syllabus and told which software package to use. They then develop the course on their own. Any guidance they do obtain is through informal discussions with colleagues. Although full-time faculty who are currently teaching online are always available to advise new online instructors, there is no information beyond word of mouth to assist the new instructors in developing their courses. There is an abundance of information transmitted informally about what is effective, but there is little in the way of information, other than anecdotal, as to what constitutes best practices for online instruction.

Overview of Effective Online Instruction Pedagogies

What constitutes effective online teaching pedagogies is not always clear and the literature for online mathematics instruction is particularly mixed. Some studies show no difference in grade point average (GPA) between computer-based and lecture format instruction (Dimirci, 2007; Gill & Greenhow, 2008; Jacobson, 2006; Larson & Sung, 2009). There are other studies that show that lecture format classes are superior to online courses when considering GPA (Karatas & Simsek, 2009; McClendon & McArdle, 2002; Wynegar & Fenster, 2009). Other studies show a GPA advantage for online classes over lecture format classes (Chow & Shutters, 2002; Clark, Hollstrom, & Millacci, 2009; Freeman, 1997; Zhang, 2005). Although grades are not a definitive indicator of learning outcomes, the research does imply that the results of online instruction may be dependent upon the specific instance under consideration and may not be universally applicable.

Considering computer-based learning systems, literature from Hawkes Learning Systems, in use at SCC, shows that computer-based homework using the Hawkes System is an effective way to increase student grades (Hawkes Learning Systems, 2010). Another study showed a constant lowering of exam scores for an online course when compared to the same course given in lecture format (Weems, 2002). There is, therefore, no consensus of the relationship between computer-based homework and exam scores.

Some research suggests student self-efficacy and academic maturity are the leading indicators of success in an online mathematics course (Chow & Shutters, 2002; Ironsmith, Marva, Harju, & Eppler, 2003; Spence & Usher, 2007; Wadsworth, Husman, Duggan, & Pennington, 2007). This has lead some researchers to conclude that a more rigorous screening of potential students is essential for student success in an online

format (Bambara, Harbour, Davies, & Athey, 2009; Chow & Shutters, 2002; Ironsmith, et al., 2003; Spence & Usher, 2007; Wadsworth, et al., 2007). However, such screening is impractical at an open-enrollment institution such as SCC. As long as the student can show the required COMPASS test scores, SCC is not allowed to further restrict their entry into a class.

Student engagement with other students is also considered an important aspect of student success in online courses and increases students' chance of passing a course (Swan, 2002). Some research considers that engagement with other students is particularly important since it is easier for students to feel detached in an online setting because there is less interpersonal contact (Morgan & Toledo, 2006). Therefore, it may be beneficial to provide the students with additional opportunities for engagement with other students in an online setting.

Student engagement with the instructor is also important. Swan (2002) lists student engagement with the instructor as one of the items that aids in student completion of an online course. It has also been postulated that online courses have such a high attrition rate because of the lack of attention paid to students by faculty in cyberspace (Carr, 2000). One possible explanation for this is that instructors utilize the same class pedagogies online as they do in lecture format (Littlejohn, 2002). Other experts in the field of online education consider that the effectiveness, or lack thereof of an online course is due to instructor factors (Zen, 2008). Thus in an online format, it is necessary for the instructor to find methods to engage their students.

There are different software packages for mathematics instruction. The package in use at SCC for MT 120 and MT 150 is the Hawkes Learning System from Quant Publishing. The data from the publishers are impressive. When used by Morehead State, the school claimed an 88% success rate in their courses (Hawkes Learning Systems, 2010). In this study, success was defined as passing the course (Hawkes Learning Systems, 2010). This increased success rate has resulted in a 21% increase in graduation rates (Hawkes Learning Systems, 2010). Hawkes Systems have other studies which show that their system resulted in a full letter grade improvement over classes that had traditional lecture format classes (Hawkes Learning Systems, 2010). Although these studies were conducted in-person and not in a distance learning environment, are from a biased source, and focus on grades obtained, this still indicates that the use of this system may be beneficial and should be further investigated.

Hawkes Learning System software uses mastery learning techniques. Mastery learning systems are those where the information to be presented is broken up into units and the student must reach a predetermined level of mastery for one unit before moving on to the next (Davis & Sorrell, 1995). Mastery learning systems have been shown to be an effective way of teaching algebra (Taylor, 2008). In a study comparing mastery learning to lecture format, implementing mastery learning achieved better results (Guzver & Emin, 2005; Mevarech, 1991).

Study Overview

Teaching is an art as well as a science. The teaching situation varies across different groups of students. Therefore, hard and fast rules concerning methods that lead to student success cannot be applied across all classes. This does not mean that there are not some methods that are generally more successful than others. SCC has a pool of instructors who came of age before the internet, thus, they may not have taken an online course themselves. Instructors new to the online environment will simply tend to transfer their existing teaching practices online (Engelbrecht & Harding, 2005). It is therefore important that we identify factors that help lead to student success online, so that these methods can be implemented.

This study will attempt to determine what the students and instructors see as the most important aspects of online and in-person format classes. Surveys will be given to both students and instructors. This is important, because students do not always have a clear view as to what is necessary for success and faculty might not know what is important for student engagement. Jacobson (2006) showed that students thought that computer-based instruction systems were actually more effective in teaching them than they actually were. In his study, even though exam grades showed no differences, students rated computer-based instruction as more effective. In a study by Anthony (2000), students and instructors had different perceptions of what factors increased a student's chances of success in a first year mathematics course. It is therefore important to get a balanced view of both instructor and student opinions.

There are many teaching methods that can affect the efficiency of online learning. Unfortunately, those studies that have produced answers one way or the other have been the result of scientific studies where the variables have been carefully controlled. In a real life educational scenario, there is little control over any of the variables. The teaching environment at SCC is a heterogeneous situation, which because of the open access policies of KCTCS, cannot be made more homogeneous. Some of the classes under consideration may consist of academically poor students while others excel academically. What are being sought in this study are those pedagogical structures that remain consistent across all performance levels, and that work in the loosely coupled system that is instruction at SCC.

For the Spring 2012 semester, SCC is offering 3 sections of MT 120 online and 4 sections of MT 150 online. These will form the online sections examined. The SCC North Campus is offering 4 sections of MT 120 in lecture format and 4 sections of MT 150 in lecture format. These sections will comprise the in-person sections examined. At the beginning of the Spring 2012 semester, the following demographic data will be collected for the classes being studied (a) student age, (b) part time or full time status, (c) gender, (d) program, and (e) GPA. These data are readily available from my local Institutional Research (IR) Office, once Institutional Review Board (IRB) permission is obtained from KCTCS (Beaudoin, personal communication June 7, 2010). These data will be analyzed to determine whether or not there are differences between the class makeup in the in-person and the online classes.

Toward the end of the semester, a survey will be given to all students enrolled in MT 120 and MT 150 online and at the SCC Somerset Campus. The survey will consist of a Likert type questionnaire designed to determine student attitudes about what factors they consider important to their success in class (see Appendix A). A similar survey will also be given to the instructors in these courses so that their responses can be compared to that of the students (see Appendix B). Since not all students will respond to the survey, this may introduce a bias into the survey results. However, a concern over non-response bias may not be warranted (Thorpe, 2002). The number of respondents will have to be monitored to ascertain whether or not this is the case. Since a monetary incentive will be offered for completing the survey, it is hoped that non-response bias will be kept to a minimum.

For those students who chose to participate in the survey, a demographic data will be collected, consisting of (a) student id, (b) student age, (c) part time or full time status, (d) gender, (e) program, and (f) GPA. These demographic data will be compared to determine whether or not the survey respondents form a representative sample. After the semester is over, a third group of demographic data will be collected, gathering the same information as the first collection. These data will be analyzed to determine whether there are any patterns in completer students.

After the final exam has been given, telephone interviews will be conducted consisting of open ended questions (see Appendix C, Appendix D, Appendix E, and Appendix F). The purpose of these interviews is to determine whether or not there are

areas in the survey that instructors and students considered important, but were not included in the questionnaire.

This study will determine (a) what factors students perceive as crucial to success in an online college algebra course, (b) what factors the students perceive as crucial to success in an in-person college algebra course, (c) what factors the instructors perceive as crucial to success in an online college algebra course, (d) what factors the instructors perceive as crucial to success in an in-person college algebra course, (e) the demographic differences, if any, between in-person and online sections of MT 120 and MT 150, and (f) the completion rates and final exam grades for online and in-person college algebra courses. The purpose is to allow instructors of these courses to determine more efficient ways of structuring them so that student success is improved.

Data analysis will consist of three phases. The first will be a comparison of the demographic data between online and lecture format classes to determine whether or not there is a significant difference between class makeup. Next, the Ministeps program will be utilized to conduct an analysis, and attempt to determine the similarities and differences between the survey groups (a) Online students, (b) In-Person students, (c) Online instructors, and (d) In-Person instructors. Finally, completion rates and final exam grades between online and in-person sections will be compared to determine if there is parity between the two modes of instruction. In the final phase, demographics, perceptions, and grades will be analyzed to determine if there are any correlations.

Significance of the Study

This study is intended to be of primary interest to instructors of MT 120 and MT 150 at SCC. Since SCC is a rural community college with a distributed campus, it is hoped that the results of this study would also be applicable to other distributed college systems.

This is intended to be an applied research study that will provide theories that can be immediately applied to improve online instruction at SCC. It will provide a list of areas that students and instructors feel are essential for success in an online math environment. Perhaps more importantly, it will also highlight differences between areas that students and instructors feel are important in online classes and areas that students and instructors feel are important in in-person classes. This will allow instructors to select more efficient online teaching strategies. It will also assist online instructors to transition their course plans from lecture format into online format.

In addition to identifying areas that both students and instructors feel are essential for success in online courses, this study will provide a demographic breakdown of both online in in-person sections so that it can be determined whether or not whether there are differing student composition in the different modalities, requiring different techniques to teach. Final exam scores and completion rates will also be compared. This will show whether or not there are grade and completion differences between the modalities that need to be examined.

Chapter Two: Literature Review

The literature concerning effective mathematics course structures, especially those mathematics courses taught though online delivery, presents conflicting evidence. Some studies show online delivery to be more efficient time-wise and to achieve better results than traditional in-person classes (Chow & Shutters, 2002; Taraban & Rynearson, 1998; Zhang, 2005). Other studies imply that online delivery is not living up to its promise of providing a comparable level of education to the student (Karatas & Simsek, 2009; McClendon & McArdle, 2002; Wynegar & Fenster, 2009). Yet other studies indicate that online and in-person classes are comparable in the results that they achieve (Aragon, Johnson, & Shaik, 2002; Neuhauser, 2002; Wynegar & Fenster, 2009). Taylor (2008), in a study of Intermediate Algebra students, some of whom learned the material on a computer-based mastery learning system and some of whom learned the material in a traditional classroom showed mixed results. Some of the students performed better in a traditional classroom setting while other students performed better learning the material via computer (Taylor, 2008). Therefore, the success of online courses may depend to a degree on the composition of the student body.

There does not appear to be a "one size fits all" solution to online college algebra course design, but this does not mean that there is not some commonality as to what makes an effective online course. There are some common themes concerning workable structures in online courses, just as there are in in-person courses. The purpose of this study is to help determine effective class structures for the online sections of MT

120 and MT 150 as taught at SCC so that the instruction of these courses may be improved.

Online Course Effectiveness

The effectiveness of a course is important for all concerned. Courses must be shown to be effective, since the integrity of a course is an important concern to all stakeholders (Mayes, 2001). For the students, a low quality course can impact their ability to successfully transition to the next level. For the institution, failure to ensure the quality of courses may erode the credibility of the institution and even result in problems when seeking accreditation (Yates & Beaudrie, 2009). The college must therefore ensure that their online classes are of comparable quality to their in-person classes, both for student progression and for accreditation purposes.

Advantages of In-Person Courses.

Studies have shown advantages for a traditional in-person format method of teaching. In a comparison of computer-based instruction, online, and traditional lecture formats in the teaching of college algebra at a community college, traditional in-person classes were found to not only have the highest final GPA for their students, but also a higher student retention rate (Wynegar & Fenster, 2009). They found that in-person sections had almost a half a grade point advantage over their online counterparts as well as a 9% lower failure rate (Wynegar & Fenster, 2009). Karatas and Simsek (2009) comparing university students in both in-person and online modalities in an instructional technologies course showed that students in a traditional lecture course achieved better results on exams. Perhaps a more important advantage for the in-person sections in this study was that when given another test over the material four weeks after the course

ended, the students from the in-person sections retained more of the material (Karatas & Simsek, 2009).

In-person courses often have lower drop out rates than their online counterparts (Zheng & Smaldino, 2003). Some sources indicate that the success rates for students in online classes range from 50% to 75%, which is lower than that of in person classes (Cohen & Brawer, 2008). A study of remedial algebra classes at Valencia Community College found that traditional lecture resulted in an approximately 20% greater retention rate than the same course taught using a self-paced computer learning system which mimicked an online environment (McClendon, & McArdle, 2002). Chow and Shutters (2002), studying online remedial mathematics courses at Valencia Community College at the same time as the McClenden and McArdle study, back up this 20% greater attrition rate of online courses compared to in-person classes. Other studies also back up this advantage in retention in favor of in-person courses of approximately 20% (Aragon & Johnson, 2008; Shieh, et. al., 2008).

Implementing online courses may also be more time intensive for the faculty. A study by Bender, Wood, and Vredevoogd (2004) indicated that online courses were more time intensive for instructors on a per student basis than comparable in-person courses. However, this study was conducted at a university where large class sizes were the norm. This might not be the case at rural community college with a distributed campus such as SCC, where class size tends to be smaller.

Advantages of Online Courses.

In contrast, there are other studies that indicate that online courses may be more effective than in-person modalities. At Valencia Community College, comparing online

and in-person modalities for a remedial algebra course, Chow and Shutters (2002) found that the online sections had higher GPA's, even though their retention rate was lower. They also found that while only 72% of in-person students passed the final exam, 100% of the online students did so (Chow & Shutters, 2002). This may be because only the stronger students survived until the end in an online setting. It also implies that the greater retention rate for in-person classes may be balanced by a greater pass rate online, which may make the two modalities more equal as regards eventual student success. According to Bandura (1997), students who lack self-efficacy beliefs in an area will avoid situations that would lead to social comparisons. This gives another possibility. Online courses may attract weaker students who wish to hide in the anonymity of an online setting. Another study comparing undergraduate students learning relational algebra in a traditional classroom environment or in a computer-based environment showed almost a 20% advantage in test scores for the computer-based learning environment (Zhang, 2005). Perhaps just as important, the students in the computer-based section were more satisfied with their learning experience (Zhang, 2005).

Online instruction can also result in higher retention rates than in-person instruction

A study of 100 and 200 level online and in-person courses at the University of Cincinnati showed on average only 77% of in-person learners were successful whereas 85% of online learners were successful (Clark, Holstrom, & Millacci, 2009). In this study success was defined as a grade of C- or better.

Computer-based systems can also be more efficient time-wise for students. Jacobson (2006), studied university students enrolled in a pre-algebra course. Jacobson

(2006) found that in some sections utilizing computer-based homework, students who spent the least amount of time on homework, had the highest average grades. This was not universal, but it does indicate that certain students may find a computer-based approach more efficient (Jacobson, 2006). Taraban and Rynearson (1998), in a study of computer-based instruction in an undergraduate psychology class found that traditional lectures resulted in a 7% grade point advantage over computer-based learning, but at the cost of a 124% increase in time spent. Thus, not only may some students learn more efficaciously utilizing computer-based systems, but they might also learn more efficiently. However, this is contradicted by a study by Rabe-Hemp, Woollen, and Humiston (2009) which indicates that students put more hours into study of the material in online classes. The actual situation in algebra classes at SCC will be investigated in this study.

Comparable Results for Both Modalities.

Other studies have shown similar results for both formats. Jacobson (2006) studied pre-algebra university students. The students were divided into those who did their homework on a computer-based system, similar to what is utilized for online instruction, the control group did regular paper and pencil homework (Jacobson, 2006). No significant differences were noted on exam grades between the two groups (Jacobson, 2006). Larson and Sung (2009) when comparing a Management Information System course taught in-person, in a mixed format setting, and online, found no significant differences in grades existed between the three modes of presentation. This result is supported by another study that showed there was insufficient evidence at the 95% confidence interval to support the claim that computer aided assessment increased student

scores (Gill & Greenhow, 2008). In a study of university physics students, there was no difference in final grades between computer-based sections and sections using a paper-and-pencil approach (Demirci, 2007).

McClendon and McArdle (2002), although their study showed a higher retention rate for traditional lecture in teaching remedial mathematics, found that there was no significant difference when the student's preferred mode of learning was taken into account. This is backed up in a study of college students by Neuhauser (2002), which showed no significant differences in grades or retention among students who were allowed to self select into online or in-person sections of the same course, taught by the same instructor.

It has also been noted that the initial benefits of computer-based instruction wear off once the novelty wears off, and differences in retention and success rates move towards parity (Cohen & Brawer, 2008). Thus any study comparing a computer-based and paper-and-pencil approach should take into account the student's prior experience with computer-based learning. Jacobson (2006) found that imposing computer-based homework on an otherwise coherent course structure did not help students on exams. There is even a website httpp://www.nosignificantdifference.org, whose purpose is to catalog articles that show no difference exists between the two modalities. Therefore, neither modality appears to have a clear advantage over the other.

Effective Teaching Skills Online Differ from Effective Teaching Skills In-Person

For better or worse, both styles of instruction are here to stay, and both provide unique environments for learning (Richardson & Newby, 2006). This provides a challenge for those instructors who teach online. In the absence of pedagogical

knowledge about effective online teaching techniques, new instructors will tend to simply transfer their existing teaching practices online (Engelbrecht & Harding, 2005). This does not always provide an efficient teaching environment in an online setting. Simply applying technology to an existing course structure does not result in an efficient course (Jacobson, 2006; Littlejohn, 2002). The technology must be intelligently applied in order to achieve the desired learning objectives. Littlejohn (2002) contends that one of the factors of poor online course design is the adherence of the academic faculty towards the passive forms of teaching and learning that they have been used to in the classroom. Instructors must change their teaching to a learner-centered style in order to maximize the effectiveness of online education (Fabry, 2009).

Different learning techniques are employed by students online, therefore, instructors must adapt their delivery methods to the new medium (Aragon, et al., 2002). Online courses are fundamentally different in their focus from in-person classes. Traditional classrooms are source-based, where the instructor is responsible for presenting the material, while online courses are receiver-based, where the student is responsible for accessing the information (Burch, 2001). This means that in in-person courses, the class revolves around the source, the instructor. In online courses, the course revolves around the receiver, the student. This implies a need to alter pedagogical structures to facilitate student success.

Teachers tend to teach in the manner that they enjoyed most when they were students, and for most teachers this is a source-based style (Barrett, Bower, & Donovan, 2007). Faculty also tend to equate presenting information with education (Moore, 1997). In a survey of online instructors at community colleges throughout Florida, although the

literature calls for a learner-centered approach, most instructors showed a preference for source-based practices (Barrett, et al., 2007). Online courses will have pedagogical problems if faculty simply takes in-person class structures, which typically revolve around the instructor presenting information, and translate them into an online, learner-centered environment (Burch, 2001; Mayes, 2001; Moore, 1997). Instead, online courses have to be intelligently designed to take advantage of the unique environment of the web (Burch, 2001).

Effective methods of transitioning from source-based to learner-centered instruction need to be implemented if online instruction is to be successful. An online learning environment is a mediated-learning environment, thus the goal of the instructor is to act as the facilitator to knowledge rather than the transmitter of knowledge through lecturing (Matthews-Lopez & Lopez-Permouth, 2002). Faculty need to be challenged to look at teaching from a different perspective when they teach online. Instructors also need to make sure that the content they are presenting is in a form that is easy to access in the online environment (Burch, 2001). This implies that as well as being subject matter experts, instructors must have some competency in presenting themselves on the web.

Different Learning Skills are Required Online

Students also have to adapt to new roles when they begin to take courses online. Students are generally used to taking a passive role in their learning, and do not always respond well when the responsibility for learning is placed upon them (Theil, Peterman, & Brown, 2008). This is hardly surprising, since they have generally come from an environment that rewards passively acquiring and then repeating information. Thus, some

means must be found to make the students take responsibility for their own learning. This is a completely new role for many students.

The situation is further complicated by the fact that students who are used to a highly structured environment may become confused and frustrated without specific guidance and that students used to self-directed, constructivist formats may not perform well when exposed to the highly structured drill often found in computer-based mathematics programs (Goyne, McDonough, & Padgett, 2000). The information needs to be presented in a manner that is accessible to the way the student is used to accessing information. As students gain additional experience online, they tend to shift into more constructivist learning behaviors, rather than surface modes of learning (Richardson & Newby, 2006). Students, therefore, must be guided through the transition phase. Not only does the material and method of presentation need to be considered, but also the student's level of experience with online learning.

Student self-efficacy is considered to be one of the leading indicators of student success in an online format (Chernish, et al., 2005; Ironsmith, Marva, Harju, & Eppler, 2003; Puzziferro, 2008; Spence & Usher, 2007; Wadsworth, Husman, Duggan, & Pennington, 2007). This has lead some researchers to suggest a pre-screening of potential online students to determine whether or not they have the skills needed in order to be successful online (Bambara, Harbour, Davies, & Athey, 2009; Ironsmith, et al., 2003; Spence & Usher, 2007; Wadsworth, et al., 2007). However, at SCC, if the student has the required scores for entry into the class, they cannot be denied admission. However, a beginning of course survey could be developed that could give the student a better

understanding of what is required for success in an online setting and use this to guide students toward an appropriate mode of instruction.

Student learning styles have also been shown to have an impact upon a student's ability to succeed in an online setting (Manochehri & Young, 2006). In a study by Manochehri and Young (2006) it was found that for in-person classes, student learning style was not a factor in student success, but for online courses, student learning style played an important part. In another study, after assessing students with the Felder and Silverman learning styles model, it was found that those students who were classed as reflective or sequential learners benefited the most from online delivery (Battalio, 2009). However, Neuhauser (2002) showed that learning styles did not have an effect on student success rates in online courses. Thus the effect of student learning styles on success in an online course is open to controversy.

Other student characteristics may also have an impact upon a student's success in an online format. It has also been shown that students with higher GPA's and more experience in online courses have a higher rate of completion in online courses (Aragon & Johnson, 2008; Dupin-Bryant, 2004). Another study indicated that high school GPA and math SAT scores were powerful indicators of student success in an online setting (Morris, Wu, & Finnegan, 2005). However, these are also indicators of success in in-person courses. It is not known whether or not they more strongly correlate with success in an online format.

Course Design

A clear and consistent course structure, frequent interaction with the instructor, and dynamic group discussion have been shown to be associated with successful online

courses (Swan, 2002). Students also desire a clear course organization and want all the information they need concerning course structures when they first access the course (Conrad, 2002). Youngblood, Trede, Franziska, and Corpo (2001) in a survey of postgraduate students who had taken online courses stated that the two top things that students wanted from an instructor were a clarification of grading (87%) and a clarification of course objectives (86%). In contrast to this only 60% of the students surveyed thought that the instructor did a good job of clarifying expectations and only 47% thought that they did a good job of clarifying grading (Youngblood, Trede, & Corpo, 2001). Online courses must also address student learning style differences, motivate the student, and encourage social interaction and reflection (Aragon & Johnson, 2008).

In an in-person format, the instructor can makes changes in the presentation of the material based upon real-time feedback from the students, who differ from class to class. By contrast, in an online setting, feedback from the students is asynchronous. This means that there will be a delay between problems that arise and the instructor's response. Therefore online courses require more careful planning in order to anticipate these problems than would an in-person section of the same course if they are to be effective.

According to Zen (2008) we must view the technology of online teaching simply as a tool. The tool does not determine whether or not the course will be successful. The idea that the use of high quality materials to present the subject is sufficient is a misconception (Mayes, 2001). Successful learning will occur when there is high quality support for the individual learner (Mayes, 2001). It cannot be assumed that because a high quality teaching system is being utilized that student learning is taking place. Once

again, a course structure that focuses on student learning is necessary. Since no two students are identical, the support an individual student needs will vary from student to student. This may be more difficult to effect in an online setting than in an in-person format due to the asynchronous nature of the communications.

The software package that is selected is important. It should provide multi-media presentations and learner-content interaction (Zhang, 2005). It has been shown that adult students prefer self-directed and self-designed activities where they are in control of the learning pace (Chernish, DeFranco, Lindner, & Dooley, 2005). Individual learning style differences can be accommodated through multiple representations of the same material, as well as by software that offers a degree of learner control (Goyne, et. al., 2000; Snelson, 2002). This means that whatever system is chosen, should offer a degree of learner control as well as several different ways of presenting the material to help support student success. Learners must also have access to a system that is easy to use and intuitive if learning is to be maximized (Zhang, 2005). So, the system chosen must also be user friendly.

Although student satisfaction does not always directly correlate with learning outcomes, there are also mixed results when it comes to how effective students view online instruction. Online students in the study by Rabe-Hemp, Woollen, and Humiston (2009) reported their class less favorably than did traditional in-person students. This is in contrast to another study, where online and lecture students were compared and students in both sections reported similar levels of satisfaction with the course (Karatas & Simsek, 2009). Jacobson (2006) showed that students using computer-based homework rated computer-based homework as more effective than traditional paper and pencil work, even

though this increased satisfaction did not equate to higher grades. Thurmond, Wambach, Helen, and Frey (2002) showed that student satisfaction is due to course structure alone and not to student characteristics. It therefore appears that the instructors as the course designers are in control of whether or not students are satisfied with their courses, just as they are in an in-person setting.

Littlejohn (2002) contends that designing an online course around content, and not around outcomes, results in a passive course that will result in surface learning. We therefore need to make sure whatever course we develop does not just present the content, but guides the student to, and accurately assess the outcomes that we want the student to achieve. In mathematics courses, this is generally accomplished by implementing a mastery learning approach. In a mastery learning system, a student must attain a certain level of proficiency in each area before they are allowed to move on to more advanced material. Student learning is therefore tied to outcomes rather than to content. Data relating to mastery learning systems in mathematics does indicate an increase in student achievement (Hawkes Learning Systems, 2010; Taylor, 2008). Studies from Hawkes (2010) showed that their mastery learning system produced better grades for students than traditional in-person methods. Taylor (2008), studying the use of ALEKS, another mastery learning system, among college freshmen, found that the use of the ALEKS system was beneficial.

Student Engagement with the Subject Matter

In order to be successful, students must become actively involved with the course material (Zen, 2008). A study from New Brunswick, Canada, has shown that online learners connect more with the course material than with colleagues or instructors

(Conrad, 2002). This makes engagement with the course software an important factor for student success. Advanced technology can provide students with richer and more dynamic learning environments (Taraban & Rynearson, 1998). This will aid in student engagement with the material. In the Hawkes system that is utilized for teaching MT 120 and MT 150 at SCC, students can view video of lectures, have the system read the text to them, be guided through the problems with a step by step tutorial, perform practice homework, perform homework for a grade, and take exams (Hawkes Learning Systems, 2010). Thus the student is presented with multiple avenues through which they can engage the material.

Student Engagement with the Instructor

Student interaction with the instructor has been shown to significantly affect student learning outcomes, both in in-person settings and online (Swan, 2002). In an in-person setting, the instructor is always present, by definition. In an online setting, the instructor must use alternate means to make their presence known. There is therefore a heightened need for instructor activity in projecting their presence in an online setting (Swan, 2002).

There are advantages for the online presentation of material. The use of the computer or other electronic means to present basic information frees the instructor in an online setting from presenting fundamentals and provides more opportunities for extended discussions (Bender, et al., 2004). This allows the instructor to spend their contact time with the students discussing the material in a deeper context, rather than devoting time to presentation and review, potentially increasing student/instructor interaction. A study at a Mid-Western university by Rabe-Hemp, Woollen, and Humiston

(2009) showed that students have greater interaction with their instructors in an online setting than in an in-person setting. However, other researchers point out that feeling isolated is a major cause of student stress when taking an online course (Shieh, Gummer, & Niess, 2008). Morgan and Toledo (2006) point out that students tend to feel detached in an online setting. An instructor's online presence and accessibility appear to be important factors affecting student satisfaction with the online experience (Zen, 2008).

However, other studies contradict these findings and show that isolation is not the major factor in student stress rates (Hara & Kling, 2001). Hara and Kling (2001) indicate that the causes for student stress online fall into two main categories (a) technical issues, and (b) communication issues with the instructor. This leaves doubt as to whether student stress is due to isolation, or simply poor communications with the instructor. In a study on student non-completers 46% indicated technology and communications issues were the reason for dropping the class (Aragon & Johnson, 2008). A study from Perdue University indicates that a student's sense of community is increased only by student to student interaction, and that interaction with the instructor may not foster a sense of community for the student (Drouin, 2008). Further, a study from New Brunswick, Canada, indicates that the students view the online instructor in a functional rather than an instructional capacity (Conrad, 2002). Therefore, although contact with the instructor is important, the nature of that contact has changed from that required in an in-person setting.

Teaching presence promotes deep learning for the student, whereas instructor interaction does not (Garrison & Cleveland-Innes, 2005). Therefore interaction must be carefully structured, and not just communication for communications sake (Garrison &

Cleveland-Innes, 2005). Students did want a clarification of course objectives and grading policies at the beginning of the course (Youngblood, Trede, & Corpo, 2001). Students also wanted to see a message from the instructor when the course started (Conrad, 2002). This implies that the role of the online instructor may have changed from information presenter, to online facilitator.

This need for instructor presence online has placed a burden on instructors who only have experience teaching in a classroom setting (Crawley, Fewell, & Sugar, 2009). Experienced classroom instructors who transition to online teaching are often inclined to maintain teaching elements that may have worked well in the classroom, but are not necessarily effective in an online setting (Shieh, et al., 2008). The transition from the classroom setting to the online one has been described as daunting for many instructors (Crawley, et al., 2009). Thus, what has worked for a successful instructor in the past may fail miserably when translated into an online scenario, and new avenues for interaction with students must be utilized.

The online instructor must be able to evaluate the role he or she plays in teaching and learning (Shieh, et al., 2008). It is essential that the online instructor establish personal contact with their students (Carr, 2000). In order to be successful, online instructors must make frequent use of e-mail, respond to their students promptly, hold regular office hours including virtual office hours, and develop personal touches to stay in touch with their students (Carr, 2000). Effective online instructors pay as much attention to the social and emotional aspects of communication as to content (Zen, 2008). It has been shown that simply sending e-mails to students resulted in higher perceived levels of social and academic support, as well as better academic coping strategies on the

part of students (Heiman, 2008). The online instructor must make use of the technology available for asynchronous communication with their students in order to make up for the lack of presence that occurs in an online setting.

It has been shown that social presence is a key factor for predicting success in online courses (Shieh, et al., 2008). In a classroom setting, course completion is improved when students feel that they are individually known to the instructor (Vaden-Goad, 2009). It appears that this also holds true in online courses. In one study of student motivation of undergraduate students in Texas, it was found that motivational e-mails increased student motivation to a level on par with that of in-person students (Huett, Kalinowski, Moller, & Huett, 2008). The fact that there is no physical instructor presence places an additional burden on the instructor and their development of alternative communication strategies. Thus, although it has been shown that students require an instructor presence online, the nature of the student's relationship with the instructor appears to be fundamentally changed.

Student Engagement with Other Students

A student's engagement with other students is considered to be an important part of learning. In a study of a traditional in-person remedial mathematics class, it was found that group work increased the pass rate by 22% (Dees, 1991). Students who work in groups in an online setting also tend do better than those students who choose to work alone (Allen, 2001). This may be because students feel detached in an online setting (Morgan & Toledo, 2006). Students want the opportunity to talk to other students like they do in face to face classes (Moore, 1997). However, Graham and Scarbrough (2001) found that 1/3 of the students questioned preferred not doing group work and that

independent learners might resist a collaborative learning environment. Therefore, there are conflicting student desires when it comes to the subject of group work.

A student's sense of community may be important for the success of an online student (Wighting, Liu, & Rovai, 2008). Online instructors should therefore explore avenues for creating student opportunities for collaborative work. However, a study from Perdue University has shown that a student's sense of community had a bearing on student satisfaction, but no bearing on course grades or retention rate, while some students felt that the development of a sense of community was unnecessary in an online course (Drouin, 2008). Therefore, student engagement with other students is another variable that appears to be context dependent.

Littlejohn (2002) believes that students develop an understanding of the course material through the medium of discussion, and that online courses often fail to take this social aspect of education into consideration. Research into the problem solving behaviors of groups indicates that they engage in self-monitoring behaviors that are commonly associated with subject matter experts throughout the problem solving process (Yates & Beaudrie, 2009). Therefore, student performance may increase if they are allowed to work in groups. Mayes (2001) contends that students engaged in group work think about the subject matter at a deeper contextual level than they would if they were working alone. Crawley (2009) tells us that conversations around intellectual topics stimulate others to think intellectually. This implies that the deeper thinking that we wish to develop in our students can be improved through the use of group work. However, there is also evidence that forcing group work benefits lower performing students at the

expense of better performing students (Hooper, 1992). As with most other variables looked at there does not appear to be a "one-size-fits-all" solution.

An advantage for online courses is that, asynchronous, computer-based group work appears to be even better at fostering group discussions than other formats. Students perceive online discussions to be more equitable than traditional classroom discussions (Baglione & Nastanski, 2007; Swan, 2002). This may be because no one has the ability to dominate the conversation in online asynchronous communication. Baglione and Nastanski (2007) indicate that this may be due to the physical anonymity present in the online format. They also claim that another benefit of this type of discussion is that it allows time for research and reflection before answering a question (Baglione & Nastanski, 2007). It has been suggested that because of the time for reflection, introverts might be able to communicate more effectively in an asynchronous online format (Neuhauser, 2002). Crawley (2009) also found that online discussions extended intellectual engagement for the students beyond the limitations of the typical classroom environment. Computer mediated communication encourages experimentation and the sharing of ideas, as well as increasing participation (Swan, 2002). Online asynchronous discussions may actually encourage participation by reflective learners who would not otherwise contribute in an in-class environment (Rabe-Hemp, et al., 2009). Students can also increase their effectiveness at group learning by being taught specific group learning techniques (Hooper, 1992). Therefore, computer -based asynchronous communication may be an excellent format for group work.

However, care must be exercised in the formation of online groups. The instructor must carefully structure the online environment to provide for successful peer interactions (Swan, 2002). Student ability levels also have to be considered when forming online groups. In a study of group work by high and average ability students, it was found that high ability students completed instruction more efficiently when grouped with other high performing students, while average ability students performed better when placed in heterogeneous groups (Hooper, 1992). We therefore have the unenviable position of being forced into choosing whether to establish structures that are of the greatest benefit to the better performing students or course structures that are of more benefit to average performing students

Feedback

Timely and constructive feedback of a student's work is considered to be a key factor affecting the quality of learning (Zen, 2008). Yates and Beaudrie (2009) consider immediate feedback to be an advantage of computer-based assessment. Not only can online feedback be instantaneous, but it can also contain detailed feedback of student errors (Angus & Watson, 2009). Immediate and detailed feedback is often considered to be one of the benefits of computer-based instruction, whether utilized in an online or an in-person setting. Therefore computer-based assessment should be an ideal avenue through which to facilitate student learning no matter what modality it is employed in.

The feedback must be in a form that allows students to learn from mistakes and to correct their errors (Gill & Greenhow, 2008). Mastery learning techniques, where students must repeat the material until achieving a mastery level score, have been shown to increase student ability in mathematics (Mevarech, 1991). However, the impersonality

of computerized assessment may hinder some online students (Yates & Beaudrie, 2009). Therefore, it is important that the type of feedback be beneficial for the students. The Hawkes system utilized for teaching MT 120 and MT 150 at SCC, does provides individualized feedback for the student and provides this information to their instructors, so that they may monitor the individual student's progress.

Students in most math classes are subjected to exams. Math classes at SCC are no exception. The stated reasons for examinations are to test the student's knowledge, and to point out weaknesses to the student so that the student may correct their problem areas. Frequent feedback is an important factor in the success of a course in an online environment (Gaytan & McEwan, 2007; Vaden-Goad, 2009). When assessing students in order to improve their performance it has been found that frequent assessments that count for less of the final grade are more effective than less frequent assessments that count for more of the final grade (Angus & Watson, 2009; Sirvani, 2009). Perhaps more importantly, frequent testing has been shown to improve student performance regardless of their scores on each individual assessment (Angus & Watson, 2009). Computerized testing reduces the burden of student assessment for instructors by automating the assessment process and communicating student assessments to instructors (Johnson & Green, 2006). It therefore seems to be an ideal medium through which to implement frequent, low-stakes testing.

Frequent testing has other beneficial aspects for the student as well. It has been shown to increase student engagement and to reduce test anxiety (Sirvani, 2009). Both of these have positive aspects for the student. Computerized testing has been shown to reduce testing time in some studies (Yates & Beaudrie, 2009). However, other studies

show that computer-based testing increases the time needed for completion (Bugbee Jr., 1996). This is an area that requires further investigation.

Some students prefer computer-based administration of exams believing they are easier and less boring than their paper counterparts (Johnson & Green, 2006). However, other studies show that students tend to do better on paper-and-pencil exams than on computer-based exams (Bugbee Jr., 1996; Weems, 2002). Computer-based exams have the following advantages (a) students have immediate access to the results, (b) it allows for a detailed assessment of student performance to be made more easily available to the student, and (c) the previous advantages promote a more student-centered learning environment (Gaytan & McEwan, 2007).

The administering of exams for online courses is a subject of debate among faculty. All online mathematics courses at SCC have a proctored final examination. Instructors are allowed at their discretion to have one other proctored exam during the course of the semester. All other exams, if any, are given, are un-proctored. Some instructors argue that since online exams are not visible to the instructor, they invite cheating and should therefore be proctored (Glaves, 2009). It is true that lack of instructor control is one of the disadvantages of online assessment (Yates & Beaudrie, 2009). However, whether this is actually a problem or simply a holdover from a traditional in-person mindset is open to debate.

In a study at the Mathematics department at the College of Southern Nevada, course grades were determined by exams given in one of two formats (a) proctored, or (b) totally online (Yates & Beaudrie, 2009). The results showed that no significant difference between grades earned existed in courses with proctored exams and in courses where

exams where given totally online (Yates & Beaudrie, 2009). This indicates that assessing totally online may be a valid means of student assessment, otherwise grade inflation would be apparent in those classes that were assessed totally online (Yates & Beaudrie, 2009).

Outcomes

In spite of the widespread use of online delivery methods for teaching mathematics there is concern about course quality and efficacy. Colleges in Nevada were advised to use rigorous outcome measures when assessing program effectiveness of online courses in order to validate instructional effectiveness and to retain accreditation (Yates & Beaudrie, 2009).

The success rates of students engaged in online instruction is also a concern. Some sources state that the success rates of students in online courses ranges from 50% to 75%, which is less than that of traditional classes (Cohen & Brawer, 2008). Another study indicates an online dropout rate 15% to 20% higher than in traditional classes (Shieh, et al., 2008). Distance learning courses have a high drop-out rate in comparison with conventional courses (Zheng & Smaldina, 2003). Perhaps one of the most interesting results comes from Valencia Community College showed that while an in-person developmental mathematics class had a 60% student success rate and the online section of the same class only had a 38% success rate, of the students who made it to the final exam, only 72% of the in-person students passed while 100% of the online students passed the final exam (Chow & Shutters, 2002). Chow and Shutters (2002) suggest that this is because students in online courses have a tendency to self select, with only the strongest students making it to the end of the course.

Other researchers have concluded the same thing. Taylor (2008) concluded that there is no "one size fits all" solution. Some students perform best in a computer-mediated environment and some students perform better in traditional in-person classes. He concluded that instructors must evaluate the student under consideration when deciding on an appropriate class type. Others have also found that while learning with computers is highly effective for some students, it is also ineffective for others (Hativa, 1988).

Overall, there is evidence of benefits when utilizing computer-based systems. Computer-based practice has been shown to substantially raise achievement scores in mathematics (Hativa, 1988). A study utilizing MyMathLab instead of traditional paper-based homework showed that students raised their success rates by approximately 20% (Kodippili & Senaratne, 2008). Thus in spite of the risks, there are also obvious advantages to delivering instruction via computer.

Computer-based lessons may also be to be more effective time wise than traditional in-person lessons. In a study of an undergraduate psychology class it was found that traditional lecture had a 7% increase in grades, but required an increase of 124% in time (Taraban & Rynearson, 1998, Spring). Jacobson (2006) studying pre-algebra classes at the university level, found that in some cases, students were able to attain higher exam grades with less homework time using a computer-based system rather than traditional paper and pencil approaches. This implies a significant efficiency advantage for computer-based learning. However these results have been contradicted by others (Rabe-Hemp, Woollen, & Humiston, 2009).

In a study that looked at computer-based versus paper-and-pencil testing, students felt that the computer-based questions were easier even when they were more difficult (Johnson & Green, 2006). This implies that students may be more motivated answering computer-based than paper-and-pencil problems (Johnson & Green, 2006). However, a study from Ohio State University has shown students do not comprehend material presented on the computer screen as well as they comprehend printed text (Ohio State University, 2000). This coupled with the findings by Johnson and Green (2006) that students found computer-based questions easier, leads to the question as to whether or not computer-based tests are really easier, or students just assume them to be because they are missing some of the information presented.

Summary

Online courses offer the student flexibility and access that are unavailable in traditional in-person courses. For a certain type of student, computer instruction appears to result in better performance. Online classes are cheaper for a college to implement in certain settings, allow rural students access to classes that would otherwise be unavailable, and are an ideal solution to drawing in revenue from beyond the traditional service area.

Opposed to these advantages are some disadvantages. Even though some students perform better in an online setting, there are others who do not do well without the structure that traditional in-person classes provide. Because of the lack of personal contact with the instructor, students are isolated, and thus more likely to become

disconnected. There are also questions of quality associated with online instruction and assessment.

Online education is a relatively new area of teaching, one that presents challenges but also provides opportunities different than traditional in-person classes. We are still in an experimental phase in determining what works and what does not. Our standard approach up to this point has been to take traditional in-person approaches and then to modify them to meet the demands of this new environment. This might not be the most efficient way to proceed. We need to focus on the outcomes that we want to achieve, rather than on the methods we utilize to achieve this goal if we wish to maximize the potential of online education.

The literature suggests that there are some commonalities for a successful online course. Some of the factors that provide for student success include (a) student engagement, (b) instructor accessibility, (c) clear course goals, and (d) an easy to use software interface. However, when we look at how to implement these factors, there seems to be variation in the literature. This implies that although we have a set of guiding principles, how to apply them is situation dependent and will vary from institution to institution, and even from class to class.

After reading through the literature, two questionnaires were developed (a) for students taking online classes and in-person classes, and (b) For instructors teaching online and in-person classes.

Table 2.1. Justification for Student and Instructor Questionnaires

Questions for Both Modalities Student Questions/Instructor Questions	References or Justifications
It is necessary to be motivated to learn the material in order to be successful in this class. / It is important that students are motivated to learn the material in order to succeed in this class.	Bandura, 1997; Whiting, Liu, & Rovai, 2008
I was motivated to learn the material presented in this class. / My students were motivated to learn the material presented in this class.	Bandura. 1997; Whiting, Liu, & Rovai, 2008
At the beginning of the semester, I was confident of my ability to succeed in this class. (students only)	Bandura, 1997; Chernish, DeFranco, Lindner, & Dooley, 2005; Ironsmith, Marva, Harju, & Eppler, 2003; Puzzifero, 2008; Spence & Usher, 2007; Wadsworth, Husman, Duggan, & Pennington, 2007
After taking this class, my confidence level in mathematics has increased. (students only)	Richardson & Newby, 2006
Regular homework assignments are important for success in this class. / Regular homework assignments are important for success in this class.	Hawkes Learning Systems, 2010; Gayton & McEwan, 2007; Mevarech, 1991; Taylor, 2008; Yates & Beaudrie, 2009; Vaden-Goad, 2009; Zen, 2008; Zhang, 2005
How many hours a week on average did you spend on homework. / How many hours per week did you expect your students to spend on homework.	Rabe-Hemp, Woollen, & Humiston, 2009

Table 2.1, (continued).

The Hawkes System helped me to learn the material necessary for this course. / The Hawkes System helped my students to learn the material necessary for this course.	Hawkes Learning Systems, 2010; Mevarech, 1991; Taylor, 2008; Zhang, 2005
The exams in this course accurately measured my abilities. / The exams accurately measured my student's abilities.	Mayes, 2001; Yates & Beaudrie, 2009
Interaction with the instructor is important for success in this course. / Interaction with the instructor is important for success in this course.	Hara & Kling, 2001; Littlejohn, 2002; Shieh, Gummer, & Niess, 2008; Swan 2002; Zen, 2008
My instructor was accessible. / I was accessible to my students.	Hara & Kling, 2001; Littlejohn, 2002; Swan 2002; Shieh, Gummer, & Niess, 2008; Zen, 2008
I sought help from my instructor whenever I did not understand a concept. / My students sought my help when they did not understand a concept.	Bandura, 1997; Wadsworth, Husman, Duggan, & Penington, 2007
It is important that a course have clear goals at the start of the semester. / It is important that a course have clear goals at the start of the semester.	Conrad, 2002; Youngblood, Trede, Franziska, & Corpo, 2001
This course had clear goals at the start of the semester. / This course had clear goals at the start of the semester.	Conrad, 2002; Youngblood, Trede, Franziska, & Corpo, 2001
It is important to work with other students to help learn the material. / Working with other students is important to help students learn the material.	Allen, 2001; Aragon & Johnson, 2008; Crawley, 2009; Dees, 1991; Drouin, 2008, Littlejohn, 2002; Moore, 1997; Swan, 2002

Table 2.1, (continued).

I had sufficient opportunities to work with other students on the material. / My student's had sufficient opportunities to work with other students on the material.	Allen, 2001; Aragon & Johnson, 2008; Dees, 1991; Drouin, 2008; Littlejohn, 2002; Mayes, 2001; Moore, 1997
I feel that my instructor took an interest in my success (students only).	Carr, 2000; Heiman, 2008; Huett, Kalinowski, Moller, & Huett, 2008; Vaden-Goad, 2009; Zen, 2008
I would have preferred more interaction with my instructor. / I had sufficient interaction with my students.	Hara & Kling, 2001; Shieh, Gummer, & Niess, 2008; Zen, 2008
The pace of the course was much too slow/too slow/about right/too fast/much too fast. / The pace of the course was much too slow/too slow/about right/too fast/much too fast.	One of the most frequent student complaints.
I prefer taking classes in which modality. / I prefer teaching classes in which modality?	Jacobson, 2006; McClendon & McArdle, 2002; Neuhauser, 2002; Zhang, 2005
I have had (numeric answer) online courses before (students only).	To provide a baseline for the other questions

Rasch Analysis

The major portion of this research project is a survey measuring student and instructor perceptions of factors that many consider to be important for student success in college algebra in both online and in-person modalities. The analysis of these perceptions presents several challenges. The responses to most of the survey items will be in the form of a 5 point Likert scale. This presents several challenges when analyzing the data. First,

Likert scales do not provide interval data, but rather ordinal data (Mueller & Bradley, 2009). Therefore, the data will consist of a set of rankings for each item in the survey. There will be an order for the rankings, but it will not be known how magnitude changes between them. For example, whether selecting *strongly agree* over *agree* shows the same level of change as selecting *disagree* over *strongly disagree*. What is desired is to create a unit of measurement that will remain the same across the operating range of the variable (Andrich, 1988). In other words, the ordinal data needs to be transformed into interval measures.

The Rasch model allows the construction of linear measures from ordinal data (Grangwer, 2010; Wright & Linacare, 1989, Wright & Stone, 1999). It does this by utilizing a logarithmic transformation to change the percentage data of the responses into a scale of log odds ratios or logits, which form an interval scale (Bond, & Fox, 2007).

Another advantage is that Rasch analysis utilizes this logarithmic transformation to place both the persons and the responses in the form of linear measures on the same scale (Bond, & Fox, 2007). Critics of the Rasch model, sometimes contend that this is a weakness of the model, since it places everything on the same scale and does not permit each item to have a separate discrimination (Rasch Model, 2011). However, since the purpose of this survey is to compare perceptions across modes of instruction and among different groups of respondents, this property is actually as an advantage in this case, and necessary for this project.

A problem with classical test theory, as applied to a Likert type survey, is that it assumes that the items on the survey are of equal importance, implying no

interdependence among them (Mueller & Bradley, 2009). However, it can be assumed that the factors that are being measured are not all of equal importance, since the purpose of this survey is to determine which factors are perceived as most important. It is also fairly certain that the items are interdependent, although the extent of this interdependence is unknown. Because of the way it analyzes items, Rasch analysis possesses a characteristic know as parameter separation (Bond, & Fox, 2007). This means that the item scores are be analyzed independently from other items and from the respondents. The analysis will allow the items to be examined separately and placed along the same scale, thereby showing which items the students and instructors perceive as most important and which are perceived as least important without worrying about interdependencies between items (Bond, & Fox, 2007; Royal & Bradley, 2008). Similarly, there are five groups in the survey (a) online students, (b) in-person students, (c) first-time online students, (d) online instructors, (e) in-person instructors. Utilizing parameter separation to look at the survey respondents and placing them on the same rating scale will be a great help in this situation.

Rasch analysis has another advantage, called the invariance principle. This property makes the item rating independent of specific samples within standard error estimates (Bond, & Fox, 2007). Basically, this means that the transformation that places the items along the logit scale should keep the items in the same relation for subgroups of the group of respondents, therefore the results are not as tied to a specific sample as they would be with other methods of analysis. This means that I can use Rasch analysis to identify where the relationship between the items and respondent groups fails to hold, and

therefore identify items where there is disagreement between the groups. This is a great advantage when trying to draw general conclusions that will apply across all classes.

Rasch analysis deals with unexpected responses by its use of what are called "fit" statistics. Rasch analysis calculates infit and outfit values for data items and respondents (Bond, & Fox, 2007). Infit implies that the data or person fit the model more closely than is expected, while outfit implies that the data or the respondent vary more from the model than would normally be expected (Bond, & Fox, 2007). In both cases, fit statistics provide a useful tool for helping to identify problem questions or respondents. Unlike most statistical methods, Rasch analysis attempts to fit the data to the model rather than the model to the data (Bond, & Fox, 2007). Therefore poor fit in an item implies that the data for that item are not fitting the model and therefore the validity of the item is suspect. It can also be assumed that there will be a certain amount of error in the data due to the different interpretations that the survey respondents place on each item. Rasch fit statistics will help to determine whether or not this error is sufficient to cause a loss of confidence in the item (Bond & Fox, 2007; MacAllister, 2008; Wright & Linacare, 1989).

The use of Rasch analysis will therefore take the ordinal data and transform it into linear measures. It will place the items in the survey and the respondents on a common scale so that they can be effectively compared. Rasch fit statistics will also allow the identification of potential problem items or respondents. Therefore Rash analysis is an ideal method to employ for this part of the research.

Chapter Three: Methods

This research project compared online and in-person sections of MT 120 and MT 150 at SCC across several areas in an attempt to improve the delivery of these classes. This project considered (a) the demographics of online and in-person sections of MT 120 and MT 150, (b) student and instructor opinions of factors important for student success in online and in-person sections of these courses, (c) grades on the final exam as well as completion rates for in-person and online courses, and (d) the results of telephone interviews of instructors and selected students about what was most beneficial or detrimental in each modality. This project is intended to be applied research, or, hopefully, the first stage of an action research project. That is, a project that is designed to generate theories that will be applied to improve the teaching of mathematics at SCC (McMillan, 2008). It did not attempt to quantitatively prove or disprove the theories generated.

The collection of this data was approved by the University of Kentucky IRB, IRB number 11-0848-P4S. Since this research involved students at Somerset Community College, research approval was also obtained from the KCTCS Human Subjects Review Board.

The data for this project were collected during the Spring 2012 semester. The classes under consideration were all sections of MT 120 and MT 150 taught online at SCC (except for the section being taught by me, to avoid a conflict of interest), and all sections of MT 120 and MT 150 taught in-person on the Somerset North Campus of SCC. Although Somerset has multiple campuses and centers, data collection for in-person sections was restricted to Somerset North Campus because homework for these

courses at Somerset North Campus is performed utilizing the Hawkes Learning System. This may, or may not be the case at other campuses or centers. The online sections utilize the Hawkes Learning System for homework, thus providing continuity across groups.

All sections of MAT 120 and MAT 150 utilized a common syllabus, therefore the same material was covered. There was also a common, proctored final for both modes of instruction. Since the survey was restricted to the Somerset North Campus, homework was performed in a similar manner utilizing the Hawkes Learning System. The difference between the modes of instruction was that the online sections learned the material using the Hawkes Learning System, while the in-person sections had lectures from their instructors in addition to the instructional material available through Hawkes. The in-person students also had face to face access to their instructors if they had difficulty with the material. This was not the case for the online students, especially those who had another KCTCS institution as their home campus.

For the Spring 2012 semester this consisted of 3 sections of MT 120 and 3 sections of MT 150 online, and 4 sections of MT 120 and 4 sections of MT 150 in in-person. Since I was teaching one of the online sections of MT 120, this section was removed from the study to avoid conflict of interest. Being an instructor for one of the courses allowed me to observe the conduct of these courses and the administration of the final exams from an insider perspective while not affecting the data gathered. This left 2 sections of MT 120 and 3 sections of MT 150 under consideration for the online sections. This discrepancy in numbers was considered acceptable because it allowed the sampling of all online courses and all in-person courses at Somerset North Campus, thus helping to reduce sampling error.

Demographics

For the Spring 2012 semester the following data were gathered for students in this study group (a) class, (b) student age, (c) part time/full time status, (e) student gender, (f) program, and (g) GPA. This information was obtained from the SCC database. During the final weeks of the semester a Survey Monkey questionnaire was sent to the students and the instructors in the classes under consideration (See Appendix A and Appendix B). The Survey Monkey questionnaire contained a consent statement informing students and instructors of the purpose and risks of the study as well as its voluntary nature. For those students who agreed to participate, the following demographic information was gathered (a) student id, (b) class, (c) student age, (d) part time/full time status, (e) student gender, (f) program, and (g) GPA.

At the end of the semester, the same non-identifiable demographic information was collected that was collected at the beginning of the semester with the addition of information on whether or not the student withdrew or not. This was to show whether there were any patterns in the students who were retained throughout the semester as well as indicating whether or not the survey respondents were representative of the actual classes under consideration.

For student age, the number of students and the percentage for the following ranges were ascertained (a) Under 18, (b) 18-19, (c) 20-21, (d) 22-24, (e) 25-29, (f) 30-34, (g) 35-39, (h) 40-49, (i) 50-64, and (j) 65 and over. These ages were chosen because they are the current age breakdowns reported by the college (Beaudoin, personal communication September 12, 2010). Age, part time/full time status, gender, program,

and GPA were analyzed. The purpose of this part of the study was to determine the differences, if any, in demographics between online and in-person students.

Perceptions of Factors Important for Success

At the end of the semester, surveys, (See Appendix A and Appendix B) were distributed to students and instructors of the classes being investigated in this study. The purpose of these surveys was to determine student and instructor perceptions of some of the items that contribute to student success in MT 120 and MT 150.

Student Surveys.

At the end of the semester, the students were emailed a link to the Survey Monkey questionnaire. (See Appendix A). The students were informed that completion of the survey would qualify them for a drawing for a $25.00 gift certificate to Walmart. They were informed that their participation was voluntary, would in no way affect their class grades, and that their responses would remain confidential. Although the students were tracked by their email addresses, their responses were kept on either a locked computer in a private office or a password protected flash drive. Any paper copies were kept in a locked filing cabinet in a private office. Once all the semester's data were gathered, the students were assigned a confidential identifier and all the original data with the identifying information was destroyed. This allowed the tracking of the students through the course, yet maintained a degree of confidentiality.

Students were asked at the completion of the survey to give their permission for a follow up telephone interview that lasted approximately 5 minutes. They were informed that their responses would remain confidential and that participation was entirely voluntary. They were advised that successful completion of the telephone interview

section of the project would qualify them for a drawing for a $25.00 gift certificate at Walmart. The contact information obtained was removed from the survey data and stored on a separate file in a secure location. Once the surveys were completed, the contact information was destroyed.

The limitations of gathering these data revolved around the response rate to the survey. In both the in-person and online sections, only those students who were motivated enough to take the time to go to the survey had their perceptions counted. This may have introduced a bias into the data. However, the non-response bias of a survey questionnaire presented in this manner may not be a significant concern (Thorpe, 2002). The responses to the survey were monitored to determine whether or not this was the case. It was also hoped that the use of a monetary incentive would increase the response rate. However, since both in-person and online students were presented with the survey in the same fashion, it was hoped that comparable response patterns between the two presentation modes would be realized, which appeared to be the case. The use of Rasch analysis fit statistics also helped to identify whether or not non-response bias was a problem.

Instructor Surveys.

Instructors were presented with an email link to the Survey Monkey survey at the same time as the students were (See Appendix B). They were also notified that their participation was voluntary and that they could quit at any time. All instructor responses were recorded using an identifier which indicates which mode, online or in-person, they were teaching in. This served to identify instructor responses across the two modes of instruction, while maintaining a degree of confidentiality. If an instructor was teaching in

both modalities, they were be given a survey for each mode. Likewise, since the surveys were sent to instructors in both sections via email, it was hoped that comparable response patterns would be obtained between both in-person and online groups. As with the students, this appeared to be the case.

Although it might have been desirable from a research standpoint to include a third category for instructors teaching in both modes, this was not done because with the number of instructors teaching in both modes at SCC, confidentiality could not be adequately maintained.

Data Analysis of Perception Surveys

Once the data were collected via Survey Monkey, it was analyzed using Rasch analysis utilizing the Ministep program. The Ministep program is a reduced form of Winsteps that retains full functionality, but is limited to 25 items and 75 cases, which is sufficient for this project (Winsteps, n.d.). This indicated what factors students and instructors perceived as most important for success in both online and in-person settings. More importantly, it allowed the determination of whether or not there were areas where the perceptions of the factors needed for student success markedly differed. These items were then examined individually.

The Winsteps Help Manual recommends starting analysis with the number of JMLE iterations set to 0 to obtain a rough estimate, then to 10 or 15 before deciding if more iterations would result in a better model (Winsteps, n.d.). Since the data sets were small and additional iterations were not time consuming, JMLE iterations were set to no limit.

Only items with a mean squared error between 0.5 and 1.5 are productive to the measure, but the item is not considered degrading until the mean square goes above 2.0 (Winsteps, n.d.). The following steps for investigating questionable items were followed (a) Investigate problem outfit before problem infit, (b) Investigate mean squared errors before t standard errors, and (c) Investigate high error values before low or negative values (Winsteps, n.d.).

Final Exam Grades and Completion Rates

All sections of MT 120 and MT 150 at SCC have common final exams. For both MT 120 and MT 150, a committee is assigned to create a paper copy of the exam. The committee chooses questions and agrees upon the difficulty level of the questions. The result of this becomes the paper copy of the final exam that is given to the in-person sections. Using the paper exam as a guide, an online exam is created by assigning similar questions in both competency and difficulty from the Hawkes Learning System. (Deitz, personal communication May 9, 2011). There is, therefore, a correspondence between the two exams. The difference is that the in-person exam has the specific question agreed upon by the final exam committee while the online exam has a problem measuring the same competency generated by the Hawkes Learning System.

Another difference is that the online exams are graded by computer, while the in-person exams are graded by a rubric. Online students are required to go to a KCTCS testing center to take their final exam, so all final exams are proctored. The online students will have had experience taking exams in the proctored setting before taking the final exam since they will have taken the course midterm in a proctored setting. The in-person students will have an advantage in being more familiar with the setting in which

they will be taking the final, since taking an exam in an in-person environment mimics the final exam setting. This may give them an advantage in grades on the final exam, however, neither group of students are unfamiliar with the setting in which the final exam will be given.

Although the two final exam types are not identical, they are similar enough to compare. The final exam grades, without student identifiers, were also obtained for the study group. The grades were compared to determine whether or not there were differences in outcome between the in-person and the online sections. This indicated whether or not the grade distributions on the final exam across the two modalities were comparable. Since the final exam was created by the mathematics department at SCC with the aim of creating an assessment tool that was comparable across all classes while the other exams and the grades given in these courses were at the discretion of the individual instructor, only the final exam was used to compare between group differences.

Analysis of Survey Responses

Once the following three sets of data were gathered (a) demographics of the students who participated in the survey, (b) survey responses, and (c) grades on the final exam, the following operations were performed:

1) The students were assigned an identifier that places them in one of three categories (a) in-person student, (b) first-time online student, or (c) online student with previous experience.

2) Excel was utilized to place the students in random order.

3) The student at the top of the list was awarded the $25.00 gift certificate.

3) The student records were placed in random order.

3) Each student was assigned a confidential identifier.

4) All identifying information was then deleted from the file.

Several analyses were then performed on this data set. The first was a simple numeric and percentage breakdown across the demographic and final exam outcomes across online and in-person modes. The beginning of semester demographics, end of semester demographics, and demographics from the students who participated in the survey were analyzed. This helped to determine whether or not the students who responded to the survey composed a representative group. It also helped to determine whether there were patterns among the students who completed the course in online and in-person formats.

Rasch analysis was performed on the perception factors for students and instructors utilizing the Ministep program. This allowed the comparison of the perception items and respondents along a single scale in order to determine variations among the respondents and perceived importance among the items. The purpose of these analyses was to identify factors and perceptions that appeared to be beneficial to student success as well as those that appeared to be detrimental to student success. This study also determined whether or not these factors appeared to remain consistent across online and in-person modes of instruction, and if not, where they differed.

Interviews

After the semester was over, for those instructors and for selected students who agreed to participate in a telephone interview, student and instructor interviews were

conducted. This was done to see if there were any items not covered in this study that instructors and students considered important.

The contact list was kept in an EXCEL database. This was placed in random order. These students were then contacted for interviews, (See Appendix C and Appendix D). The first student contacted won the $25 gift card. No identifying information about the student was recorded, simply whether they took the course online or in-person. The instructors were likewise contacted by telephone and given the appropriate interview questions depending on whether they taught the course in-person or online. (See Appendix E and Appendix F). Instructors teaching both modalities were asked both sets of questions. No identifying information other than the course modality was recorded for the interview participants. At the conclusion of the interviews, the contact lists were deleted.

Conclusion

When this study was completed, there were four sets of results that could be used to assess what differences, if any, existed between in-person and online sections of MT 120 and MT 150 at SCC. First, there was demographic information comprised of age, gender, part time/full time, and program for online and in-person sections of the courses under consideration. Next, there were four measures of perceptions of factors important for student success. These were (a) student perceptions of factors important for student success online in college algebra, (b) student perceptions of factors important for student success in-person in college algebra, (c) instructor perceptions of factors important for student success online in college algebra, and (d) instructor perceptions of factors important for student success in-person in college algebra. There was a comparison of

completion rates and grades on the final exams for the in-person and online classes in the sample. Finally, there was a list of responses to the telephone interviews for both students and instructors, of items that they felt were important.

Correlations between these data provided an overview of the differences and similarities between online and in-person sections of MT 120 and MT 150. This overview can be used to make better informed choices about the teaching methods employed in each format.

Chapter Four: Results

Demographic information for the classes under consideration was obtained from the Office of Institutional Research (OIR) at SCC (See Appendix G). This consisted of 2 sections of online MT 120, 3 sections of online MT 150, 4 sections of in-person MT 120 and 4 sections of in-person MT 150. This gave a total of 292 online and 214 in-person students in my study group. This shows a financial advantage for SCC for online courses. While the online sections accounted for 38% of the classes, they enrolled 58% of the students. Generating even more income for SCC, 46% of the online students come from outside the college's service area. This would represent a more efficient use of faculty, since it results in greater revenue from students with fewer faculty if student success rates could be made comparable.

Analysis of the demographic data showed mostly similarities between online and in-person students (See Table 4.1).

Table 4.1. Demographics at the Beginning of the Semester

	In-Person Students	Online Students
GPA	2.5	2.5
Average Age	24.2	27.7
%Female/%Male	62.6%/37.4%	72.9%/27.1%
% Full Time	75%	57%
% Transfer	31%	28%

The average online GPA was 2.5 with a standard deviation of 0.9 whereas the average in-person GPA was 2.5 with a standard deviation of 0.9. Therefore, the

beginning GPA for the students in the study group was similar across both modes of instruction.

Average student ages across modes of instruction were also similar. The average online age was 27.7 with a standard deviation of 8.4, while the average in-person age was 24.2 with a standard deviation of 7.9. Therefore, the average online student appears to be slightly older, but since the differences in the averages of both age and GPA where well within one standard deviation of each other, they are relatively similar. When looked at across gender, online, the average female age was 28.2 and the average male age was 27.4. In-person, the average female age was 24.7 and the average male age was 23.3, so the average age remained similar across gender.

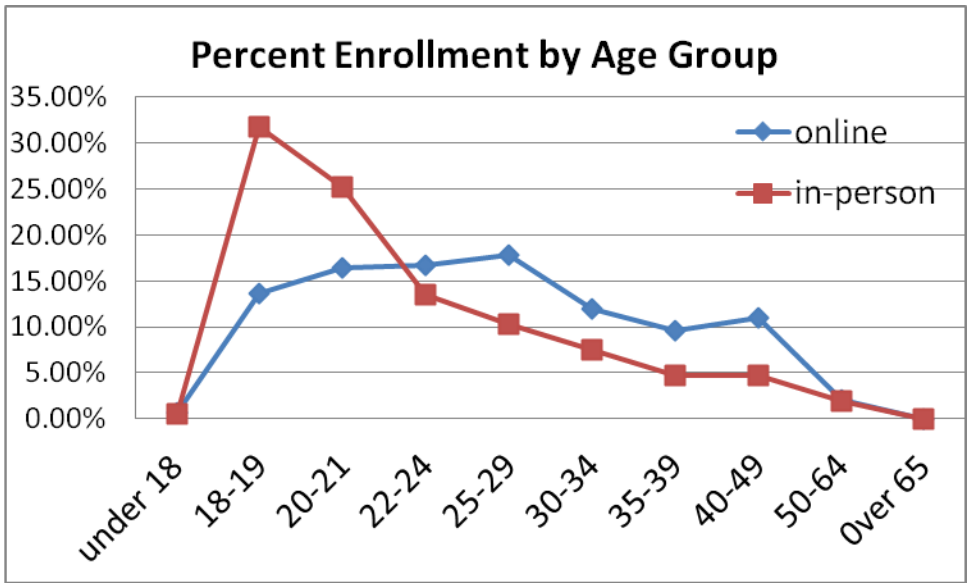
Statistics for transfer status were similar. Online 28% of the students were transfer status with 72% being in terminal programs, whereas in-person 31% were transfer status with 69% in terminal programs.

Considering full-time or part-time status, differences were noted between the two modes of instruction. Online 57% of the students were full-time and 43% were part-time. In-person 75% were full-time and 25% were part-time. This indicates that the online mode of instruction was more popular with part-time students while in-person instruction was more popular with full-time students.

There were some slight differences in online and in-person enrollment by gender. Online the breakdown was 72.9% female and 27.1% male while in-person, the class composition was 62.6% female and 37.4% male. Online instruction appeared to have a greater attraction for female students.

Breaking down enrollment across the defined age groups showed that in-person sections of the classes were more popular with students under the age of 22. After this, online became the preferred method of taking courses (See Figure 4.1).

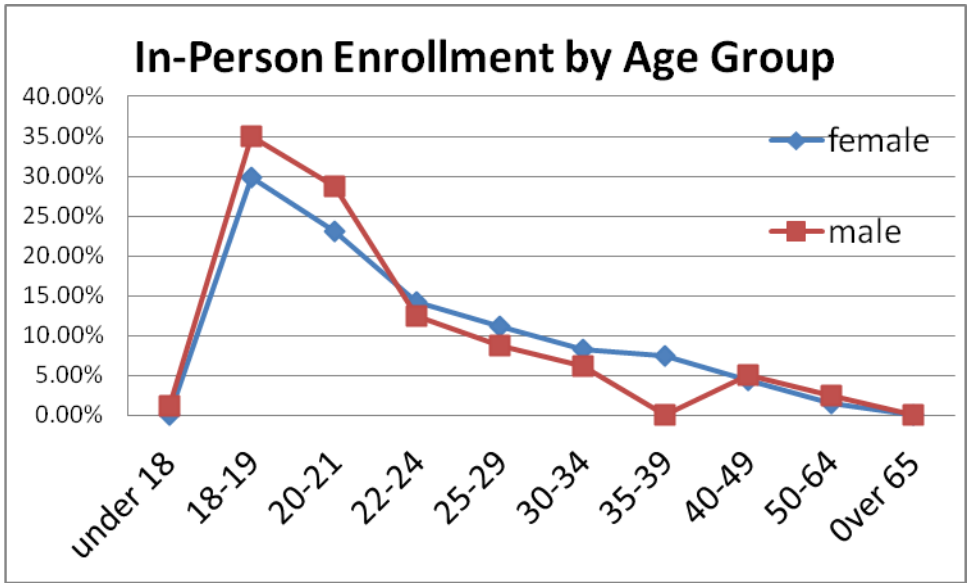
Figure 4.1. Online and In-Person Enrollment by Age

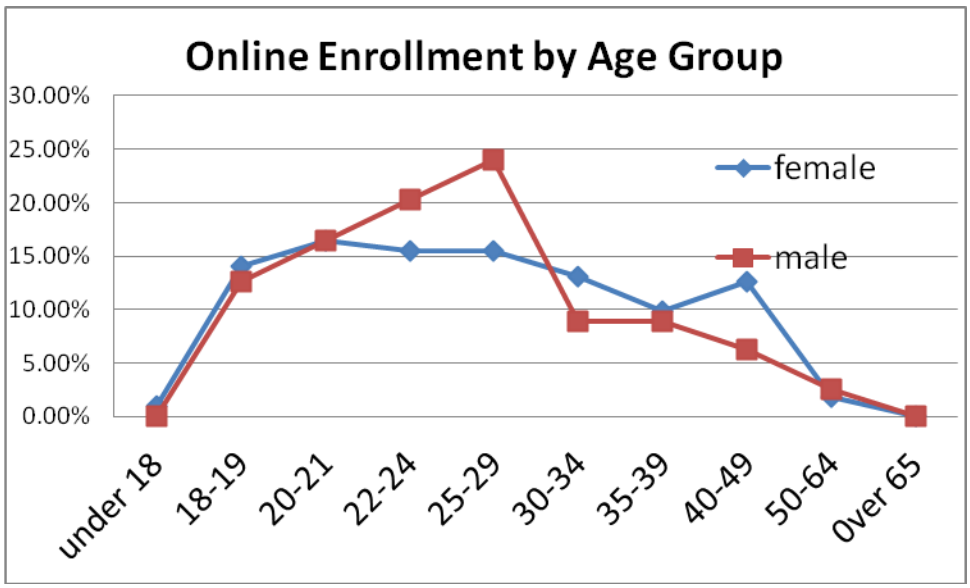


Next, the percentage enrollment of each gender across the age groups was considered. In-person, the percentage of each age group across the genders were roughly similar. A slightly higher percentage of males below 22 chose the in-person mode of instruction, and a slightly higher percentage of females over 22 chose in-person instruction, but the differences were slight.

Online there were some differences noted. A higher percentage of males in their 20's chose online instruction, while this situation was reversed, and a higher percentage of females over 30 chose online instructon (See figure 4.2).

Figure 4.2. Online and In-Person Enrollment by Age and Gender





End of Semester Demographics

After the semester, the demographic data were gathered again, along with whether or not the student had officially withdrawn from the course (See Appendix G and Table 4.2). This showed that 33% of online students withdrew compared to 18% of in-person students.

Table 4.2. Demographics for Students Who Did Not Withdraw and Withdrawl Rates

	In-Person Students	Online Students
GPA	2.5	2.4
Average Age	24.5	26.7
%Female/%Male	60%/40%	70%/30%
% Full Time	74.4%	49.7%
% Transfer	30%	24%
% Withdrawl	18%	33%
% No Show for Final Exam	26%	25%

Among online students, those who did not withdraw had a GPA of 2.4, while those who withdrew had a GPA of 2.7. The average age of the students who did not withdraw was 26.7, while those who withdrew had an average age of 29.8 years. The female/male ratio was 70% female/30% male. Of the online students who did not withdraw, 49.7% were full time while 74.4% % of the in-person students who did not withdraw were full time. For the online students who withdrew, 37% of the students had Somerset as their main campus compared to 63% who listed other campuses.

Among in-person students, those who remained had a GPA of 2.5, while those who withdrew had a GPA of 2.6. The average age of the students who did not withdraw was 24.5 years and the average age of the students who withdrew was 23.9 years. The female:male ratio of the students who remained at the end of the semester was 60%:40%.

These results were similar to the demographics at the beginning of the semester except that more full time online students dropped out and there were almost twice as many withdrawls in the online sections.

Demographics of the students who participated in the survey were also considered (See Table 4.3).

Table 4.3. Demographics for Students Who Participated in the Survey

	In-Person Students	Online Students
GPA	2.9	3.2
Average Age	30.2	31.9
%Female/%Male	87%/23%	96%/14%
% Full Time	78%	73%
% Transfer	30%	23%
% Withdrawl	4%	12%
% No Show for Final Exam	17%	31%

This showed slight differences from the population as a whole. The GPA was approximately 0.5 points higher. The avereage age was slightly older. For the online students, more full time students than expected answered the survey, and fewer transfer students. The withdrawl rate was much lower for both online and in-person students. This

implies that the survey participants represented a slightly stronger group academically than then the non-survey students. There was ahigher percentage of females in the survey group.

Perception Surveys

During the second week of April, The link to the survey was emailed to the 506 students in the study group (See Appendix A). All course instructors were requested to ask their students to fill out the survey. The survey was closed the first week of May, at which time there were 49 responses, 26 from online and 23 from in-person students. This represented a 9.6% response rate. However, only 241 students actually took the final exam. This represents 48% of the students who initially started the course. Therefore, the response rate may be better than it appears, since it is unknown how many students were actively participating in the course when the survey was sent out.

The instructor surveys were sent to the instructors at the same time (See Appendix B). There were a total of six instructors involved, five of who responded. Since some instructors were teaching in both modes, this gave a total of four online and four in-person responses.

Comparing the number of student responses for each mode of instruction, 53% of the responses were from the online sections and 47% from the in-person sections. This matched fairly well with the proportions of online and in-person students in the study group. There was an under representation of male students. Only one response among the online surveys was male and only 3 among the in-person responses. This gave an online female response rate of 96% and an in-person female response rate of 87%. This was not representative of the study group. When the demographics for the students who stayed

until the end of the course was analyzed, the gender breakdown for online courses was 70% female, 30% male, while the in-person statistics were 60% female and 40% male. This is close to the statistics at the beginning of the semester. Therefore, there is an underrepresentation of male students in the survey group.

The following items on the instructor and student surveys were analyzed using the Ministeps program: Questions 1 through 13 on the instructor survey and 1, 2, 5 through 14, and 16 on the student survey (See Appendix A and Appendix B). These items were selected because they asked the same questions and used the same rating scale. The questions selected measured the importance of student motivation, the necessity of homework, the efficacy of Hawkes, the accuracy of exams, the importance of the instructor's presence, the accessibility of the instructor, the students seeking help when they did not understand a concept, the importance of clear course goals, the clarity of course goals, the importance of group work, the opportunity for group work, and whether or not there was sufficient instructor interaction.

A Ministeps analysis was performed on these items. Since the Rasch model has the property of person invariance, this means that the responses should be approximately the same for all subgroups of the same group. Therefore, by considering the importance the different groups place on the various items, agreement and disagreement among the groups can be determined. Because of the small number of instructor respondents, it was realized that the results for instructor analyses needed to be approached with caution.

Initial Item Analysis

Since the desired result was to obtain a set of items that worked across all subgroups in the survey, Rasch analysis was utilized to determine problem items so that

they could be eliminated until a set of items remained that behaved consistently across all subgroups.

The initial Ministeps analysis produced the item map seen in figure 4.3 and the item measure table seen in table 4.4.Those items with the lowest measure being the items that were most easily verified, while those with the highest measure were the most difficult to verify, 0 being average score.

Looking at the mean squared scores in table 4.4, there are two items (a) Hawkes Effective, and (b) Sufficient Instructor Interaction, that show misfit that does not contribute to measure, but are not degrading. Looking at zstd misfit showed the same two items with high outfit, Hawkes Effective, and Sufficient Instructor Interaction. There were three items with high infit, Course Had Clear Goals, Homework Necessary, and Clear Goals Important. Since this is an opinion survey, high outfit indicated more disagreement concerning an item than expected, while high infit represented more agreement than expected, not necessarily a problem item.

Next, Item DIF measures were considered (See Table 4.5). This was done to determine where the respondent groups were substantially the same and where they were substantially different.

Figure 4.3. Initial Ministeps Item Map

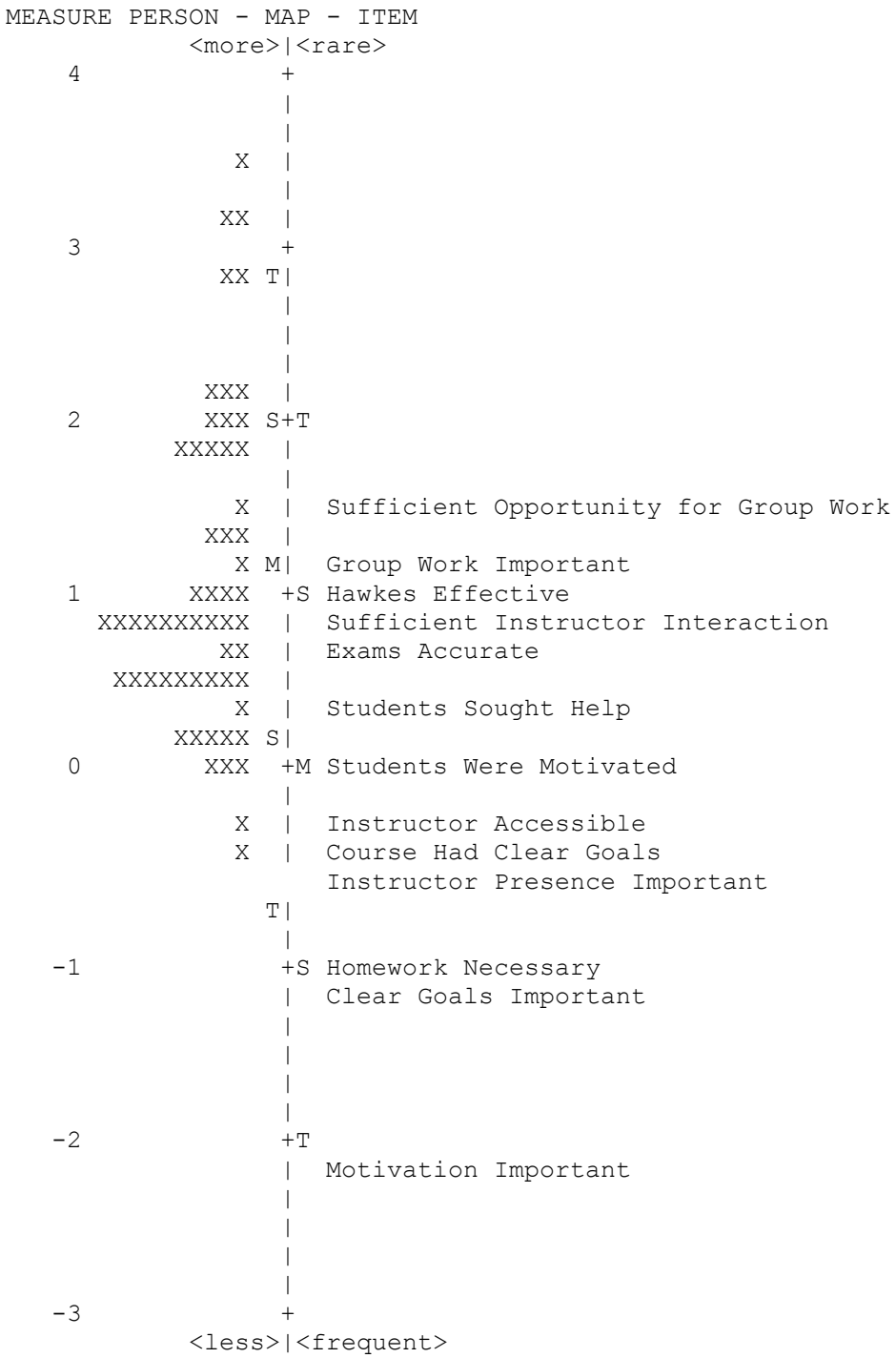


Table 4.4. Item Ministeps Item Table

ITEM	MEASURE	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	CORR.
Suff. Opportunity for Group Work	1.49	1.09	0.6	1.09	0.6	0.52
Group Work Important	1.10	1.05	0.4	1.06	0.4	0.34
Hawkes Effective	1.07	1.59	3.0	1.58	3.0	0.52
Sufficient Instructor Interaction	0.83	1.53	2.7	1.63	3.1	0.05
Exams Accurate	0.65	0.93	-0.3	0.94	-0.3	0.59
Students Sought Help	0.35	0.90	-0.5	0.91	-0.5	0.56
Students Were Motivated	0.07	0.89	-0.6	0.95	-0.2	0.51
Instructor Accessible	-0.26	0.92	-0.4	0.94	-0.2	0.57
Instructor Presence Important	-0.49	1.11	0.6	1.08	0.5	0.43
Course Had Clear Goals	-0.53	0.62	-2.2	0.60	-2.4	0.71
Homework Necessary	-0.98	0.58	-2.5	0.65	-1.9	0.54
Clear Goals Important	-1.20	0.55	-2.8	0.52	-2.7	0.59
Motivation Important	-2.09	0.90	-0.4	0.89	-0.3	0.30

Table 4.5. Initial Item DIF Measures

ITEM	I	O	i	n	o
Motivation Important	-1.83	-2.37	-2.03	-1.61	-2.23
Students Were Motivated	1.2	1.89	-0.1	-0.24	-0.29
Homework Necessary	-1.76	-2.33	-1.05	-0.25	-0.73
Hawkes Necessary	-0.64	-0.62	1.21	0.78	1.45
Exams Accurate	0.02	-0.08	0.4	-0.23	1.13
Instructor Presence Important	0.02	-0.08	-0.79	0.78	-0.49
Instructor Accessible	-0.73	-0.68	-0.1	-0.24	-0.29
Students Sought Help	1.2	1.41	-0.21	0.78	0.46
Clear Goals Important	-1.77	-1.39	-1.05	-0.26	-1.37
Course Had Clear Goals	-0.73	-1.39	-0.1	-0.24	-0.85
Group Work Important	1.2	0.95	1.29	0.78	0.97
Sufficient Opportunity for Group Work	1.91	2.12	1.29	0.78	1.61
Sufficient Instructor Interaction	1.2	1.41	1.21	-0.23	0.37

Key:
O: Online Instructors
I: In-Person Instructors
i: In-Person Students
n: First-Time Online Students
o: Online Students

Ordinarily, a difference of 0.64 logits indicates a moderate to large group difference. However, this only applies to larger sample sizes than are available for this project (Winsteps, n.d.). The largest group in this study is 26, for the online students, each of the faculty groups has four, and n, the first-time online students, 2. Since one of the main purposes of this study is to compare student and instructor perceptions, there is no choice but to work with the faculty data.

The number of first-time online students was not used in the determination of between group differences. There were only two students in this category which is too small to have any statistical significance; however, since this is an action research project, they were left in. If they showed excessive variation, although that would not disqualify an item, it might indicate an area that instructors might wish to address. The small sizes in this study indicate that the results will be more volatile than if larger samples were available, resulting in larger differences being necessary to indicate a difference. The initial criteria used for identifying problem items was a difference in measure of 1.04, as stated, the column labeled n was not considered in this process, it's purpose being to identify possible issues with first-time online students. The cut off of 1.04 was chosen because there were 2 items with mean squared errors above 1.5 and zstd scores over 2; Hawkes Effective and Suficient Instructor Interaction. Both of these items were mentioned in the end of semester interviews. Excluding first-time online students, Sufficient Instructor Interaction had a difference in DIF measure of 1.04 and Hawkes Effective had a difference in DIF measure of 2.26. Therefore 1.04 was chosen as the cut off point.

This identified seven items with significant between group differences (a) Students were motivated, (b) Homework necessary, (c) Hawkes effective, (c) Exams accurate, (d) Students sought help, (e) Course had clear goals, and (f) Sufficient instructor interaction. If first-time online students had been included, this would have resulted in a measure of 1.64 for Sufficient instructor interaction and 2.26 for Hawkes effective. Using the same criteria for the cut off this would have resulted in four areas with significant between group differences (a) Students were motivated, (b) Homework necessary, (c) Hawkes effective, and (d) Sufficient instructor interaction. This was not done because there were only two first-time students which was statistically insignificant, and two of the three items that would have been left out (a) Exams accurate, (b) Students sought help, and (c) The course had clear goals, were mentioned as problem areas in the interviews. The items with between group differences of 1.04 or greater were then examined individually (See Apendix H and Appendix I).

The Students Were Motivated.

Considering the online student responses on this item, 35% strongly agreed, 46% agreed, and 19% disagreed. Among in-person students 26% strongly agreed, 61% agreed, 9% disagreed, and 4% strongly disagreed. Therefore, although most students claimed to be motivated, in the online venue almost 1 in 5 claimed to be unmotivated. This may simply imply a lack of interest in the material.

In-person instructors agreed with this item 75% of the time and disagreed 25% of the time. Online instructors were unanimous, 100% disagreeing with this item. This implies that all online instructors considered their students generally unmotivated. The

criticisms the instructors mentioned in the interviews were students not seeking help in a timely manner, communicating effectively, or taking an interest in their education.

Homework Necessary.

While all faculty agreed that regular homework was necessary for student success, 75% strongly agreed with this item and 25% agreed. This was the same regardless of mode of instruction. Among online students, 35% strongly agreed, 62% agreed, and 4% disagreed. For in-person students 43% strongly agreed while 57% agreed. This does not appear to be a case of a difference of opinion, simply the fact that instructors felt more strongly about the necessity of homework than did the students. This item was not mentioned in the end of semester interviews.

Hawkes is Effective.

The effectiveness of Hawkes was an area of disagreement in the interviews. When looking at the survey responses, online instructors strongly agreed 25% of the time and agreed 75% of the time. Their in-person counterparts strongly agreed 50% of the time and agreed 50% of the time. Online students strongly agreed with this item 15% of the time, agreed 31%, disagreed 27%, and strongly disagreed 27%. Their in-person counterparts strongly agreed 17% of the time, agreed 39%, disagreed 17%, and strongly disagreed 26%.

This represents a disagreement in the effectiveness of Hawkes between the students and the instructors.

Students Sought Help.

Online students strongly agreed that they sought help when needed 19% of the time. They agreed 42% of the time and disagreed 38% of the time. Among in-person

students, 35% strongly agreed, 43% agreed, and 22% disagreed. This indicates a need to increase student help seeking behaviors, especially among the online sections.

The online instructors agreed with this item 25% of the time and disagreed 75%. The in-person instructors strongly agreed 25% of the time, agreed 25% of the time, and disagreed 50% of the time. This indicates the students are seeing themselves in a better light than the instructors do or possibly not understanding when they need help. Common complaints from online instructors during the end of semester interviews were students not seeking help until the last minute and lack of communication from students.

Course Had Clear Goals.

Among both online and in-person instructors, 50% strongly agreed and 50% agreed. Online students strongly agreed 42% of the time, Agreed 50% of the time, and disagreed 4% of the time. In-person students strongly agreed 26% of the time, agreed 61% of the time, disagreed 9% of the time, and strongly disagreed 4% of the time.

Except in matter of degree, there seems to be a reasonable amount of agreement on this item.

Sufficient Instructor Interaction.

Online faculty agreed with this item 25% of the time and disagreed 75% of the time. Their in-person counterparts agreed 75% of the time and disagreed 25% of the time. Online students strongly agreed 31% of the time, agreed 27% of the time, and disagreed 42% of the time. In-person students strongly agreed 9% of the time, agreed 35% of the time, disagreed 52% of the time, and strongly disagreed 4% of the time.

Online students appeared more satisfied with the amount of instructor interaction than in-person students while the situation was reversed for the instructors. Therefore,

online students, overall, appear to be satisfied with the online environment and the lower instructor interaction that that implies. The reverse was true for in-person students, many of whom desired more instructor contact than they received during the course of lectures. The online instructors were generally dissatisfied with the amount of contact with their students, implying that they would prefer an amount of interaction more closely resembling that obtained in an in-person setting.

Exams Accurate.

Online instructors strongly agreed 100% of the time, while their in-person counterparts strongly agreed 25% of the time and agreed 75% of the time. Online students strongly agreed 8% of the time, agreed 50% of the time, disagreed 31% of the time, and strongly disagreed 12% of the time. In-person students strongly agreed 30% of the time, agreed 30% of the time, disagreed 35% of the time, and strongly disagreed 4% of the time.

This represents an area of disagreement. While all instructors agree that the exams are accurate, a sizable percentage of the students do not.

Continued Evaluation

Except for the items, the course had clear goals and homework necessary; the above items appeared to indicate differences of opinion between the groups. The items with between group differences greater than or equal to 1.04 were removed and another look was taken at the item DIF measures (See Table 4.6).

Ignoring the first-time online students, who were kept to determine whether or not first-time online students show major differences, this showed a fair amount of agreement among the remaining items. All had a mean squared measure below 1.5 and a zstd below

2 (See Table 4.7), while the largest spread in DIF measure was 1.01 for the item, sufficient opportunity for group work, an item that was not mentioned during the interviews.

Table 4.6. Item DIF Measures with Problem Items Removed

ITEM	I	O	i	n	o
Motivation Important	-1.87	-2.46	-1.98	-1.81	-2.24
Instructor Presence Important	0.19	0.16	-0.63	0.91	-0.26
Instructor Accessible	-0.65	-0.55	0.16	0.24	-0.03
Clear Goals Important	-1.78	-1.39	-0.93	-0.32	-1.28
Group Work Important	1.52	1.33	1.73	0.93	1.45
Sufficient Opportunity for Group Work	2.39	2.74	1.73	0.93	2.18

Key:
O: Online Instructors
I: In-Person Instructors
i: In-Person Students
n: First-Time Online Students
o: Online Students

Table 4.7. Ministeps Item Table with Problem Items Removed

ITEM	MEASURE	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	CORR.
Suff. Opportunity for Group Work	1.98	1.05	0.3	1.03	0.2	0.61
Group Work Important	1.54	0.99	0.0	1.00	0.0	0.47
Instructor Accessible	-0.03	1.19	1.0	1.16	0.8	0.51
Instructor Presence Important	-0.29	1.24	1.2	1.40	1.8	0.43
Clear Goals Important	-1.12	0.51	-3.2	0.47	-2.8	0.67
Motivation Important	-2.10	0.91	-0.4	0.93	-0.1	0.34

Next, the respondent person measures were analyzed using Ministeps (See Appendix J). This table showed an adaquate person fit in most cases. There were seven persons with a mean squared error greater than 1.5 , four online students and three in-person students, i3, i19, i2, o14, o2, o7, o9 (See Appendix H and Appendix J). None of

these students took the final exam. These 7 persons were removed and the item map calculation and an item DIF calculation performed again. This resulted in the item measures seen in table 4.8.

Table 4.8. Item Measures with Problem Respondents Removed

ITEM	MEASURE	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	CORR.
Suff. Opportunity for Group Work	2.01	0.95	-0.2	0.95	-0.2	0.54
Group Work Important	1.56	0.91	-0.4	0.92	-0.4	0.39
Sufficient Instructor Interaction	1.18	1.35	1.8	1.40	2.0	0.13
Hawkes Effective	1.09	1.93	4.0	1.91	3.9	0.55
Exams Accurate	0.59	0.92	-0.4	0.90	-0.5	0.65
Students Sought Help	0.48	0.96	-0.2	0.95	-0.2	0.61
Students Were Motivated	0.05	1.11	0.6	1.17	0.9	0.49
Instructor Accessible	-0.54	0.76	-1.2	0.86	-0.7	0.62
Instructor Presence Important	-0.66	0.89	-1.5	0.85	-0.7	0.54
Course Had Clear Goals	-0.66	0.75	-1.3	0.71	-1.5	0.69
Homework Necessary	-1.19	0.68	-1.8	0.76	-1.1	0.54
Clear Goals Important	-1.48	0.65	-2.0	0.6	-1.8	0.56
Motivation Important	-2.42	0.9	-0.4	0.76	-0.6	0.38

These item measures are subtantially the same as the original, except only the item Hawkes Effective has a mean squared measure over 1.5. Using the item Hawkes Effective as a baseline for items with excessive between group differences, two such items were indicated, Hawkes effective and students were motivated. This would have left the following items (a) Homework necessary, (b) Exams accurate, (c) Students sought help, (d) Course had clear goals, and (e) Sufficient instructor interaction. Since these problem respondents represented 14% of the survey population and the areas left in were mentioned in the post-semester interviews, the initial analysis with all respondents included was used.

Reliability

In Rasch analysis, Person reliability is comparable to the traditional concept of test reliability (Winsteps, n.d.). The reliability measures for the three data analyses are shown in table 4.8. Rasch analysis provides two reliability measures, real and model. The real measure being an under estimate and the model measure being a best case estimate (Winsteps, n.d.).The item reliability estimates for the all three cases ranged from 0.95 to 0.97, indicating a sufficient sample size (Winsteps, n.d.).

Table 4.9. Correlation Measures

Person Measure	Real	Model	Cronbach Alpha
Initial Analysis	0.69	0.76	0.72
Problem Items Removed	0.42	0.56	0.49
Problem Respondents Removed	0.75	0.80	0.78

The person reliability measures were lower than desired for the initial analysis. The reliability could be improved by (a) Sampling a wider range of respondents, (b) Increasing the length of the survey, or (c) Increasing the number of categories per item. Since the purpose of this study was to find general problem areas with the respondents at hand so that they could be further investigated, the reliability is sufficient.

The probability curve for the initial analysis was then calculated (See Figure 4.4). The rating scale summary can be seen in table 4.10.

Figure 4.4. Category Probabilities for Initial Ministeps Analysis

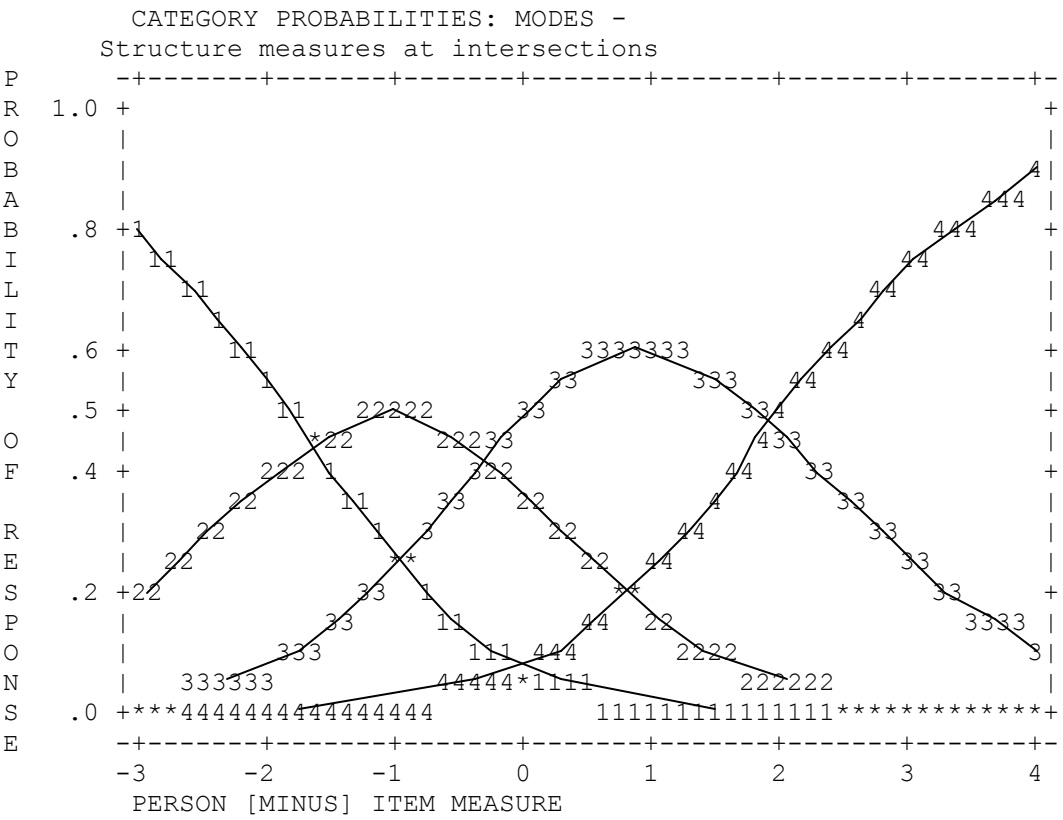


Table 4.10 Rating Scale Diagnostics

Category	Count (%)	Infit Mean Square	Outfit Mean Square
Strongly Disagree	37 (5%)	1.11	1.17
Disagree	148 (20%)	0.96	0.92
Agree	328 (44%)	0.96	0.91
Strongly Agree	226 (31%)	1.03	1.01

The distribution of responses in figure 4.4 indicated reliable measures. The numbers 1 through 4 in figure 4.4 represent the 4 categories of the Likert scale in the survey. The lines connecting these numbers show four distinct peaks. This indicates that the

respondents recognized four discrete categories when answering the survey and that there was no confusion between the categories on the Likert scale. The Likert scale, therefore, functioned as intended.

The rating scale diagnostics in Table 4.10 indicated that the rating scale was adequate. In spite of the low number of responses for the strongly disagree category, the fit statistics do not justify eliminating this category.

When the items with between group differences greater than or equal to 1.04 were removed the reliability decreased. This is not necessarily a problem as lowering the spread of the responses and reducing the number of items results in lower reliability measures (Winsteps, n.d.). Since items that were disagreed upon were removed, resulting in less spread among the responses and fewer items were measured, this result is to be expected and indicates a lowering of variability among respondents, which is what was desired in this operation.

The person measures were improved when the respondents with a mean squared outfit greater than 1.5 were removed. However, as previously stated these respondents represented 14% of the survey group. Further, the demographic data indicated that the survey group was, in general, composed of the stronger students. Since this was the case, these students were retained.

Preferred Mode of Instruction

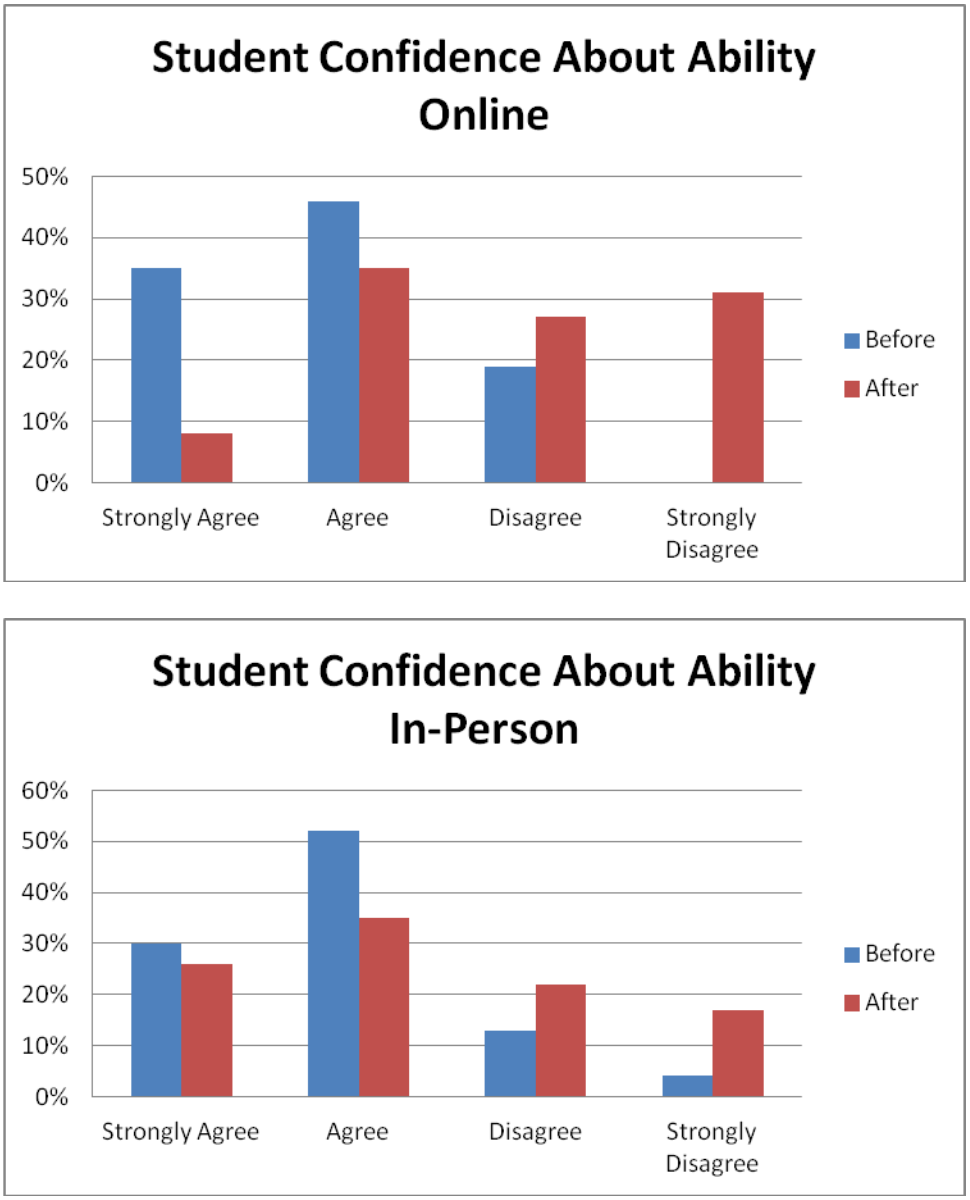
Among the five surveyed instructors, only one preferred teaching online, the rest preferred in-person instruction. This pattern was similar, if not as strong, among the students. For in-person students, 13 preferred an in-person setting, 7 indicated no preference, and 3 preferred online. For the online students, 8 preferred in-person

instruction, 10 indicated no preference, and 8 preferred online. Therefore, even among students who took the course online, as many would have preferred to take the course in-person as online. This implies that there are other reasons than course preference that cause students to take online courses.

Student Confidence

An analysis of questions 3 and 4 on the student perception survey indicated that overall students were confident of their ability to succeed in the class at the beginning of the semester. Approximately 82% of in-person and 85% of online students agreed that they were confident of their ability to succeed in the class at the beginning of the semester. When surveyed about their confidence at the end of the semester, 39% of in-person and 58% of online students disagreed that their confidence level had increased. There is a marked drop in student confidence after taking MT 120 or MT 150. This is especially true of online students (See figure 4.6).

Figure 4.6. Online and In-Person Confidence Levels Before and After Course



Number of Hours per Week on Homework

The amount of homework performed versus the amount expected was an area of disagreement among students and faculty. All Instructors agreed on a workload

somewhere between 3 and 6 hours. However, 62% of online and 26% of in-person students reported spending more than 6 hours per week on homework. (See Table 4.11).

Table 4.11. Number of Hours Per Week Spent/Expected on Homework

	Online Students	In-Person Students	Online Instructors	In-Person Instructors
Less Than 1	0%	0%	0%	0%
1 to 2	4%	22%	0%	0%
3 to 4	15%	39%	50%	75%
5 to 6	19%	13%	50%	25%
More Than 6	62%	26%	0%	0%

Pace of Course

The results for the pace of the course showed differences between students and faculty. Among online students 43% considered the pace of the course too fast, while 36% of in-person students felt that the course was too fast. (See Table 4.12).

Table 4.12. Pace of the Course

	Online Students	In-Person Students	Online Instructors	In-Person Instructors
Much Too Slow	0%	5%	0%	0%
Too Slow	0%	5%	0%	0%
About Right	52%	55%	75%	100%
Too Fast	28%	27%	25%	0%
Much Too Fast	15%	9%	0%	0%

The Instructor Took an Interest in My Success

A large proportion of students disagreed that the instructor took an interest in their success. (See Table 4.7). Approximately ¼ of students felt that the instructor did not take an interest in their success regardless of modality.

Table 4.13. The Instructor Took an Interest In My Success

	Online Students	In-Person Students
Strongly Agree	4%	9%
Agree	42%	35%
Disagree	23%	13%
Strongly Disagree	4%	9%

End of Semester Interviews

After the final exam was given, an attempt was made to contact those individuals who had agreed to a follow up interview. All 5 instructors were contacted. Twenty four students provided phone numbers. Three attempts were made to contact each student on the list. Attempts were made in the morning, early afternoon, and early evening hours, to account for different schedules. This resulted in the contacting of 10 students, 5 online and 5 in-person. The results of the interviews can be found in Appendix K.

Lack of Instructor Contact and Poor Communication.

That lack of instructor contact and poor communication skills on the part of online students were a common theme among online faculty. Two in-person instructors mentioned the face to face environment as being helpful to their classes. Instructor

contact was mentioned by two online students, one positively (the instructor was accessible) and one negatively. A third did not mention faculty specifically, but mentioned extensive use of the schools tutoring center.

Online faculty complained about the lack of communication from their students and their not seeking help until the last minute when it was too late to effectively address the problems the student was having. Online students on the other hand mentioned the lack of instructor feedback. In-person students made no references to lack of contact or communication problems. Lack of student communication and students failing to seek help in a timely manner were unanimous complaints of online instructors, but were not mentioned by in-person instructors.

Hawkes.

Hawkes was unanimously supported by those faculty who mentioned it, both online and in-person. Among the students, some liked Hawkes, especially the mastery learning approach, while others disliked the system. There was a student complaint that Hawkes assumed too much background knowledge on the part of the student and skipped steps in its explanation. There was also a complaint that the instructor explained things differently than Hawkes did, leading to confusion.

Suggestions for Improvement.

Among the suggestions for course improvement among the online instructors were getting the students to go for tutoring, more structured contact with the instructor, and real time communication with the instructor. Among the online students, there was a desire for videos and a virtual classroom environment. This contradicted one online instructor who wished their students would make better use of Hawkes multimedia

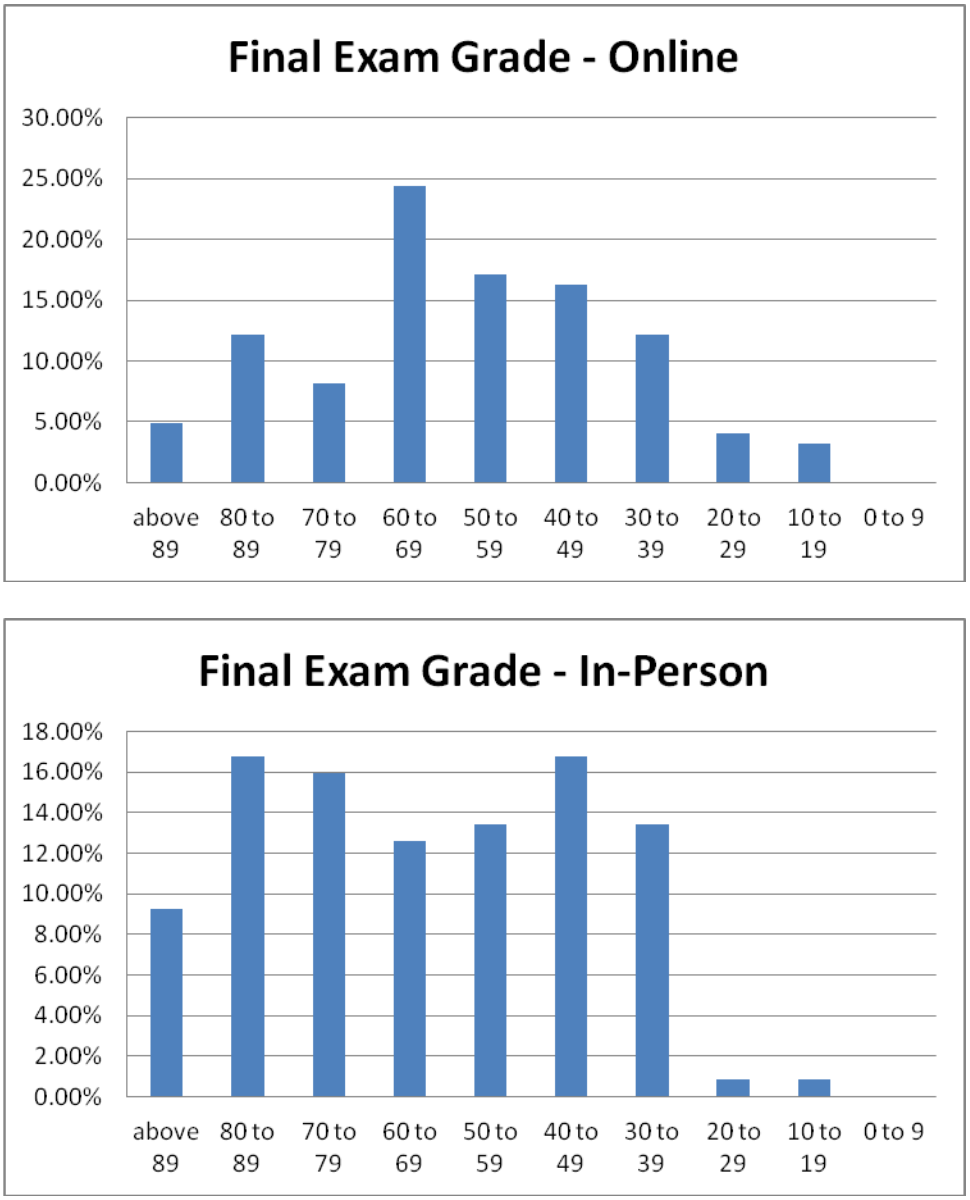
presentations and another online instructor who claimed that students were lax in viewing supplemental course material, indicating that students might not take advantage of such opportunities even if they were offered.

Final Exams

The final exam grades in aggregate and for the survey students were collected (See Appendix L). In aggregate, 241 in-person students took the final exam. This is 47% of the total number in the survey group. 23% withdrew and an additional 26% did not take the final exam.

Among in-person students, 56% took the final exam, 18% withdrew, and 26% did not take the final exam. For the students who did take the exam, the average was 68%, with a standard deviation of 18%. For online students, 42% took the final exam, 33% withdrew, and 25% did not take the final exam. The average exam grade was 57% with a standard deviation of 19%. The final exam grade breakdowns can be seen in figure 4.7.

Figure 4.7. Final Exam Grades, Online and In-Person



Among the students who replied to the survey, 26 were online students. Among these 53% took the final exam, 12% withdrew, and 35% did not take the final exam.

Their exam average was 59% with a standard deviation of 15%. Among the 23 in-person students who took the survey, 79% took the final exam, 4% withdrew, and 17% did not take the final exam. Their average grade on the final exam was 68% with a standard deviation of 18%. Therefore, the survey respondents appear to represent a slightly more motivated group for the in-person students. The final exam grade breakdowns for the students who took the survey can be seen in figure 4.8.

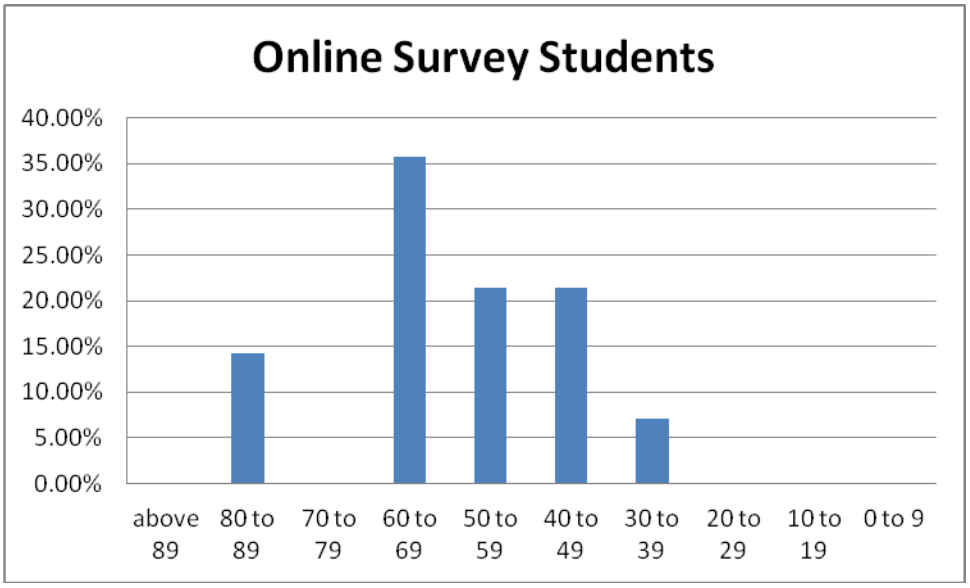
Ministeps Analysis of Survey Students

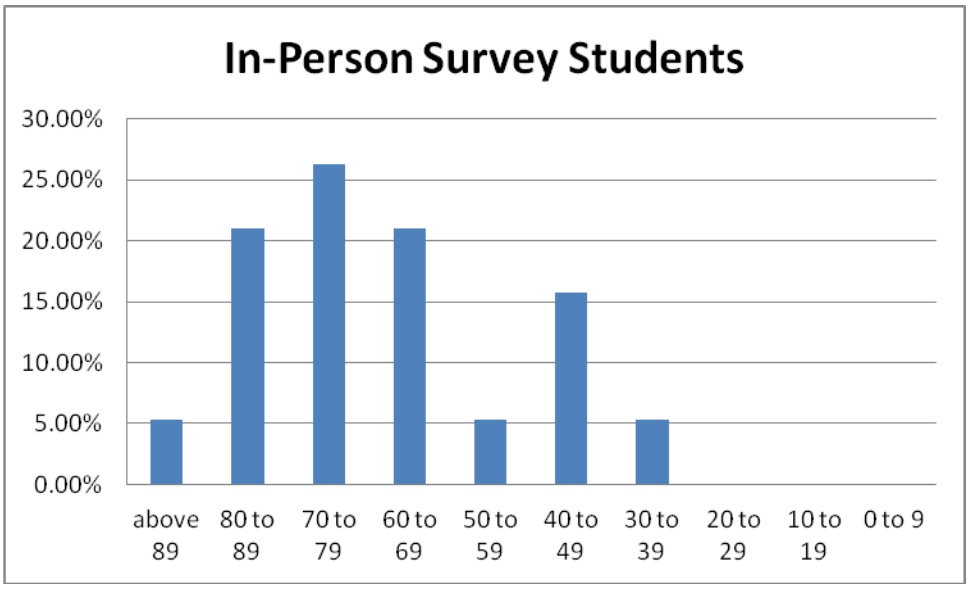
The students who participated in the survey were broken down into those who took the final exam and those who did not. Another Ministeps Item DIF analysis was run to see if there were any major differences between the two groups. Since this analysis was restricted to students, the questions (a) At the start of the semester I was confident of my ability to succeed in this clas, (b) Since I took this class, my confidence level has increased, and (c) I feel that the instructor took an interest in my success, were added to the previously analyzed questions. The table for this analysis can be seen in table 4.14.

Since the survey groups were so small, no attempt was made to identify problem items. The data were simply used to see if any trends were apparent between students who took the final and those who did not.

Looking for general trends on table 4.14, it can be seen that those students who did not take the final exam went into the course feeling more confident that those students who took the final exam. They had the largest drop in confidence however, leaving the course feeling the least confident in their abilities. The students who did not take the final exam were also the least likely to agree that Hawkes was an efective

Figure 4.8 Final Exam Results, Survey Participants





teaching platform, or that the exams were acurate. They were the most likely to claim that they asked for help when it was needed. They were also the most likely to agree that group work was important. Students who did not take the final exam were the least likely to feel that the instructor took an interest in their success, but the most likely to agree that they had suficient instructor interaction.

Table 4.14. Item DIF Measures for Students Taking Final and Those Not Taking Final

ITEM	I	O	i	n
Motivation Important	-1.55	-2.58	-4.14	-1.86
Students Were Motivated	-0.12	-0.52	-0.06	-0.19
Confidence at the Beginning of Semester	0.12	0	-1.09	-0.72
Confidence at the End of the Semester	0.35-	1	2.06	2.05
Homework Necessary	-0.85	-0.93	-1.79	-0.53
Hawkes Effective	0.99	0.87	1.6	1.57
Exams Accurate	0.12	0.31	1.18	1.42
Instructor Presence Important	-0.83	0	-0.53	-0.91
Instructor Accessible	-0.39	-0.52	0.77	-0.19
Students Sought Help	0	1	-1.09	-0.36
Clear Goals Important	-0.83	-1.17	-1.79	-1.35
Course Had Clear Goals	-0.25	-1.43	0.37	-0.36
Group Work Important	1.39	1.37	0.37	0.13
Sufficient Opportunity for Group Work	1.19	1.37	1.18	1.26
Instructor Took an Interest in Success	-0.67	-0.52	1.18	1.26
Sufficient Instructor Interaction	1.49	0.87	-0.53	-0.53

Key:
I: In-Person Student Who Took the Final Exam
O: Online Student Who Took the Final Exam
i: In-Person Stuent Who Did Not Take the Final Exam
o: Online Student Who Did Not Take the Final Exam

Chapter Five: Discussion

The results of this project indicated several areas of concern regarding algebra classes at SCC, particularly in the online setting. The in-person courses were conducted as lecture format courses. Assessment was by assigned homework in the Hawkes Learning System and paper exams. Instruction in the online courses was done utilizing the Hawkes Learning System. Assessment was by assigned homework in the Hawkes System and online exams. Two online instructors had their students send scans of their work papers from the exams to them in order to allow the students an opportunity for extra credit. This did not result in any significant changes in outcome. One class having 38% of its students and the other 47% of its students taking the final exam compared to a 42% average for online classes overall. Both modes of instruction had a proctored final exam that was designed to be as similar as possible between the two modes of instruction, even though the in-person classes took a paper copy of the exam and the online students took an online version of the exam.

Demographics

The demographics at the beginning of the semester indicated that both modes of instruction had a majority of female students. A slightly higher proportion of female students being observed in online classes, 72.9% online compared to 62.6% in-person. When looking at the age breakdowns across gender (See Figure 4.2), it is seen that the higher percentage of female students online occurred in the 30-64 year old age groups. This is an age group where our female students may have outside commitments to attend to and therefore may require an online setting in order to continue their education. Two of the online students mentioned the need for flexibility during the interviews and one

student and one online faculty respondent specifically mentioned time commitments due to children (See Appendix K). The need for flexibility rather than preferring the online setting is also backed up by the low proportion of students who responded that they prefer online instruction. Therefore, the online courses at SCC meet a student need and provide opportunities to students who might not otherwise be able to attend college, making them an efficient way to improve student access, but with the disadvantage of lower success rates for many students.

The average age and GPA were similar across both modes of instruction. Average age and GPA also remained similar when comparing those students who withdrew from the course and those students who remained (See Table 4.1 and Table 4.2). This indicated a similar level of academic ability and maturity for the students regardless of the mode of instruction. Therefore it would be unlikely that one group would have had an advantage over the other based upon previous experience, which would imply that the changes in outcome were due to method of instruction. Using retention and grades on the final exam as indicators, the in-person sections showed a clear advantage.

Withdrawal Rates

There was a noted difference in withdrawal rates between online and in-person classes. Online students had a 33% withdrawal rate, while only 18% of the in-person students withdrew. This means that online students were almost twice as likely to withdraw as their in-person counterparts. The situation was exaggerated for those students who were at other KCTCS campuses. Of the online students who remained in the course, 49% listed Somerset as their home campus compared to 51% who listed other KCTCS institutions. When considering those online students who withdrew, 37% listed

Somerset as their home campus compared to 63% who listed other KCTCS institutions. Therefore, student access to in-person help at a local campus may be a factor in student success.

Those students who did not take the final exam indicated parity between the two modes of instruction. Of the online students who did not withdraw, 25% did not show up for the final, compared to 27% of in-person students. Among those students who responded to the survey, 31% of online students did not show up for the final, while 17% of the in-person students did not show up for the final. Therefore, it is not simply a matter of students disappearing from the class at the beginning of the semester. There are a significant number of students who stay until the final weeks of the course who do not take the final exam. A follow up study to determine why there are such a large number of absences for the final exam would be beneficial.

Although online courses may be financially rewarding for SCC, they might not be the best choice for students, particularly those whose home campus is not SCC. At the beginning of the semester, 54% of online students listed SCC as their home campus while 46% listed a different KCTCS institution. Among the online students who took the final exam, 63% listed SCC as their home campus compared to 37% who listed other KCTCS institutions. This may be because online students with a home campus of SCC still have access to the services of the college, being able to come in and meet with their instructor if needed. The ability to utilize on-campus services was mentioned in the post semester online student interviews as beneficial

Online Student Isolation

The need for greater support structures for online students was mentioned in the end of semester interviews. There were online instructors who wanted more class structure, one who collected paper homework, and another who wanted to get the students into a tutoring center or class. One of the online students mentioned the tutoring center as something that helped during the class. One student also mentioned wanting web cast lectures. There seems to be a desire on the part of both online instructors and students to mimic the in-person setting more closely, utilizing the online setting as a necessity due to outside commitments, rather than as a preferred mode of instruction. However, getting the students to utilize the support structures when they were offered was a cause of concern in the online instructor interviews.

The online students in this study seemed not to validate the work of Conrad (2002) in which the students wanted the instructor to act as more of a facilitating presence. The online students in this study appeared to desire a more active presence on the part of the instructor. Simply keeping in touch with the students did not appear sufficient. One instructor stated that motivational emails did not have a major impact on class success. This contradicts Heiman (2008) and Huett, Kalinowski, and Moller (2008), whose studies found that motivational e-mails raised student levels of motivation to levels comparable to those of in-person classes**.** This was not the case with the students at SCC. The online instructors at SCC believed that their students required more contact in a structured format.

One possible reason for this is that the students in the studies referenced in the literature did not succeed because of the online environment that they were in, rather,

their abilities and academic maturity allowed a facilitated environment to be successful. The literature cited may be a case of experienced students developing more advanced learning styles that the majority of students at SCC are not academically mature enough to master. Since the student composition is unlikely to change, nor are the numbers of students seeking online classes, SCC would benefit by developing a plan to help the students bridge the gap between needing directed study and the ability to be self-actualizing academically. At the present time there are no such opportunities for students. Like the instructors they must figure out the online environment on their own.

Under Representation of Male Students

Male students were underrepresented in the survey. The gender ratio at the beginning of the semester was 73% female/27% male online and 63% female/37% male in-person. Among the students who did not withdraw, the ratios were 70% female/30% male for online courses and 60% female/40% male for in-person courses, which is comparable to the beginning of semester demographics. However, males fell behind when considering those students who actually took the final exam. Males composed 24% of the online final exams and 22% of the in-person final exams. Therefore, the percentage of males who fail to complete the course is higher than the percentage of females. Looking at the GPAs of the students at the beginning of the semester does not show a significant difference between male and female students (See Table 5.1). This implies that there is another reason for the higher failure rate of the male students.

Table 5.1. GPA at the Beginning of the Semester

	Online	In-Person
Male	2.6	2.4
Female	2.5	2.6

The survey respondents showed an even greater disparity; 96% of the online survey respondents were female and 87% of the in-person survey respondents were female, and of the 24 students who agreed to a follow up interview, none were male. The higher failure rate combined with the low response rate for male students indicates a problem area. The lack of male participation in this survey implies a lack of participation among the male students which may transfer into academic problems. This is a topic that should be investigated further. Gathering male/female enrollment and pass rates for all courses at SCC would show whether this is a common problem among male students or whether it is specific to mathematics courses.

Student/Instructor Areas of Agreement

With the items where there was significant between group differences removed, there were areas where all groups agreed (See Table 4.6). Motivation was ranked as the most important item, followed by the importance of clear goals with measures of -2.10 and -1.12 respectively. Next was instructor presence important with a measure of -0.29 and instructor accessible with a measure of -0.03. This implied that the importance of the instructor's presence and the instructors perceived presence were roughly equal. Lastly was group work important, with a measure of 1.54 and sufficient opportunity for group work with a measure of 1.98. These measures seemed to imply that the respondents didn't

feel that group work was that important, but they would have preferred more opportunities for group work.

Student/Instructor Differences of Opinion

The Item DIF Ministeps analysis indicated multiple student/instructor between group differences. A difference of 0.64 logits usually indicates a moderate to large difference (Winsteps, n.d.). However, this is with large sample sizes. With sample sizes such as those in this study, the results can be erratic. Also, there are two disparate groups, students and instructors. Differences of opinion were expected to occur between these two groups. What were being sought were those areas where the difference was enough to cause problems with instruction. Therefore, the difference of 1.04 logits was chosen as significant. This was done because the item with 1.04 logits difference, asking whether or not there was sufficient instructor interaction, represented the item with a mean squared score over 1.5, a zstd score over 2, had multiple mentions in the end of semester interviews, and had the lowest difference in DIF measure of the two items that met the criteria of a mean squared score over 1.5. Therefore, this was chosen as the baseline, and those questions with a difference of 1.04 logits or more were considered to indicate a significant between group difference. This resulted in seven items that indicated significant between group differences (a) Students were motivated, (b) Homework necessary, (c) Hawkes effective, (c) Exams accurate, (d) Students sought help, (e) Course had clear goals, and (f) Sufficient instructor interaction.

Student Motivation and Self Help Behaviors.

Considering student motivation, 75% of in-person instructors considered their students motivated compared to 81% of their students. Online, 85% of online students

considered themselves motivated, while 100% of online instructors considered their students unmotivated.

While the online and in-person student responses appear comparable, those of the online and in-person faculty do not. This represents a problem area. While it is possible that all the online students may be unmotivated, and it is undeniable that student welfare (the practice of using federal financial aid as a form of government assistance) is easier to accomplish online, it does not seem reasonable to assume that the difference between in-person and online classes would be so large.

Since the claimed student motivation is similar across both modes of instruction, it is more reasonable to assume that there is a communication issue between instructors and students online that is shown in this result. It is also reasonable to assume that students and instructors have a different definition of motivation. However, the closeness of instructor and student results for the in-person sections indicates that these definitions are not so different as to have no common ground.

Sixty two percent of online students reported spending over 6 hours a week on homework, while none of the online instructors expected this much effort. This does not indicate a lack of motivation on the part of these students. The existence of a communication issue is further supported by the fact that 61% of online students claimed to seek help when it was needed while only 25% of the online instructors agreed that they did so. In-person, 78% of students agreed that they sought help when needed compared to 50% of instructors. This is a much more reasonable difference.

Since it is the online instructors who showed such a large divergence, it is reasonable to see where they diverged from their students. Examining the differences in

item DIF measures (See Table 4.5), online instructors were the most likely to verify the necessity of homework, the accuracy of exams, and the importance of instructor presence. Online students were the least likely to validate these areas. Online instructors were the least likely to validate that their students were motivated, sought help, had sufficient opportunity for group work, and sufficient instructor interaction, while their students more readily verified these items. The online students considered themselves motivated, able to seek help when they did not understand a concept, did not feel as much need for group work or instructor interaction as their instructors, and were the group least likely to feel that homework was important.

The items measuring motivation and seeking help can be explained as communications issues. The items dealing with group work and instructor interaction indicate a difference of opinion. It appeared that the online instructors were more desirous of a setting that mimics the classroom environment than were their students. It is possible that given the lack of face to face communication in an online setting, that the online instructors tended to react by trying to recreate an in-person environment. This was backed up in the interviews by an instructor who required paper homework and exams to be scanned and sent in, thereby recreating the in-person assessment environment. The online instructors placed emphasis on homework, instructor interaction, group work, and students seeking help. They were emphasizing those items that would be reinforced twice a week in an in-person class. The online students for their part seemed to be much more comfortable without the instructor contact of the in-person setting; however, they were showing a lack of ability to adapt to the online environment as shown by their high failure rates. The instructor response seemed to be an attempt to

recreate the classroom environment, while the students, in spite of their greater comfort in the online setting, were not for the most part showing behaviors that lead to success in the online environment.

While the need for homework and students seeking help when they do not understand a concept cannot be argued, the need for instructor interaction and group work can. This may be a case of students who lack the self-efficacy skills necessary to be successful combined with instructors who respond to the lack of communication by doing more of what worked in the past for them. This is indicated by looking at the Item DIF measure plot (See Figure 4.3), where it can be seen that in the problem areas the online instructors and students tended to take more extreme views than their in-person counterparts. The lack of appropriate communication is also indicated by the fact that over 25% on online students did not feel like their instructor cared about their success.

Homework, Hawkes, and Assessment.

All respondent groups agreed that homework was necessary for success in the course. The differences on this item were those of degree and not actual disagreement, only 2% of student respondents disagreeing with the question. However, only 39% of students strongly agreed with this item in contrast to 75% of faculty. This indicates that faculty felt much more strongly about this item than did the students. This item did not appear to represent a disagreement over the merits of homework; rather a difference in the amount of importance attached to this item.

The concern with this item is the fact that while online instructors felt the strongest about this item, their students felt the least strongly. This does not agree with the fact that 62% of online students reported more than 6 hours of homework a week, an

amount that no online instructor felt was necessary. This may be an issue of communication, or the instructors expecting a higher level of performance than the students can attain. It might also be an issue of students not being prepared and so having to put in more time than expected. It must be remembered that the in-person students have an additional 2.5 hours a week that was not recorded, namely class time. With this in mind it might also be a case of online instructors not counting instruction time and students doing so. This is an issue that needs to be investigated in order to determine the cause of the problem. Interestingly, the group that did the most homework, online students, also felt the least strongly about the necessity of it. This needs to be addressed. Do they mean that they felt they were doing enough homework and didn't want to do more, or did they not agree with the importance of the amount of homework that they were doing? This is an important distinction, since doing over six hours per week of something you aren't convinced is important will lead to lack of motivation and disconnecting from the course.

All faculty respondents agreed that Hawkes was effective, 38% strongly agreeing with this item. Students on the other hand agreed that Hawkes was effective about 50% of the time. This means that 50% of students did not feel that Hawkes was an effective method of teaching. This may indicate a problem with the Hawkes system, or it may indicate students disliking the negative feedback that they received from the Hawkes system. This can also be seen in the attitude towards exams, while 100% of the instructors felt that the exams were accurate, only 58% of online and 60% of in-person students agreed with this assessment. Again, this raises the question of whether or not this indicated students expressing dislike for negative feedback or whether this was a

communication issue concerning what is expected on the exams. The fact that students in both online and in-person modalities had roughly the same attitude towards exams indicates the former; otherwise a higher agreement would be expected from the sections that had more access to direct communication with the instructors. This implies that the Hawkes system might not be as bad as the student responses suggest. However, review of the exams and the Hawkes system to determine more specific areas of student dissatisfaction would be beneficial.

Overview of Differences.

In five of the seven areas of difference (a) Students were motivated, (b) Homework Necessary, (c) Hawkes effective, (d) Exams accurate, (e) Sufficient opportunity for group work, and (g) Sufficient instructor interaction, the online students and instructors had the largest between group difference, each group moving in opposite directions from the norm. The cause for this is unknown, but the importance of these items indicates that they need to be addressed in order to maximize student success. The initial question to be asked is; why are the online course structures being reacted to differently by instructors and students?

Online students were the least likely to validate the necessity of homework, the effectiveness of Hawkes, or the accuracy of the exams. The differences in these items among the two groups indicated a possible problem in the course structure of online classes. This was exacerbated by the online faculty responses that considered 100% of their students to be generally unmotivated. This is important, because it indicates that student problems in these areas will not be addressed as effectively as it would for their in-person counterparts, since problems will tend to be considered as motivational issues.

This is therefore a dual problem of course structures that the students find difficult to navigate coupled with poor communication and understanding between students and instructors. Looking at one item, student motivation, and noticing that the results remain relatively comparable across online students, in-person students, and in-person faculty, while decreasing so drastically for online faculty seemed to indicate that online faculty may have a harder time adjusting to the isolation of an online setting than do their students and that lack of communication and instructor training may be major issues. This is supported by the fact that online instructors were least likely to validate that there was sufficient opportunity for group work and sufficient instructor interaction, while their students were the most likely to validate these items. This implies that it is the online instructors who were less comfortable with the isolation of the online environment.

The fact that 58% of online students didn't make it to the final exam indicated a lack of self-efficacy behaviors. However, they were the group that reported the greatest confidence when entering the course and seemed the most comfortable with the isolation of the online setting. This indicates a lack of understanding of the behaviors required to succeed and an inability during the course of the semester to rectify them.

Student Confidence

Since students were fairly confident of their ability in mathematics when they entered the course and their confidence level decreased, this represented an area of concern. Theoretically, the class should increase their confidence level in mathematics, whereas the data indicate that the courses actually reduced the student's confidence level in mathematics. Further studies should be conducted to determine whether or not the reduction in confidence levels represented the student reaching a more realistic

assessment of their capabilities, or if changes to course structure could be made to reverse this outcome and leave the student feeling more confident at the end of the course.

The situation is more problematic when looking at the item DIF measures for students who took the final exam and those students who did not (See Table 4.14). The students who did not take the final exam more readily validated the fact that they were confident going into the course, but were less likely to validate the fact that their confidence had increased after the course. This indicates that the students who did not take the final exam had the largest drop in confidence level and that not taking the final exam might have been due to lack of confidence in their ability to pass the final exam. This might have been due to course structures that allowed poorly performing students to drop by the way side, or it might have been due to the student gaining a more realistic assessment of their abilities than they entered college with. The fact that those who did not take the final exam had the highest confidence going into the course and the largest drop in confidence at the end of the semester suggests the student reaching a more realistic assessment of their abilities. More accurate student advisement might help to alleviate this problem.

Examining how students who did not take the final exam differed from their counterparts gave a more complete picture of their attitudes towards the class. They had the largest change in confidence, they were the most desirous of clear goals, and at the same time more readily endorsed the fact that the course had clear goals. This indicates that they might not have been fully cognizant of the course goals, despite their responses.

Students who did not take the final exam were more likely than those who took the final exam to endorse the need for group work. They were also more likely to endorse

the fact that they had sufficient instructor interaction, yet at the same time they were the least likely to indicate that the instructor took an interest in their success. While it is possible that the students who did not take the final exam had more interaction with their instructors and of a more negative nature than those students who took the final exam, considering their other differences, it appears to be more likely that they did not recognize what an appropriate level of instructor interaction was, that they lacked the necessary communication skills for succeeding in an online setting. Further they were not being communicated with in a fashion that adequately assesses the problem.

Poor Communication and Lack of Student Self Efficacy

There appeared to be a lack of student self-efficacy among the students in this study. This was indicated by the large numbers of students who did not take the final exam even though they were still enrolled in the course. This factor was exacerbated by the fact that there appeared to be poor communication between the students and the instructors, especially in the online setting. This was indicated by the fact that all groups in the survey considered motivation to be important, but while students in both modes of instruction generally considered themselves to be motivated, online instructors did not consider their students to be motivated. This led to the possibility that the students and instructors had different definitions of motivation. However, looking at the amount of homework that the students reported, especially in the online sections, indicates that they are putting in more time than was expected of them. This does not indicate a lack of motivation.

Online students were least likely to be seen by their instructors as seeking help when it was needed, even though they were the most likely to claim they sought such

help. The online students were also the group most likely to validate that they had sufficient instructor interaction. These items can be shown to be not accurate by the 56% completion rate of the in-person students and the 42% completion rate of the online sections. Examining the grades on the final exams shows a significant problem, especially with the online sections. When asked whether or not the instructor was interested in their success, over 25% of the online students disagreed. This is reminiscent of the fact that 100% of their instructors considered them to be unmotivated and indicates a communication problem between the two groups.

The student lack of self-efficacy was indicated by the differences in grades on the final exams. Since the in-person sections have a clear advantage in grades, it would appear that the online students were not seeking enough instructor interaction. It was also apparent that in spite of the amount of homework they reported, it might not be undertaken in a manner that was efficient in causing the material to be learned. Since the demographics were generally similar, there appeared to be skills that were transmitted in an in-person setting that were not transmitted effectively in an online format. It also did not appear that online instructors and online students are communicating in a manner that will address this issue.

Limitations of the Study

This study is limited by the number of respondents and the short time frame. This is evidenced by the low correlation coefficient of the Rasch model. This means that reproducibility is lower than desired. Increasing the length of the survey and surveying across several semesters would help to alleviate this. However, the purpose of this project was not to provide answers to a hypothesis, but to provide a general picture of problem

areas and generate ideas for solutions and future research. The level of accuracy is acceptable for this purpose.

This study is also limited by the fact that only those students motivated enough to participate in the survey had their opinions counted. The response rate was 9.6%. Male students were underrepresented in the survey and were not represented in the end of semester interviews. Survey responses were taken at face value. There was no verification of the respondent's answers.

The different modes of taking the final exam and the different final exams were a limiting factor in assessing outcome. The in-person students took the exam in a classroom setting similar to the other exams that they took during the semester. The online students took the exam at a KCTCS proctoring center. The exams are also different. The in-person sections had a paper exam and the online sections had an online exam with questions automatically generated. These differences were minimized by two factors. First, the construction of the exam ensured that there was a correlation between question content and difficulty on the final exams, even though the questions were different. Second, the online students had experience with at least one other proctored exam. Since most online students had taken online courses previously, which required proctored exams, they were familiar with the proctored exam setting.

High mean squared fit statistics for the item sufficient instructor interaction indicated confusion about the definition of interaction. This was backed up by the end of semester interviews. The instructors desired students to seek help in a more timely manner and better communicate their progress and problem areas, while the students desired feedback about their performance. The same confusion about definition may also

be case in the items discussing motivation. The high difference in measure between online students and online instructors indicating this might be the case. The instructors mentioned student help seeking behaviors and appropriate and timely communication as essential and lacking. While several online students mentioned timely communication, only one mentioned help seeking behaviors. The small number of interview students, n = 10, also made correlations with the telephone interviews less accurate.

Recommendations

This study found communication and student self-efficacy issues online, as well as a higher failure rate for male students. Further research should be done to address these areas. Several avenues of future research and several actions that could be taken to improve student success were indicated.

It would be useful to obtain the demographic and withdrawal data for all courses at SCC in order to determine whether or not the lower pass rate online persist in all disciplines or is specific to mathematics. This will allow "best practices" in online course delivery to be searched for across multiple disciplines. To date no one has done this research (Beaudoin, personal communication September 17, 2012). This data could be easily gathered. This same data could also be used to determine whether or not the high failure rate of male students occurs in all disciplines or is specific to mathematics.

Better advising and screening of online students would help increase student success. A number of students considered the pace of the course to be too fast, and a large number of students also lost confidence in their ability to succeed in mathematics courses after taking MAT 120 or MAT 150. One of the student complaints about the Hawkes Learning System was that the system skipped too many steps. This indicated a

lack of required knowledge when entering the course. Although SCC is not allowed to screen students, administering a pre-test at the beginning of the semester would help the student to gain a more realistic assessment of their abilities.

Steering prospective first-time online students into a hybrid course as a first step to teach them the needed academic skills would be helpful. In the in-person classes 56% of the students took the final exam compared to 42% online, this indicates that the face to face environment is helpful to students. This is supported by the fact that of the online students who took the final exam, 63% were from SCC and 37% were from other KCTCS campuses, while at the beginning of the semester 54% were from SCC and 46% were from other campuses. This indicates that the availability of face to face assistance is sufficient to improve student success.

Online instructors appeared to be uncomfortable in the online setting. This was indicated by the fact that only one instructor preferred teaching online, the rest preferred teaching in-person. Online instructors also desired more contact with their students and had lower opinions about the motivation of their students. This implies that formal training in online pedagogies for online instructors may be helpful. Another useful action would be to look for ways to increase student/instructor communication options for online instructors.

Conclusion

Although all classes had higher failure rates than desired, the situation is significantly worse for the online sections. Two major problems appear to be those of communication and student self-efficacy behaviors.

The demographics of the in-person and online students were substantially similar, while the success rate, as indicated by grades on the final exam and retention rate in-person was superior This implies that the student/instructor contact in the in-person setting created greater opportunity for success for the. Working on methods to reduce this gap would be beneficial. Online courses do offer educational access to SCC students, but this is coupled with a higher failure rate, indicating a need for better advisement and more student support if these students are to be successful.

Greater care in advising to help ensure that the students are academically mature enough to be successful in the online setting would be beneficial. Courses could also include a pre-test at the beginning of the semester to give students a more accurate assessment of their abilities. There was an underrepresentation of male students in this project. Community colleges are traditionally a predominantly female environment, however, the male students had higher drop-out rates both in-person and online. Of more concern, of the students who participated in the survey, only 14% of the online students and 23% of the in-person students were male. Of those students who agreed to a follow up interview, none were male. This may indicate differing male/female priorities, or it may indicate feelings of disenfranchisement among the male students. Problems among the male students were also indicated by their lower completion rates compared to female students even though their GPA's were similar. This is a topic that should be addressed to determine the reasons for its occurrence. Looking at the withdrawal rates in other disciplines would help to confirm whether there is a problem.

It appears evident that many of the students initially lack the self-efficacy behaviors needed to succeed in an online format. They arrive motivated and are willing to

do the work. However, it appears that they are not sure of the type of work that is necessary in order to succeed. This is implied by the facts that online students claim the highest motivation and the most amount of homework, yet have the lowest retention rates and average grades on the final exam.

This may be due to the fact that in the online setting no one is modeling effective behaviors for the students. They therefore maintain poor habits and foster feelings of disenfranchisement rather than communicating their problems effectively with the instructor. This is implied by the following facts (a) They enter the class with the most confidence but suffer the largest drop in confidence during the semester, (b) 50% of them felt that Hawkes was not an effective teaching method, (c) 43% felt that the exams were not accurate, and (d) over 25% felt that their instructors were not interested in their success. It would be useful if these students were steered toward a hybrid course as a first step to allow them to acquire the skills required to succeed in an online format.

The instructors, lacking clear communication from their students appear to think the worst and adopt attitudes that while they would be effective in alleviating these problems face to face, do little in an online environment. The online instructors feel as, if not more strongly about group work and instructor interaction than their in-person counterparts. These two items can be implemented in an in-person setting, but are more difficult to implement in an online setting, teaching math using a standardized software package. These are also items that the online students have the least amount of desire for of any of the groups in this study. Thus, it appears that online instructors would prefer a setting that mimics the in-person environment, while their students are more comfortable with the remoteness of the online setting, even if they do not know how to navigate it

successfully. The most telling piece of evidence for the online instructors lack of comfort in the online medium is the fact that 100% consider their students to be generally unmotivated, in spite of evidence to the contrary. Formal training in online pedagogies might be helpful in increasing instructor success. Examining additional means of student/instructor communication in the online setting would also be beneficial.

Before student self-efficacy can be addressed, effective communication must be established between the students and the instructors. Such communication appears to be problematic in the online setting. This is especially true since instruction is performed by a software package rather than the instructor. This is necessary, since the options are to equip everyone with a mathematical equation editor for communication purposes, which would have a steep learning curve, associated expenses, and unknown results, or resort to writing by hand and scanning items back and forth, which would mimic the in-person environment, but might not be a practical solution for all students. It would be beneficial to look for ways to solve the communication issues between students and instructors that exist in the online courses at SCC as a first step toward increasing student success.

APPENDIX A

Student Questionnaire of Success Factors

You are invited to take part in a study to measure perceptions of factors related to student success in this course. My name is Richard Matika, I am a student at the University of Kentucky. I am researching how student and instructor perceptions affect outcomes in this course. This study is being conducted as part of a doctoral program at the University of Kentucky. My faculty advisor for this project is Dr. Kelly Bradley of the Educational Policy Department at the University of Kentucky.

Your participation in this research is voluntary and you may quit at any time. Participation or non-participation will in no way affect your grade for this course. You will be asked to provide your email address when filling out this form. This is for the purpose of linking your responses on the survey to your demographic information and your grade on the final exam. All identifying information will be removed and replaced by a confidential identifier before the data are analyzed or reported. Successful completion of this part of the study will qualify you for a drawing for a $25 Walmart gift card.

Please be aware, while we make every effort to safeguard your data once received from the online survey/data gathering company, given the nature of online surveys, as with anything involving the internet, we can never guarantee the confidentiality of the data while still on the survey/data gathering company's servers, or while en route to either them or us. It is also possible the raw data collected for research purposes may be used for marketing or reporting purposes by the survey/data gathering company after the research is concluded, depending on the company's Terms of Service and Privacy Policies. Also, we may be required to show information which identifies you to people who need to be sure we have done the research correctly; these would be people from such organizations as the University of Kentucky.

At the end of this survey you will be asked to give permission to contact you for a further telephone interview which should take approximately 5 minutes. If you give your permission, you will be asked to provide your name and phone number. If you give your permission you may or may not be contacted. Your name will not be reported and will be used for contact purposes only. Participation in this portion of the study is entirely voluntary and you are free to quit at any time. Participation or non-participation will in no way affect your grade. Successful completion of this part of the study will qualify you for a drawing for a $25 Walmart gift card.

If you have any questions concerning this study, contact: Richard Matika at 606-387-3783, or Richard.matika@kctcs.edu.

APPENDIX A

Student Questionnaire of Success Factors

1) It is necessary to be motivated to learn the material in order to be successful in this class.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

2) I was motivated to learn the material presented in this class.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

3) At the beginning of the semester, I was confident of my ability to succeed in this class.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

4) After taking this class, my confidence level in mathematics has increased.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

5) Regular homework assignments are important for success in this class.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

6) The Hawkes system helped me to learn the material necessary for this course.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

7) The exams in this course accurately measured my abilities.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

APPENDIX A

Student Questionnaire of Success Factors

8) Interaction with the instructor is important for success in this course.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

9) My instructor was accessible.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

10) I sought help from my instructor whenever I did not understand a concept.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

11) It is important that a course have clear goals at the start of the semester.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

12) This course had clear goals at the start of the semester.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

13) It is important to work with other students to help learn the material.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

14) I had sufficient opportunities to work with other students on the material.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

APPENDIX A

Student Questionnaire of Success Factors

15) I feel that my instructor took an interest in my success.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

16) I would have preferred more interaction with my instructor.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

17) How many hours a week on average did you spend on homework?

(1) Less than 1 (2) 1 – 2 (3) 3 – 4 (4) 5 – 6 (5) More than 6

18) The pace of this course was.

(1) Much Too Slow (2) Too Slow (3) About Right (4) Too Fast (5) Much Too Fast

19) How many online courses have you taken previously? Numeric Answer

20) I prefer taking classes in which modality?

(1) Online (2) In-Person (3) No Preference

21) My KCTCS email is.

APPENDIX B

Faculty Questionnaire of Success Factors

You are invited to take part in a study to measure perceptions of factors related to student success in this course. My name is Richard Matika, I am a student at the University of Kentucky. I am researching how student and instructor perceptions affect outcomes in this course. This study is being conducted as part of a doctoral program at the University of Kentucky. My faculty advisor for this project is Dr. Kelly Bradley of the Educational Policy Department at the University of Kentucky.

Your name and identifying information will not be recorded with your responses, only whether the class you are teaching is online or in-person. Participation in this study is entirely voluntary and you are free to quit at any time.

Please be aware, while we make every effort to safeguard your data once received from the online survey/data gathering company, given the nature of online surveys, as with anything involving the internet, we can never guarantee the confidentiality of the data while still on the survey/data gathering company's servers, or while en route to either them or us. It is also possible the raw data collected for research purposes may be used for marketing or reporting purposes by the survey/data gathering company after the research is concluded, depending on the company's Terms of Service and Privacy Policies. Also, we may be required to show information which identifies you to people who need to be sure we have done the research correctly; these would be people from such organizations as the University of Kentucky.

At the conclusion of this study you will be asked for permission to contact you for a follow up telephone interview which should take approximately 5 minutes. Participation in this part of the survey is also voluntary and you may quit at any time. If you give permission for a follow up interview, you will be asked to provide a contact number. This information will be for contact purposes only and will not be reported.

If you have any questions concerning this study, contact: Richard Matika at 606-387-3783, or Richard.matika@kctcs.edu.

APPENDIX B

Faculty Questionnaire of Success Factors

1) It is important that students are motivated to learn the material in order to succeed in this class.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

2) My students were motivated to learn the material presented in this class.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

3) Regular homework assignments are important for success in this class.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

5) The Hawkes system helped my students to learn the material necessary for this course.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

6) The exams in this course accurately measured my student's abilities.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

7) Interaction with the instructor is important for success in this course.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

8) I was accessible to my students.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

APPENDIX B

Faculty Questionnaire of Success Factors

9) My students sought my help when they did not understand a concept.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

10) It is important that a course have clear goals at the start of the semester.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

11) This course had clear goals at the start of the semester.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

12) Working with other students is important to help students learn the material.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

13) My students had sufficient opportunities to work with other students on the material.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

14) I had sufficient interaction with my students.

(1) Strongly Disagree (2) Disagree (3) Agree (4) Strongly Agree

4) How many hours per week did you expect your students to spend on homework?

(1) Less than 1 (2) 1 – 2 (3) 3 – 4 (4) 5 – 6 (5) More than 60

APPENDIX B

Faculty Questionnaire of Success Factors

15) The pace of this course was.

(1) Much Too Slow (2) Too Slow (3) About Right (4) Too Fast (5) Much Too Fast

16) This class was taught.

(1) Online (2) In-Person

I prefer teaching classes in which modality?

(1) Online (2) In-Person

APPENDIX C

Telephone Interview for Online Students

1) How many online courses have you taken previously to this?

2) What things helped you the most in this course?

3) What things hindered you the most in this course?

4) Is there anything else you would like to add that could improve this course?

APPENDIX D

Telephone Interview for In-Person Students

1) What things helped you most in this course?

2) What things hindered you most in this course?

3) Is there anything else you would like to add that could improve this course?

APPENDIX E

Telephone Interview for Online Instructors

1) How much experience do you have teaching online?

2) What do you think is the most beneficial aspect of this course for students?

3) What do you think hinders students the most?

4) Is there anything you would like to add that could improve this course?

APPENDIX F

Telephone Interview for In-Person Instructors

1) What do you think is the most beneficial aspect of this course for students?

2) What do you think hinders students the most?

3) Is there anything you would like to add that could improve this course?

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
25	F	F	3.20	Nursing Pending (ADN)	JFCSW	82344	
33	F	F	3.57	Associate in Arts	SECHA	82344	
34	M	T	3.02	Information Technology	SMCLA	82344	
53	F	T	3.81	Education	JFC	82344	
21	F	T	2.56	Non Credential	ECTC	82344	
21	F	F	2.95	Human Services	HZC	82344	
47	F	T	3.71	Associate in Arts	SMC	82344	
24	F	F	2.47	Nursing Integrated Program	MDC	82344	
20	F	F	3.27	General, Allied Health	SMCLA	82344	
21	F	H	2.70	Radiography Pending	ECTC	82344	
24	M	F	3.20	Information Technology	SMC	82344	
18	F	L	1.00	Non Credential - High School	SMC	82344	
27	F	F	2.00	Bus Management & Marketing	BLC	82344	
28	F	H	2.79	Radiography Pending	SMCLA	82344	
27	M	F	1.00	General Humanities	JFCSW	82344	
35	F	H	2.02	Education	SMCLA	82344	
24	F	F	2.70	General, Allied Health	SMC	82344	
22	F	F	1.84	Medical Assisting	GTWED	82344	
37	F	T	3.21	Undecided	JFC	82344	W
48	M	F	3.76	Information Technology	GTW	82344	W
22	M	F	2.60	Undecided	BGT	82344	W
23	F	H	2.15	Undecided	JFC	82344	W
27	F	F	2.18	Nursing Pending (ADN)	JFCSW	82344	
27	F	F	2.13	Associate in Arts	SECHA	82344	
27	M	T	2.09	Information Technology	SMCLA	82344	
27	F	T	2.04	Education	JFC	82344	
27	F	T	1.99	Non Credential	ECTC	82344	
27	F	F	1.95	Human Services	HZC	82344	
26	F	T	1.90	Associate in Arts	SMC	82344	
26	F	F	1.86	Nursing Integrated Program	MDC	82344	
26	F	F	1.81	General, Allied Health	SMCLA	82344	
26	F	H	1.77	Radiography Pending	ECTC	82344	
26	M	F	1.72	Information Technology	SMC	82344	
26	F	L	1.67	Non Credential - High School	SMC	82344	

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
26	F	F	1.63	Bus Management & Marketing	BLC	82344	
25	F	H	1.58	Radiography Pending	SMCLA	82344	
25	M	F	1.54	General Humanities	JFCSW	82344	
25	F	H	1.49	Education	SMCLA	82344	
25	F	F	1.44	General, Allied Health	SMC	82344	
25	F	F	1.40	Medical Assisting	GTWED	82344	
25	F	T	1.35	Undecided	JFC	82344	W
25	M	F	1.31	Information Technology	GTW	82344	W
25	M	F	1.26	Undecided	BGT	82344	W
24	F	H	1.22	Undecided	JFC	82344	W
24	F	F	1.17	Nursing Pending (ADN)	JFCSW	82344	
24	F	F	1.12	Associate in Arts	SECHA	82344	
24	M	T	1.08	Information Technology	SMCLA	82344	
24	F	T	1.03	Education	JFC	82344	
24	F	T	0.99	Non Credential	ECTC	82344	
24	F	F	0.94	Human Services	HZC	82344	
23	F	T	0.89	Associate in Arts	SMC	82344	
23	F	F	0.85	Nursing Integrated Program	MDC	82344	
23	F	F	0.80	General, Allied Health	SMCLA	82344	
23	F	H	0.76	Radiography Pending	ECTC	82344	
23	M	F	0.71	Information Technology	SMC	82344	
23	F	L	0.67	Non Credential - High School	SMC	82344	
23	F	F	0.62	Bus Management & Marketing	BLC	82344	
22	F	H	2.57	Associate in Arts	SMC	82360	
21	F	F	2.83	General, Allied Health	SMCLA	82360	
34	F	F	3.10	Education	ECTC	82360	
32	F	F	3.12	Nursing INT Program Pending	HZC	82360	
23	F	F	2.69	Elementary Education	HZCLE	82360	
21	F	T	3.44	Physical Therapist Assist Pend	SMC	82360	
35	F	H	3.30	Associate in Arts	SMCLA	82360	
30	F	H	2.94	Education	SMCLA	82360	
19	F	T	2.20	General, Allied Health	SMCLA	82360	
19	F	F	3.00	Associate in Science	BSC	82360	
34	F	H	3.25	Health Science Technology	WKCTC	82360	
19	F	H	3.00	General, Allied Health	SMCLA	82360	
20	F	T	1.90	Associate in Arts	SMCLA	82360	

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
20	M	T	0.83	Business Administration	SMC	82360	
30	F	T	3.00	Adv Practi Resp Therap Pending	SMCLA	82360	
37	F	F	2.40	Business Administration	HEC	82360	
40	F	L	2.33	Associate in Arts	SMCMC	82360	
23	M	F	1.77	Business Administration	BSC	82360	
38	F	H	2.38	General, Allied Health	SMC	82360	
21	F	L	1.94	Associate in Arts	SMC	82360	
32	F	F	3.17	Associate in Arts	MYCRC	82360	
33	F	L	2.04	Criminal Justice	HPC	82360	
18	F	F	1.32	Volumetric Medical Imaging	JFCSW	82360	
40	F	F	2.50	General, Allied Health	SMCLA	82360	
53	M	T	2.63	Associate in Arts	SMC	82360	
29	M	H	2.73	Psychology	SMC	82360	
19	M	F	2.06	Criminal Justice	SMC	82360	
28	F	F	2.37	Social Work	SMC	82360	
22	F	T	1.00	Business Administration	SMCLA	82360	
28	M	F	2.50	Undecided	SMC	82360	
42	F	L	3.03	Social Work	SMC	82360	
22	F	F	2.39	Social Work	SMC	82360	
23	M	F	2.51	Criminal Justice	BSC	82360	
21	M	L	2.42	Criminal Justice	OWC	82360	
19	M	H	1.71	Associate in Science	SMCLA	82360	
43	F	T	1.96	Associate in Arts	HZC	82360	
20	F	T	1.57	Accounting	SMC	82360	
21	F	H	0.00	Biology/Botany	SMC	82360	
40	F	H	3.00	Pre Nursing	MDC	82360	
24	F	L	2.77	Nursing Pending (ADN)	SMCLA	82360	
21	F	F	1.82	Education	SMCLA	82360	
39	F	H	2.52	Medical Assisting (Int) Pend	MYCLV	82360	
52	F	N	3.05	Associate in Arts	SMC	82360	
46	F	T	2.66	Health Science Technology	ACTC	82360	
34	F	F	2.50	Business Administration	HPC	82360	
25	F	F	2.83	Accounting	HPC	82360	
22	F	F	3.11	Education	SMCMC	82360	
29	M	F	2.81	Associate in Arts	BSC	82360	

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
20	M	F	2.13	Criminal Justice	SMCLA	82360	
19	F	F	0.40	Pre Dental	SMC	82360	
29	F	L	2.39	Radiography Pending	SMC	82360	
20	F	F	1.80	Nursing INT Program Pending	HZC	82360	
38	F	N	2.78	Nursing INT Program Pending	HZCLE	82360	
20	F	N	2.30	Associate in Science	OWC	82360	
20	F	F	1.50	Mathematics	SMCLA	82360	
32	M	L	2.57	Associate in Arts	SMCMC	82360	
30	F	F	3.49	Adv Practi Resp Therap Pending	BSC	82360	
19	F	F	3.50	General, Allied Health	SMC	82360	W
26	M	F	3.21	Nursing	SMC	82360	W
44	F	F	3.70	Nursing INT Program Pending	HZCLE	82360	W
24	F	F	2.82	Nursing Pending (ADN)	SMCLA	82360	W
32	F	F	3.17	Physical Therapist Assist Pend	SMC	82360	W
26	F	F	2.67	Nursing Pending (ADN)	SMCLA	82360	W
38	F	T	1.70	General, Social Behavioral Sci	SMC	82360	W
37	M	F	3.33	Business Administration	SMCLA	82360	W
51	F	F	3.05	Nursing Pending (ADN)	GTWED	82360	W
20	F	F	2.94	Radiography Pending	HZCLE	82360	W
41	F	F	3.64	Associate in Science	SMCLA	82360	W
31	F	F	3.43	Undecided	SMCRC	82360	W
20	M	H	3.96	Aviation Maintenance Technolog	SMC	82360	W
42	F	F	3.19	Biotechnology	OWC	82360	W
25	F	T	2.15	Radiography Pending	SMCRC	82360	W
26	F	F	2.05	Business Administration	MDC	82360	W
20	F	F	3.11	Criminal Justice	BSC	82360	W
28	M	F	1.00	Engineering & Electronics Tech	SMCLA	82360	W
21	M	F	3.08	High School Education	SMC	82360	W
31	F	H	2.56	General, Allied Health	SMCLA	82360	W
22	F	F	0.00	Social Work	SMC	82360	W
40	F	H	3.67	Associate in Arts	SMCLA	82360	W
24	F	F	2.53	Pre Physical Therapy	HZC	82360	W
35	M	F	2.70	Associate in Science	SMCLA	82360	W

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
26	M	F	3.40	Information Technology	BSC	82360	W
19	M	F	1.60	Associate in Arts	HZCLE	82360	W
25	F	F	3.57	General, Allied Health	SMCLA	82360	W
40	F	H	2.37	Education	SMCLA	82360	W
38	F	F	3.95	Information Technology	MYC	82360	W
17	F	F	3.00	General, Allied Health	SMC	82360	W
21	F	T	2.00	Radiography Pending	SMC	82360	W
23	M	T	2.14	Education	SMCMC	82360	W
55	F	H	3.30	Computer Information Systems	JFCSW	82360	W
19	F	F	2.67	Associate in Arts	SMCLA	82360	W
46	F	F	1.22	Medical Information Technology	ECTC	82360	W
41	F	H	3.41	Education	ECTC	82360	W
35	F	F	2.19	Nursing Pending (ADN)	GTWED	82360	W
35	M	F	1.82	Associate in Arts	SMCLA	82360	W
38	F	L	2.81	Non Credential	SMCLA	82360	W
48	M	F	3.90	Clinical Lab Technician (INT)	SMC	82360	W
21	F	F	3.31	Associate in Arts	BSC	82360	W
29	M	F	2.91	Associate in Arts	BSC	82360	W
21	F	F	3.00	Associate in Arts	SMC	82360	W
23	M	F	1.97	Associate in Arts	SMCLA	82360	W
50	F	F	3.78	Practical Nurse Pending	SMC	82360	W
43	F	F	3.30	Education, General	SMCLA	82360	W
43	F	T	3.91	Associate in Science	SMC	82377	
29	F	F	3.25	Associate in Science	SMC	82377	
25	F	F	4.00	Associate in Science	SMCCC	82377	
23	F	F	3.11	Health Science Technology	ACTC	82377	
19	F	F	3.46	Radiography Pending	SMCLA	82377	
26	F	F	3.80	General, Allied Health	SMC	82377	
27	M	F	2.78	Information Technology	GTW	82377	
37	F	F	2.98	Criminal Justice	SMCLA	82377	
34	M	F	3.75	Accounting	ECTC	82377	
21	M	F	2.13	Psychology	SMCLA	82377	
18	F	F	3.05	Radiography Pending	SMCLA	82377	
45	M	F	2.88	Business Administration	SMC	82377	

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
29	M	F	3.50	Information Technology	JFCSW	82377	
27	F	T	2.56	Occupational Therapy Assistant	MDC	82377	
21	M	T	1.00	Accounting	HPC	82377	
23	M	T	0.79	Databse Admin Enhanced Mcrosft	JFCSC	82377	
24	M	L	1.86	Associate in Arts	SMC	82377	
23	F	F	2.81	Associate in Arts	SMCLA	82377	
26	F	H	2.96	Associate in Arts	SMC	82377	
20	F	F	2.57	General, Allied Health	SMCLA	82377	
37	M	F	1.29	General, Social Behavioral Sci	HZCLE	82377	
20	F	F	2.08	Psychology	JFC	82377	
24	F	T	2.65	Biology/Botany	MYC	82377	
28	F	H	1.75	Associate in Science	HPC	82377	
34	F	T	2.69	Pre Nursing	MDCHC	82377	
23	F	F	1.05	Pre Nursing	BLC	82377	
33	F	L	2.70	Nursing Pending (ADN)	SMC	82377	
33	F	N	1.99	Associate in Arts	SMCLA	82377	
27	F	L	2.86	Associate in Arts	MYC	82377	
27	F	H	2.93	Nursing INT Program Pending	HZC	82377	
36	F	F	2.47	Nursing INT Program Pending	HZC	82377	
29	F	L	2.01	Associate in Arts	SMCLA	82377	
26	F	L	2.53	Nursing Pending (ADN)	MDC	82377	
30	F	T	2.68	Associate in Science	OWC	82377	
24	F	T	2.75	Medical Information Technology	SMCLA	82377	
21	F	F	2.58	Undecided	SMC	82377	
29	F	T	3.86	Criminal Justice	GTW	82377	
25	F	H	1.10	Elementary Education	SMCLA	82377	W
27	F	H	2.17	Associate in Arts	SMC	82377	W
25	M	F	2.18	Associate in Science	SMCCC	82377	W
36	F	F	0.56	Medical Assisting	HEC	82377	W
24	F	H	2.64	General, Allied Health	SMCLA	82377	W
34	F	L	2.56	Associate in Arts	ECTC	82377	W
30	F	F	2.63	Accounting	ECTC	82377	W
19	F	F	2.77	Nursing INT Program Pending	HZC	82377	W

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
21	F	F	2.00	Criminal Justice	JFCSW	82377	W
29	F	T	2.81	Nursing Pending (ADN)	JFCSC	82377	W
37	F	T	1.50	General, Allied Health	SMCLA	82377	W
36	M	T	3.40	Associate in Arts	SMCCC	82377	W
20	F	T	2.84	Nursing INT Program Pending	HZC	82377	W
40	F	T	3.38	Education	ECTC	82377	W
26	M	H	3.68	Associate in Science	SMC	82385	
19	M	L	3.50	Undecided	JFC	82385	
19	M	F	3.00	Information Technology/CIS	SMCLA	82385	
20	F	F	1.20	Surgical Technology Pending	SMC	82385	
25	M	F	3.05	Electrical Technology	SMCLA	82385	
22	F	F	2.63	Nursing Pending (ADN)	HPC	82385	
19	F	F	1.33	English	SMC	82385	
19	F	T	2.22	Special Education	SMCRC	82385	
28	M	H	1.74	Associate in Arts	SMC	82385	
19	M	F	2.82	Physical Therapist Assist Pend	SMC	82385	
19	F	T	0.25	General, Allied Health	ECTC	82385	
31	M	H	2.37	Information Technology	BGT	82385	
31	F	F	3.07	Associate in Science	SMCCC	82385	W
28	F	H	3.09	Business Administration	ECTC	82385	W
19	F	F	2.33	Pharmacy Technician	SMCLA	82385	W
27	M	T	2.11	General, Allied Health	SMCLA	82385	W
37	F	F	2.77	Information Technology	SMC	82385	W
24	M	F	3.40	Physical Therapist Assist Pend	SMCLA	82385	W
26	F	T	2.11	Associate in Arts	SMC	82385	W
31	F	F	2.42	Social Work	SMC	82385	W
21	M	F	3.56	Associate in Science	SMC	82385	W
39	F	H	2.00	Associate in Arts	SMC	82385	W
18	F	F	1.50	Special Education	SMC	82385	W
24	F	H	2.57	Associate in Science	SMCCC	82385	W
20	F	T	3.90	Pre Nursing	HPC	82385	W
19	F	F	3.00	Middle School Education	SMCMC	82385	W
22	F	T	2.80	Associate in Arts	BGT	82385	W
21	F	F	2.60	Associate in Science	SMCLA	82385	W
23	M	F	3.90	Electrical Technology	SMCLA	82385	W
21	F	T	2.08	Elementary Education	SMC	82391	

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
22	M	T	3.14	Forestry	SMC	82391	
24	F	F	4.00	Social Work	SMCLA	82391	
25	F	H	2.87	Associate in Science	MYCRC	82391	
19	F	F	4.00	Nursing Pending (ADN)	SMC	82391	
19	F	H	2.74	Nursing Pending (ADN)	SMCLA	82391	
24	M	H	4.00	Associate in Science	BLC	82391	
35	F	F	3.79	Education	SMC	82391	
19	F	F	3.84	Associate in Science	SMC	82391	
18	F	F	3.77	Pre Nursing	SMCMC	82391	
23	F	F	3.40	General, Allied Health	SMC	82391	
20	F	F	2.75	Medical Assisting (Int) Pend	SMCLA	82391	
30	F	T	3.79	Nursing Pending (ADN)	SMC	82391	
18	F	H	3.25	HS Medical Information Tech	SMCLA	82391	
24	M	T	3.13	Education	SMC	82391	
19	F	F	3.29	Physical Education/ Coaching	SMC	82391	
21	M	F	3.40	Nursing Pending (ADN)	SMC	82391	
45	F	T	3.23	General, Allied Health	SMC	82391	
29	F	L	2.97	Associate in Arts	SMC	82391	
21	F	F	3.08	Associate in Arts	JFC	82391	
43	F	F	3.62	Associate in Arts	SMCLA	82391	
20	F	F	3.55	Associate in Science	SMC	82391	
21	M	H	2.00	Nursing Pending (ADN)	SMC	82391	
38	M	F	2.97	Nursing Pending (ADN)	SMC	82391	
26	F	F	3.06	Associate in Arts	SMCLA	82391	
20	M	T	2.09	Psychology	SMC	82391	
22	F	H	2.79	Associate in Science	SMCLA	82391	
19	F	N	2.67	Radiography Pending	SMCLA	82391	
29	F	L	1.27	Elementary Education	SMC	82391	
19	M	F	1.00	Information Technology	SMC	82391	
18	F	F	2.67	Associate in Arts	SMC	82391	
43	F	F	2.38	Associate in Arts	SMCLA	82391	
40	M	F	2.93	Associate in Arts	SMCMC	82391	
22	M	H	2.80	Information Technology	SMC	82391	
37	F	H	2.85	Associate in Arts	SMCLA	82391	
22	F	H	2.64	Associate in Science	SMCLA	82391	
38	F	F	2.46	Nursing Pending (ADN)	GTWED	82391	W

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
27	F	H	2.67	Associate in Arts	SMC	82391	W
19	F	F	2.00	Engineering & Electronics Tech	SMC	82391	W
23	M	F	3.43	Associate in Science	SMC	82391	W
48	F	F	3.79	Education	GTW	82391	W
31	M	L	3.88	Business Administration	JFC	82391	W
27	F	F	2.95	Associate in Science	HZC	82391	W
31	F	H	2.53	Associate in Arts	SMC	82391	W
43	F	F	3.00	Associate in Arts	SMC	82391	W
47	F	T	2.24	General, Social Behavioral Sci	SMC	82391	W
21	F	F	2.88	Physical Therapist Assist Pend	SMCLA	82391	W
19	F	F	3.26	Nursing INT Program Pending	HZC	82391	W
32	F	F	2.46	Undecided	SMC	82391	W
59	M	H	4.00	Non Credential	SMC	82391	W
19	M	F	3.84	Information Technology	SMCLA	82391	W
19	F	F	3.07	Physical Therapist Assist Pend	SMC	82213	
18	F	F	3.20	Radiography Pending	SMC	82213	
19	M	F	3.54	Pre Pharmacy	SMC	82213	
18	M	F	3.53	Elementary Education	SMC	82213	
27	F	F	3.39	Associate in Science	SMC	82213	
20	F	F	3.05	Associate in Arts	SMC	82213	
20	M	F	2.82	Nursing Pending (ADN)	SMC	82213	
25	M	F	3.28	Biology/Botany	SMC	82213	
21	M	F	3.17	History	SMC	82213	
20	M	F	3.17	Associate in Science	SMC	82213	
30	M	F	1.69	Undecided	SMC	82213	
23	F	L	3.11	Associate in Arts	SMC	82213	
26	M	F	3.08	Criminal Justice	SMC	82213	
31	F	F	2.63	Associate in Science	SMC	82213	
41	M	F	3.25	Information Technology	SMC	82213	
19	M	F	2.30	Business Administration	SMC	82213	
23	F	F	2.46	Associate in Science	SMC	82213	
20	M	F	2.08	Engineering & Electronics Tech	SMC	82213	
18	F	F	2.29	Elementary Education	SMC	82213	
29	F	T	1.97	Nursing Pending (ADN)	SMCLA	82213	

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
19	M	F	0.00	Associate in Arts	SMC	82213	
19	M	F	2.78	Business Administration	SMC	82213	
21	M	L	2.03	Associate in Arts	SMC	82213	
18	F	F	0.00	General, Allied Health	SMC	82213	
21	F	N	0.25	Associate in Science	SMC	82213	
22	F	F	1.71	Accounting	SMC	82213	W
27	F	F	2.49	Elementary Education	SMCCC	82213	W
19	M	F	1.40	Undecided	SMC	82213	W
19	F	F	3.00	Undecided	SMC	82213	W
46	M	F	3.76	Associate in Arts	SMC	82213	W
19	M	F	3.26	Biology/Botany	SMC	82229	
53	F	F	3.79	Information Technology	SMC	82229	
19	F	F	3.08	Nursing Pending (ADN)	SMC	82229	
36	F	F	3.07	Associate in Arts	SMC	82229	
30	F	F	3.52	Associate in Arts	SMC	82229	
18	M	F	3.00	Computer Aided Drafting/Design	SMC	82229	
19	M	F	1.71	Undecided	SMC	82229	
21	F	F	3.25	Undecided	SMC	82229	
19	F	H	2.05	Undecided	SMC	82229	
19	F	F	2.12	Associate in Science	SMCRC	82229	
22	F	F	2.30	Nursing Pending (ADN)	SMC	82229	
17	M	F	1.47	Undecided	SMC	82229	
20	M	F	1.36	Radiography Pending	SMC	82229	
20	M	F	3.07	Middle School Education	SMC	82229	
19	M	T	1.10	Undecided	SMC	82229	
60	M	F	1.92	Associate in Science	SMC	82229	
20	F	F	2.47	Pre Dental	SMC	82229	
19	F	F	1.93	Undecided Transfer	SMC	82229	
19	M	H	2.37	Information Technology	SMC	82229	
25	F	H	0.00	Biology/Botany	SMC	82229	
20	M	F	2.77	Information Technology	SMC	82229	W
20	M	F	3.57	Criminal Justice	SMC	82229	W
33	F	H	2.64	Associate in Arts	SMC	82229	W
21	F	F	4.00	Associate in Arts	SMC	82229	W
19	M	F	2.90	Undecided	SMC	82229	W

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
22	M	F	2.81	Associate in Science	SMC	82229	W
20	M	F	2.98	Undecided	SMC	82229	W
20	M	F	4.00	Undecided	SMC	82239	
29	M	T	3.30	General, Allied Health	SMC	82239	
38	F	F	3.60	Radiography Pending	SMC	82239	
46	M	F	2.72	Associate in Science	SMC	82239	
19	M	F	3.50	Nursing Pending (ADN)	SMC	82239	
20	F	F	2.86	Associate in Arts	SMC	82239	
23	F	H	2.03	Undecided	SMC	82239	
18	M	F	1.75	Undecided Transfer	SMC	82239	
42	F	L	2.29	Associate in Arts	SMC	82239	
24	F	T	2.19	Associate in Science	SMC	82239	
19	M	F	0.00	Nursing Pending (ADN)	SMC	82239	
27	F	T	2.14	Elementary Education	SMCCC	82239	W
22	M	T	3.32	Associate in Arts	SMC	82239	W
32	M	F	0.00	Undecided	SMC	82239	W
20	M	T	2.14	Associate in Arts	SMC	82239	W
28	M	F	4.00	Criminal Justice	SMC	82239	W
19	M	F	1.75	Biology/Botany	SMC	82239	W
22	F	F	2.98	Information Technology	SMC	82239	W
21	F	F	3.91	Associate in Arts	SMCCC	82239	W
18	F	F	3.87	Nursing Pending (ADN)	SMC	82239	W
31	M	F	3.18	Psychology	SMCCC	82239	W
24	M	F	2.90	English	SMCCC	82239	W
20	F	F	3.11	Elementary Education	SMC	82239	W
24	M	F	2.77	Radiography Pending	SMC	82247	
19	F	F	3.41	Pre Dental	SMC	82247	
20	F	F	3.23	Business Administration	SMC	82247	
19	F	F	2.98	Associate in Arts	SMC	82247	
20	F	F	3.28	Nursing Pending (ADN)	SMC	82247	
18	F	F	3.36	Associate in Arts	SMC	82247	
27	F	F	2.25	Associate in Science	SMC	82247	
19	F	T	2.83	Pre Dental	SMC	82247	
21	F	F	2.87	Elementary Education	SMC	82247	
25	F	F	2.38	Criminal Justice	SMC	82247	
19	F	F	2.00	Associate in Arts	SMC	82247	

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
20	F	F	2.93	Psychology	SMC	82247	
19	F	F	3.08	Social Work	SMC	82247	
20	F	F	2.09	Psychology	SMC	82247	
19	F	T	1.33	Social Work	SMC	82247	
19	F	F	0.78	Chemistry	SMCRC	82247	
19	F	F	2.56	Undecided	SMC	82247	
20	F	F	1.57	Criminal Justice	SMC	82247	
21	F	F	1.81	Criminal Justice	SMC	82247	
19	F	F	1.26	Biology/Botany	SMC	82247	
20	M	F	0.00	Criminal Justice	SMC	82247	
21	F	F	2.55	General, Allied Health	SMC	82247	W
19	M	F	2.06	Undecided	SMC	82247	W
19	M	T	2.50	Agriculture/Horticulture	SMC	82247	W
21	M	F	2.15	General, Allied Health	SMC	82247	W
18	F	F	3.44	Elementary Education	SMC	82247	W
44	F	F	3.61	Associate in Science	SMC	82247	W
26	M	F	2.63	Criminal Justice	SMC	82247	W
31	M	T	1.72	Associate in Arts	SMC	82247	W
21	F	F	3.56	Special Education	SMC	82368	
21	F	F	3.56	English	SMC	82368	
45	F	H	3.67	Associate in Arts	SMC	82368	
33	F	F	3.63	Elementary Education	SMC	82368	
19	F	F	2.83	Undecided	SMC	82368	
20	M	H	2.00	Associate in Arts	SMC	82368	
31	F	F	2.91	Associate in Arts	SMC	82368	
30	M	F	3.63	General, Allied Health	SMC	82368	
19	M	F	2.75	Criminal Justice	SMC	82368	
18	F	F	2.68	Associate in Science	SMC	82368	
34	F	F	3.71	Business Administration	SMC	82368	
22	F	T	2.24	Business Administration	SMC	82368	
19	M	F	2.70	Microsoft Networking MCSE	SMC	82368	
36	F	H	3.06	Radiography Pending	SMCRC	82368	
29	F	F	3.29	Radiography Pending	SMC	82368	
19	F	F	2.40	Undecided Transfer	SMC	82368	
23	F	F	2.35	Elementary Education	SMC	82368	
25	F	F	2.71	English	SMCMC	82368	

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
20	M	F	1.91	Criminal Justice	SMC	82368	
28	F	T	1.63	Associate in Science	SMC	82368	
19	F	F	1.73	Associate in Science	SMC	82368	
18	F	F	3.00	Associate in Science	SMC	82368	W
19	F	F	2.50	Undecided	SMC	82368	W
19	F	F	1.00	Middle School Education	SMC	82368	W
22	M	F	2.60	Undecided	SMC	82368	W
19	F	F	2.50	Elementary Education	SMC	82368	W
19	M	F	0.00	Nursing Pending (ADN)	SMC	82368	W
19	F	F	3.97	Pre Nursing	SMC	82388	
19	F	F	3.40	Education, General	SMCCC	82388	
21	M	F	2.97	Physical Therapist Assist Pend	SMCLA	82388	
42	M	F	3.68	Associate in Arts	SMC	82388	
39	F	F	3.00	Elementary Education	SMC	82388	
37	F	F	3.71	Adv Practi Resp Therap Pending	SMC	82388	
23	M	T	2.96	Information Technology	SMC	82388	
20	F	F	2.91	Nursing Pending (ADN)	SMC	82388	
19	F	F	2.72	Undecided	SMC	82388	
21	M	F	3.60	Criminal Justice	SMC	82388	
20	M	F	2.14	Associate in Science	SMC	82388	
24	M	H	1.96	Associate in Arts	SMC	82388	
24	F	F	2.50	Business Administration	SMC	82388	
19	M	F	1.00	Associate in Science	SMC	82388	
25	F	F	1.50	General, Allied Health	SMC	82388	
20	M	F	2.40	Associate in Arts	SMC	82388	
21	M	F	1.57	Associate in Arts	SMC	82388	
33	F	H	2.60	Undecided	SMCMC	82388	
21	F	F	0.00	Nursing Pending (ADN)	SMC	82388	
19	M	F	1.29	Music	SMC	82388	W
22	F	F	2.20	Physical Therapist Assist Pend	SMC	82388	W
19	M	F	2.71	Psychology	SMC	82388	W
20	F	F	1.96	Undecided	SMC	82388	W
22	F	H	2.41	Art/Art History/ Fine Art	SMC	82388	W
19	F	F	2.00	General, Allied Health	SMC	82388	W
34	F	F	3.50	Nursing Pending (ADN)	SMC	82388	W

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
46	F	F	2.80	General, Allied Health	SMC	82395	
21	F	F	2.76	Pre Nursing	SMC	82395	
19	F	F	3.30	Associate in Arts	SMC	82395	
23	F	F	3.27	Adv Practi Resp Therap Pending	SMC	82395	
18	F	F	3.78	Small Business Management	SMC	82395	
20	F	F	3.50	Nursing Pending (ADN)	SMC	82395	
38	F	T	3.75	Undecided	SMC	82395	
38	F	F	4.00	Nursing Pending (ADN)	SMC	82395	
23	M	T	2.31	Physical Therapist Assist Pend	SMC	82395	
22	F	F	2.83	Associate in Science	SMCRC	82395	
20	F	F	3.31	Undecided Transfer	SMC	82395	
34	F	F	3.15	Associate in Arts	SMC	82395	
20	F	F	1.75	Education	SMC	82395	
25	F	L	2.50	Social Work	SMC	82395	
36	F	L	2.28	Education	SMC	82395	
23	F	T	1.75	Art/Art History/ Fine Art	SMC	82395	
18	F	F	0.00	Criminal Justice	SMC	82395	
27	M	T	2.54	Radiography Pending	SMC	82395	
18	F	F	0.00	Nursing Pending (ADN)	SMC	82395	
38	F	F	1.29	General, Allied Health	SMC	82395	
19	M	F	0.13	Elementary Education	SMC	82395	
21	M	F	0.96	Criminal Justice	SMC	82395	
22	F	F	1.95	Associate in Science	SMC	82395	
21	F	F	2.75	Art/Art History/ Fine Art	SMC	82395	W
20	M	F	2.20	Criminal Justice	SMC	82395	W
25	M	H	2.02	Education, General	SMC	82395	W
19	F	F	2.35	Sociology	SMC	82395	W
21	F	F	2.63	Social Work	SMC	82395	W
33	F	H	2.72	Associate in Arts	SMC	82395	W
23	F	T	2.32	Associate in Arts	SMC	82404	
30	F	F	4.00	Pre Nursing	SMC	82404	
21	M	H	4.00	Undecided	SMC	82404	
23	F	F	3.18	Practical Nurse Pending	SMCCC	82404	
30	F	H	3.22	Associate in Science	SMC	82404	
44	F	H	4.00	Pre Nursing	SMC	82404	

APPENDIX G

Student Demographics

Age	Sex	Course Load	GPA	Program	Home Campus	Class Number	Withdraw
33	F	T	2.28	Business Administration	SMC	82404	
40	F	H	3.14	Associate in Arts	SMC	82404	
50	F	F	3.70	Associate in Arts	SMC	82404	
23	F	T	2.86	Associate in Science	SMC	82404	
23	F	T	1.60	English	SMC	82404	
20	F	T	2.47	Associate in Arts	SMC	82404	
19	M	H	2.29	Political Science	SMC	82404	
23	M	F	2.44	History	SMC	82404	
21	F	N	2.33	General, Allied Health	SMC	82404	
21	F	T	0.86	Psychology	SMC	82404	
37	F	T	2.75	Education	SMC	82404	W
19	F	F	3.32	Communications	SMC	82404	W
24	M	F	2.80	Medical Assisting (Int) Pend	SMC	82404	W
21	M	T	2.25	Associate in Arts	SMC	82404	W
52	M	F	3.09	General, Allied Health	SMC	82404	W
25	F	H	3.18	Psychology	SMC	82404	W
26	F	T	3.72	Associate in Arts	SMC	82404	W

APPENDIX H

Student Responses

Respondent ID	Final Exam	Number Online Courses Previously Taken	Motivation Important	Students Were Motivated	Confidence at Beginning of Semester
I1	52	1	4	3	3
I2	74	0	4	3	2
i1	0	10	4	1	3
I3	86	0	4	3	3
I4	34	3	4	2	3
I5	74	0	3	3	3
I6	62	0	4	3	2
I7	81	3	4	4	3
I8	61	0	4	3	4
i2	0	0	4	3	4
i3	0		4	4	4
i4	0	5	4	3	3
I9	75	3	3	3	3
I10	71	1	4	4	4
I11	48	2	3	3	3
I12	64		4	3	3
I13	85	6	3	4	4
I14	49	2	3	3	4
I15	89	4	4	4	4
i5	0	6	4	4	3
I16	40	6	4	2	1
I17	96	0	3	3	2
I18	21	0	3	3	3

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O: Online Student Who Took The Final Exam

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I: In-Person Student Who Took The Final Exam

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APPENDIX H

Student Responses

Respondent ID	Confidence Level End of Semester	Homework Necessary	Hawkes Effective	Exams Accurate	Instructor Presence Important
I1	2	3	3	2	3
I2	3	3	3	2	3
i1	1	3	1	2	3
I3	2	3	3	3	4
I4	2	3	1	2	3
I5	3	3	3	3	3
I6	3	3	2	3	4
I7	3	4	3	4	3
I8	4	4	4	4	4
i2	3	4	4	4	4
i3	1	4	1	2	4
i4	1	3	2	1	1
I9	3	3	3	3	3
I10	4	4	1	4	4
I11	2	4	2	2	3
I12	3	3	3	2	3
I13	4	4	3	4	4
I14	4	4	4	4	4
I15	4	4	4	4	4
i5	4	4	3	3	4
I16	1	3	1	2	3
I17	3	3	2	3	3
I18	2	3	1	3	3

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APPENDIX H

Student Responses

Respondent ID	Instructor Accessible	Students Sought Help	Clear Goals Important	Course Had Clear Goals	Group Work Important
I1	3	2	3	3	2
I2	3	2	4	3	2
i1	3	3	3	2	1
I3	4	2	3	3	1
I4	2	4	4	3	3
I5	3	3	3	3	2
I6	3	3	3	3	3
I7	4	3	3	3	3
I8	4	4	4	4	3
i2	3	4	4	4	4
i3	2	3	4	1	3
i4	1	3	3	3	4
I9	3	3	3	3	3
I10	3	4	4	4	2
I11	4	4	3	3	2
I12	3	3	3	3	2
I13	3	4	4	4	3
I14	4	3	3	3	2
I15	4	4	4	4	2
i5	4	4	4	4	2
I16	2	2	4	3	2
I17	3	2	3	2	2
I18	3	3	3	3	3

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APPENDIX H

Student Responses

Respondent ID	Sufficient Opportunity for Group Work	Instructor Took an Interest in Success	Sufficient Instructor Interaction	Hours per Week on Homework	Pace of the Course
I1	2	3	3	3	4
I2	2	3	2	4	2
i1	1	2	3	3	4
I3	3	4	2	3	3
I4	2	2	3	4	4
I5	3	3	2	3	3
I6	2	4	2	5	
I7	3	4	2	5	3
I8	4	4	2	3	3
i2	3	4	4	3	4
i3	1	1	3	5	1
i4	4	1	4	5	5
I9	3	3	2	5	3
I10	3	4	3	2	3
I11	2	4	3	3	3
I12	3	3	2	4	3
I13	4	4	1	2	3
I14	2	3	2	2	3
I15	2	4	3	5	3
i5	3	4	2	4	3
I16	1	2	2	3	5
I17	2	3	3	2	2
I18	1	3	2	3	4

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APPENDIX H

Student Responses

Respondent ID	Number of Online Courses Taken Previously	I Prefer Takin Classes in Which Modality
I1	1	In-Person
I2	0	In-Person
i1	10	In-Person
I3	0	In-Person
I4	3	In-Person
I5	0	No Preference
I6	0	In-Person
I7	3	In-Person
I8	0	No Preference
i2	0	No Preference
i3		Online
i4	5	No Preference
I9	3	Online
I10	1	In-Person
I11	2	In-Person
I12		In-Person
I13	6	No Preference
I14	2	No Preference
I15	4	In-Person
i5	6	No Preference
I16	6	In-Person
I17	0	In-Person
I18	0	Online

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APPENDIX H

Student Responses

Respondent ID	Final Exam	Number Online Courses Previously Taken	Motivation Important	Students Were Motivated	Confidence at Beginning of Semester
o1	0	0	3	3	3
O1	44	0	4	3	3
O2	44	6	4	4	4
o2	0	6	3	3	4
O3	68	5	4	3	3
O4	55	5	4	4	4
O5	67	3	4	4	4
o3	0	12	4	4	4
o4	0	6	4	3	3
O6	47	4	3	3	2
o5	0	7	4	3	3
O7	62	11	4	4	2
o6	0	4	4	2	3
o7	0	5	3	2	3
O8	62	10	4	3	3
o8	0	6	3	2	3
O9	53	10	4	4	4
O10	53	3	3	2	3
O11	33	10	4	3	3
O12	87	15	4	4	3
O13	68	3	4	3	2
o9	0	6	3	4	4
o10	0	7	4	3	2
O14	82	6	4	3	4
o11	0	9	4	4	4
o12	0	6	4	2	2

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APPENDIX H

Student Responses

Respondent ID	Confidence Level End of Semester	Homework Necessary	Hawkes Effective	Exams Accurate	Instructor Presence Important
o1	2	3	2	3	3
O1	3	3	3	3	2
O2	2	3	3	3	3
o2	1	3	2	3	3
O3	1	4	1	2	4
O4	2	4	2	3	4
O5	4	4	3	3	3
o3	1	3	1	1	2
o4	2	4	2	3	4
O6	3	3	3	3	3
o5	3	3	4	3	2
O7	3	3	3	3	3
o6	1	3	4	1	3
o7	4	4	2	2	4
O8	2	4	1	2	3
o8	1	3	1	2	3
O9	3	3	4	4	4
O10	3	3	3	3	2
O11	2	4	2	3	3
O12	3	3	3	3	4
O13	3	4	3	3	4
o9	2	3	2	2	4
o10	1	4	1	2	4
O14	3	4	4	4	2
o11	1	3	1	1	3
o12	2	3	1	2	4

Key:

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APPENDIX H

Student Responses

Respondent ID	Instructor Accessible	Students Sought Help	Clear Goals Important	Course Had Clear Goals	Group Work Important
o1	3	3	3	3	
O1	3	2	3	3	23
O2	4	2	4	4	2
o2	3	2	3	3	2
O3	2	3	4	3	3
O4	4	3	4	4	3
O5	3	2	4	4	2
o3	4	4	4	4	4
o4	3	3	3	3	2
O6	3	3	3	3	3
o5	3	4	4	3	2
O7	4	2	3	4	1
o6	3	2	4	4	3
o7	3	4	3	3	4
O8	2	3	3	3	2
o8	3	3	4	2	3
O9	4	4	4	4	3
O10	3	2	3	3	2
O11	3	2	4	4	4
O12	4	4	4	4	3
O13	4	3	4	4	2
o9	4	3	4	3	2
o10	3	3	3	3	3
O14	4	2	3	4	1
o11	2	2	3	3	3
o12	1	3	3	2	3

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APPENDIX H

Student Responses

Respondent ID	Sufficient Opportunity for Group Work	Instructor Took an Interest in Success	Sufficient Instructor Interaction	Hours per Week on Homework	Pace of the Course
o1	2	2	3	5	4
O1	3	3	3	5	
O2	3	4	2	5	5
o2	3	3	2	2	3
O3	1	2	4	5	4
O4	2	4	3	5	4
O5	3	4	2	5	3
o3	4	4	4	5	5
o4	2	3	3	5	3
O6	3	3	2	5	3
o5	2	3	2	5	3
O7	2	4	2	5	3
o6	3	2	2	3	5
o7	1	3	4	5	4
O8	2	3	4	5	3
o8	2	2	3	3	3
O9	3	3	2	4	3
O10	2	3	2	3	3
O11	4	3	4	5	3
O12	3	4	2	4	3
O13	1	4	4	3	4
o9	3	4	3	5	4
o10	1	2	4	4	5
O14	2	3	2	4	3
o11	1	2	3	5	5
o12	1	1	4	4	4

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APPENDIX H

Student Responses

Respondent ID	Number of Online Courses Taken Previously	I Prefer Takin Classes in Which Modality
o1	0	In-Person
O1	0	In-Person
O2	6	Online
o2	6	Online
O3	5	No Preference
O4	5	In-Person
O5	3	No Preference
o3	12	No Preference
o4	6	No Preference
O6	4	No Preference
o5	7	Online
O7	11	No Preference
o6	4	Online
o7	5	In-Person
O8	10	No Preference
o8	6	In-Person
O9	10	In-Person
O10	3	No Preference
O11	10	Online
O12	15	Online
O13	3	In-Person
o9	6	Online
o10	7	In-Person
O14	6	Online
o11	9	No Preference
o12	6	No Preference

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APPENDIX I

Instructor Responses

Respondent ID	Motivation Important	Student's Were Motivated	Homework Necessary	Hawkes Effective	Exams Accurate	Instructor Presence Important
I1	4	3	4	4	4	4
O1	4	2	4	3	3	4
O2	4	2	4	3	3	3
I2	4	3	4	3	3	3
O3	4	2	4	4	3	2
I3	4	3	4	4	3	3
O4	3	2	3	3	3	3
I4	3	2	3	3	3	3

Respondent ID	Instructor Accessible	Students Sought Help	Clear Goals Important	Course Had Clear Goals	Group Work Important	Sufficient Opportunity For Group Work
I1	4	4	4	4	3	3
O1	4	3	4	4	3	2
O2	3	2	3	3	2	2
I2	4	3	4	4	3	2
O3	3	2	4	4	3	2
I3	3	2	4	3	3	3
O4	3	2	3	3	2	
I4	3	2	3	3	2	

Key:

I: In-Person Instructor

O: Online Instructor

APPENDIX I

Instructor Responses

Respondent ID	Sufficient Instructor Interaction	How Many Hours a Week Did You Expect Your Students to Spend on Homework	The Pace of This Course Was	This Course Was Taught	I Prefer Teaching in Which Modality
I1	3	4	3	In-Person	In-Person
O1	3	3	4	Online	Online
O2	2	3	3	Online	In-Person
I2	3	3	3	In-Person	In-Person
O3	2	4	3	Online	In-Person
I3	3	3	3	In-Person	In-Person
O4	2	4	3	Online	In-Person
I4	2	3	3	In-Person	In-Person

Key:

I: In-Person Instructor

O: Online Instructor

APPENDIX J

Person Measure Table

MEASURE	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	CORR.	PERSON
3.51	0.99	0.2	1.01	0.3	0.24	i18
3.11	0.64	-0.7	0.54	-0.7	0.58	I1
3.11	1.52	1.2	1.13	0.4	0.36	i17
2.78	1.38	0.9	0.98	0.1	0.62	i5
2.78	1.25	0.7	1.23	0.6	0.40	o22
2.23	2.17	2.3	2.37	2.4	0.21	i3
2.23	0.97	0.1	0.82	-0.3	0.72	i6
2.23	0.81	-0.4	0.82	-0.3	0.60	o26
1.99	1.68	1.5	1.38	0.9	0.62	i21
1.99	0.66	-0.8	0.59	-1.0	0.83	o12
1.99	1.63	1.4	1.37	0.9	0.29	o25
1.77	0.71	-0.7	0.70	-0.7	0.75	O1
1.77	0.36	-2.0	0.37	-1.9	0.83	I2
1.77	0.86	-0.2	0.88	-0.2	0.43	i1
1.77	3.52	4.0	3.09	3.5	0.21	o14
1.77	1.25	0.7	1.03	0.2	0.74	o4
1.56	0.78	-0.5	0.72	-0.6	0.47	I3
1.36	1.26	0.7	1.36	1.0	0.34	i4
1.36	0.93	-0.1	0.90	-0.1	0.62	o1
1.36	0.83	-0.3	0.79	-0.4	0.70	o13
1.18	0.90	-0.1	1.02	0.2	0.49	o5
1.00	1.34	0.9	1.30	0.9	0.52	O3
1.00	1.13	0.5	1.08	0.3	0.47	o17
1.00	1.88	2.0	1.79	1.8	0.31	o2
1.00	1.91	2.0	1.78	1.8	0.48	o7
0.82	1.03	0.2	0.96	0.0	0.57	i12
0.82	0.38	-2.1	0.39	-2.0	0.74	i15
0.82	0.46	-1.7	0.51	-1.5	0.24	i20
0.82	0.76	-0.6	0.83	-0.3	0.54	i22
0.82	0.71	-0.7	0.70	-0.8	0.31	no3

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APPENDIX J

Person Measure Table

MEASURE	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	CORR.	PERSON
0.82	1.55	1.4	1.42	1.1	0.67	o11
0.82	0.46	-1.7	0.51	-1.5	0.24	o16
0.82	1.11	0.4	1.07	0.3	0.64	o18
0.82	1.58	1.4	1.44	1.2	0.44	o19
0.82	1.33	0.9	1.19	0.6	0.65	o6
0.65	0.43	-1.9	0.45	-1.8	0.41	i14
0.65	0.40	-2.0	0.37	-2.2	0.67	i23
0.49	0.47	-1.7	0.47	-1.7	0.76	O2
0.49	0.33	-2.4	0.31	-2.5	0.75	i1
0.49	0.34	-2.3	0.35	-2.3	0.85	i10
0.49	1.09	0.4	1.04	0.2	0.60	i13
0.49	2.04	2.3	2.07	2.4	0.59	i19
0.49	3.30	4.1	3.12	3.9	-0.03	i2
0.49	0.24	-2.9	0.28	-2.7	0.66	no24
0.49	0.59	-1.2	0.65	-1.0	0.65	o15
0.49	1.03	0.2	0.96	0.0	0.63	o20
0.33	0.40	-2.0	0.40	-2.0	0.55	o10
0.17	0.43	-1.9	0.44	-1.9	0.55	i8
0.17	0.64	-1.0	0.61	-1.1	0.62	i9
0.17	0.83	-0.4	0.82	-0.4	0.52	o21
0.15	0.41	-1.9	0.40	-2.0	0.53	O4
0.15	0.41	-1.9	0.40	-2.0	0.53	I4
0.02	0.49	-1.6	0.48	-1.7	0.51	o23
0.02	1.24	0.8	1.17	0.6	0.64	o8
0.02	1.89	2.1	1.81	2.0	0.46	o9
-0.29	0.49	-1.7	0.53	-1.5	0.92	i7
-0.44	0.99	0.1	0.96	0.0	0.75	i11

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APPENDIX K

End of Semester Interviews

Online Instructor 1: 5 years experience. Interviewed 5/9/12

Most beneficial:

- None.

Most Harmful:

- Lack of contact with students.

- Students wouldn't come to web office hours even though they were repeatedly reminded of them.

- Only 5 of 29 enrolled took the final.

Ways to Improve:

- Students need more structured contact with the instructor.

Online instructor 2: 5 or 6 courses experience. Interviewed 5/9/12

Most Beneficial:

- Students are able to take the class while working/parenting.

- Learning the problem solving abilities of math.

APPENDIX K

End of Semester Interviews

Most Harmful:

- Most students are not good at math.

- They need a hands on approach.

- Students have poor time management skills.

- Students don't know how to get help until the last minute.

Ways to Improve:

- Videos or power points to show someone working the problem.

Online Instructor 3: 3 or 4 years experience. Interviewed 5/11/2012

Most beneficial:

- Flexibility time wise.

- Hawkes has a great delivery.

Most Harmful:

- Not best for most students because of lack of face to face contact with instructor.

- Not having instructor presence.

- Getting students to ask questions even when the instructor is available.

APPENDIX K

End of Semester Interviews

- The need to teach the material to oneself.

- Students want to do the material in their head. It's hard to get them to work out the steps.

- Getting students to ask questions even when an instructor is available.

Ways to Improve:

- 1:1 attention such as a tutoring center would be beneficial.

- If they could be gotten into the classroom once a month to touch base with the instructor.

Online Instructor 4: 5-6 years experience. Interviewed 5/16/12

Most helpful:

- Very good response time to student (within 24 hours).

- Instructor availability.

- Series of critical thinking worksheets (sent in by paper).

Most Harmful:

- Student had poor response time communicating with the instructor.

APPENDIX K

End of Semester Interviews

- Students don't provide enough feedback to the instructor to let them know whether the problem is solved or not.

- Students don't view supplemental material unless forced to.

- Repeated emails didn't work. A grade needed to be attached.

- Students are fighting a fear of math and easily distracted.

- Sent lots of proactive messages. Worked on some students, not on others.

Ways to Improve:

- Would have students take notes on videos and send in.

- Some real time communication would be advantageous.

In-Person Instructor 1: Interviewed 5/9/12

Most Beneficial:

- Ability to give face to face support.

- Students were more likely to utilize support.

- Students get to be told the standards.

APPENDIX K

End of Semester Interviews

Most Harmful:

- Poor attendance.

- Getting students to show steps of the problem.

Ways to Improve:

- Try to get students to commit. They won't commit to their education.

- Try to make as accessible as possible.

In person instructor 2: Interviewed 5/11/12

Most beneficial:

- Students get to see material worked completely by hand.

- The face to face presence while working steps.

Most Harmful:

- Students want to do everything in their heads. It's hard to get them to work the problem.

- Hawkes does a lot of the steps for the student.

APPENDIX K

End of Semester Interviews

Ways to Improve:

- None.

In person instructor 3: Interviewed 5/11/12

Most beneficial:

- The ability to have extra practice through Hawkes web tests.

Most Harmful:

- The amount of topics covered.

Ways to Improve:

- Would like to see students utilize the tutors more.

- Would like to see the students utilize more of the multimedia in Hawkes.

Online student 1: Over 30 hours online experience. Interviewed 5/8/12

Most beneficial:

- Flexibility

- Teacher had fixed dates for some things but was flexible with others.

APPENDIX K

End of Semester Interviews

Most Harmful:

- Not being in class and having the teacher's presence.

Ways to Improve:

- None. Good communication. Effective instructor.

Online student 2: 6 or 7 classes experience. Interviewed 5/8/12

Most beneficial:

- Teacher was available.

- Like online instruction.

Most Harmful:

- A bi-term class. The pace was too fast. Advisor made mistake in placement.

Ways to Improve:

- None. The course was laid out well.

Online student 3: About 15 classes experience. Interviewed 5/8/12

Most beneficial:

- Has 3 kids, needed flexibility.

APPENDIX K

End of Semester Interviews

Most Harmful:

- Lack of personal feedback, classroom experience (both faculty and peer interaction).

Ways to Improve:

- None.

Online student 4: More than 10 classes experience. Interviewed 5/10/12

Most beneficial:

- Instructor completely worked out examples.

- Used IM and message board for communication.

- Wanted students to succeed.

Most Harmful:

- Missed due dates due to inconsistencies from other courses. Want commonality. Some courses and instructors are easy, some hard. Needs standardization. There is a lack of standards.

- Too many concepts in one block.

APPENDIX K

End of Semester Interviews

- Quizzes 2-3 chapters after done with the material. Need to be immediately after.

- More immediate feedback.

- Only one open response question on final, more would be helpful.

- Exams inaccurate.

Ways to Improve:

- Switch to MyMathLab. It has a better walkthrough. You can send examples to the teacher. There needs to be a better way to handle math symbols so you can send a message about the problem to the teacher.

- Stagger homework and tests so they're not due at the same time.

- Virtual classroom once a week. Want to see a lecture.

Online student 5: About 4 classes experience. Interviewed 5/11/12

Most beneficial:

- There are really good tutors in library.

- Got to meet with the instructor a couple of times.

Most Harmful:

APPENDIX K

End of Semester Interviews

- Taking course online .

- No chance to see teacher regularly.

- Basically have to teach self.

Ways to Improve:

- None. Had daily tutoring appointments. Would have preferred face to face but had schedule conflicts.

In person student 1: Interviewed 5/8/12

Most beneficial:

- Hawkes system. Liked the system.

- Instructor gave extra help.

Most Harmful:

- Nothing.

Ways to Improve:

- None.

APPENDIX K

End of Semester Interviews

In person student 2: Interviewed 5/8/12

Most beneficial:

- Face to face contact with the instructor.

- Detailed instruction.

Most Harmful:

- Subject matter.

Ways to Improve:

- Different online program. Not Hawkes.

In person student 3: Interviewed 5/8/12

Most beneficial:

- Instructor's method of teaching.

- Each step was shown.

Most Harmful:

- Missed class time.

APPENDIX K

End of Semester Interviews

Ways to Improve:

- None. Enjoyed the class.

In person student 4: Interviewed 5/8/12

Most beneficial:

- Probably Hawkes. The repeated practice was helpful.

Most Harmful:

- Self. Bad at math.

Ways to Improve:

- Teacher needs to work the same practice problems that Hawkes does, not their own.

In person student 5: Interviewed 5/11/12

Most beneficial:

- Math tutor.

- Been out of school for 37 years. Needed help with calculator and forgotten basics.

APPENDIX K

End of Semester Interviews

Most Harmful:

- Lack of knowledge.

- Hawkes skipping steps on examples was a problem.

Ways to Improve:

- Hawkes should explain better.

APPENDIX L

Final Exam Grades

Online Final Exam Grades

73	65	80	11	86	58	42	62	69	63	68	74
19	74	61	25	76	67	62	64	67	33	47	68
53	74	52	69	87	89	68	67	42	45	54	54
50	68	42	54	44	16	82	52	56	44	65	86
56	61	59	80	43	35	72	30	28	48	90	67
45	25	80	41	73	53	50	35	74	59	35	21
62	53	63	75	64	47	35	33	44	51	55	95
83	41	59	52	25	63	38	68	19	93	54	63
80	33	62	39	36	93	69	95	36	36	31	43
36											

Number of Students Not Withdrawn and Not Taking the Final Exam: 72

APPENDIX L

Final Exam Grades

In-Person Final Exam Grades

72	36	74	45	38	48	44	35	51	87	41	53
70	35	26	46	71	68	54	37	82	52	97	70
74	78	84	85	83	95	68	90	47	78	49	62
72	48	62	85	37	95	51	72	74	91	94	40
32	79	39	39	52	45	62	34	47	48	31	35
18	39	38	49	65	64	45	65	72	55	65	55
60	62	34	46	53	74	59	88	64	59	60	87
75	74	81	103	61	37	72	94	63	86	100	95
86	56	86	84	42	88	58	49	42	51	96	89
49	85	72	71	89	56	89	81	40	53	87	

Number of Students Not Withdrawn and Not Taking the Final Exam: 57

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