

Taking Statistics Doesn't have to be Scary: Keeping the Heartrate Down

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Abstract

In this paper, the authors examined how a well-developed graduate-level statistics course that uses online technologies scaffolds students who are in M.A. degree and Ph.D. programs to become less anxious and to become more motivated towards developing statistical and technological skills and knowledge. The significant emphases upon which these authors will focus upon are the following instructor characteristics: 1) Ability to communicate statistics at a level that students can understand; 2) Desire to provide the students with quality online learning materials; 3) Multiple teaching strategies; 4) Interpersonal skills for interaction with students; 5) Ability to use technology; and, 6) Dedication to provide online and offline feedback to students. These six factors result in empowering students to learn and reducing their statistics anxiety while preparing for three exams and six assignments with the instructor's guidance.

Introduction

In this paper, these authors demonstrated how a teacher's well-developed online curriculum using technology and interpersonal skills with students in a Statistics Methods I class, and quality learning materials can influence students' motivation (Stipek, 2002), reduce their statistics anxiety (Onwuegbuzie & Wilson, 2003; Widmer & Chavez, 1986), and empower them to participate and interact (Dewey, 1997, p. 340). A thoughtfully designed class structures the process of learning new technology while fostering "social interaction" (Vygotsky, 1981, p. 145; Wetsch, 1981, p. 190) and knowledge of statistical content. As a student, the first author was deeply impressed by the teacher's skills in helping students construct "knowledge" (Barab & Kirshner, 2001, p. 5) through their "activity" (Leontiev, 1974-75, p. 10) as a unit of life mediated by mental reflection in Vygotskyian formulations (Robbins, 2003, pp. 55-58) and "reflexivity" (p.76) rather than "taking objects in from outside" (Bereiter, 2002, p. 20) in using technologies as mediation tools.

The teacher's curriculum included online course documents with information updated on a weekly basis, assignments, and guidelines to help students complete their assignments successfully and to provide the conditions to decrease anxiety associated with performing tasks and to increase motivation associated with both mastery learning skills and performance based on given tasks. Also, the online curriculum provided three sets of exam preparation exercises to help the students better know which concepts they needed to review. These materials served to reduce exam anxiety and assisted students in reaching their goals in this class and further in applying the concepts and ideas to realities (Beins, 1985; Lutsky, 1986). The three exams given measured the objectives outlined in this course's online curriculum and contents. Learning in this Statistical Methods I class was designed to take place with

advanced skilled learners (Vygotsky, 1978), and to help less skilled learners expand their actual developmental level to the zone of proximal development (Vygotsky, 1978, 1987) both in the classroom and in the computer lab with the teacher playing the role of coach and facilitator (Bruning, Schraw, & Ronning, 1999, p. 195), who is always present to guide and scaffold the students and their learning to do their assignments and to understand what they need to do in their tasks.

Theoretical Framework

This research is based on Vygotsky's dialectical constructivism in sociocultural theory (Bruning et al., 1999, pp.196-198) and further is grounded in "Vygotsky's cultural-historical theory, which differs from sociocultural theory in the United States" (Robbins, 2003, p. XIII) in an effort to understand how the students learn in a technology-mediated statistics class. Onwuegbuzie and Wilson's (2003) comprehensive literature review related to statistics anxiety was implemented to analyze how the teacher designed this online curriculum to reduce statistics anxiety and empower the students to engage in doing tasks with advanced learners and teacher's help. Based on Vygotsky's (1978) views of "language and its importance as a social and cognitive tool," statistics students face the same level of anxiety as a foreign language student. They feel frightened by the unfamiliar content and by the new language that must be used to learn and demonstrate mastery of this content.

In this Statistical Methods I class the teacher used technology as mediation tools to aid in communication and interaction with the students to reduce the four general components of statistics anxiety: 1) instrument anxiety; 2) content anxiety; 3) interpersonal anxiety; and, 4) failure anxiety (Onwuegbuzie, 2003, p. 201). This use of technology also helped to scaffold student learning and enhance student motivation in a graduate level statistics course. As Engestrom (2003) wrote, "human activity is endlessly multifaceted, mobile, and rich in variations of content and form" (p. 20), the activities that the teacher designed considered these "multiple intelligences" (Gardner, 1983) that impact the student learning and statistics anxiety (Onwuegbuzie & Wilson, 2003, p. 198). These activities also provide interaction at the level at which the students can understand in meaningful learning environments.

These activities, learning processes, and online curriculum using technology show how the internal aspects are first influenced by the external, logically following the model of "Vygotsky's dual-dialectical vision" (Robbins, 2003, p. 5). Also, from a biological and/or cognitive perspective to understand interaction between learning and cognitive development, these authors examined the class activities, online curriculum, and use of technology that include "social interaction" (Lightbown & Spada, 2000, p. 23.) that distinguishes Piaget's view of language and cognitive development from Vygotsky's view. Furthermore, the understanding of human cognitive development in social interaction with skilled advanced learners' guidance is explained by "the zone of proximal development that defines those functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state" (Vygotsky, 1978, p. 86; Robbins, 2003, pp. 28-48).

Technology used to aid the learners' learning and access to information and the online curriculum which was designed to address different "learning styles" (Onwuegbuzie, 1998) and cultural factors (Gay, 2000) in multicultural education (Banks & Banks, 2004) may influence student motivation for learning, reduce statistics anxiety, and finally, scaffold the students to further construct "knowledge" (Berger & Luckmann, 1967, p. 87).

Methodology

In this study, the first author used qualitative methodology with a case study method (Stake, 1995, p.xi; Eisenhardt, 2002, p.9; Patton, 2002, p. 297; Yin, 2003, pp. 9-13; Mile and Huberman, 1994, p. 25) to structure data and to analyze data collected through survey questionnaires, interviews, and classroom observation. From an emic perspective in this study, the first author, who is a student and researcher, interpreted and analyzed the data, and through these methods the author will demonstrate validity and reliability (Maxwell, 2002, p. 48; Merriam, 1998, p. 199). These interpretations were then shared with the second author, the instructor of the course. From Vygotsky's cultural-historical theory to activity theory (Engestrom) and situativity (Barab) in a cognitive perspective, these authors attempted to understand better how statistics anxiety can be reduced by the teacher's attitudes and innovative instructional design using technology. Also, these authors investigated how online curriculum and the appropriate timely online and offline feedback may impact student motivation.

Participants in this study came from a pool of 50 students in either M.A. or Ph.D. degree programs. Most of the students who are in the Statistical Methods I class were required to take this graduate level statistics course in their major emphasis or as background to develop their thesis or dissertation. The first author, as a researcher and doctoral student in both Education and Urban Leadership and Policy Study at the University of Missouri-Kansas City in the U.S., enrolled in this course to understand what statistics is, how data are collected, analyzed, and interpreted, and how research, conducted using quantitative methodological tools, would be able to be implemented in the real world.

Students and the faculty member met in a classroom that was well-equipped with technological tools, such as 20 laptop computers, access to the internet and Blackboard at the University, in the front two large projection screens on which the teacher projected well-designed PowerPoint slides, course documents, and up-coming dates. Also, the class was a roomy place with spiral-type stairs and individual chairs and with a good lighting system and ideal temperature adjusted to reduce the students' anxiety and stress.

The class met once a week for 2 hours and 45 minutes, for a total of 16 meetings during the academic 2004 Fall semester. Each meeting time the teacher used a whiteboard to let students know what to do, turned on the computer to access the university's Blackboard system, opened the online syllabus to address what to do, and visited course documents to explain what to learn about. The syllabus was designed to allow students to obtain free quality materials that would support them at their current level of understanding and beyond (Miltiadou & Savenye, 2003). Because this class did not have required textbooks, which is different from most traditional classes, students needed to use technological tools to get resources linked to the internet web sites and to print out PowerPoint slides and handouts that include what the students should know about. In announcements through the university's Blackboard site for this course, the teacher supplied the students with the information that some web sites had disappeared and others had been updated. Also, before the teacher noticed these changes, some students mentioned the changes on the web sites of the class in the class and the teacher and later the whole class was informed through Blackboard.

Data were collected through survey questionnaires and interviews with the students and with the faculty member (Maxwell, 1996). The goal of data collection was to analyze and

interpret the instructor's six characteristics from both the students' perspective and the teacher's perspective in class and online experiences and to find how the teacher's six characteristics resulted in empowering students' motivation to learn about, reduce their anxieties in preparing for three exams and six assignments with the instructor's guidance.

Data Analysis

Students were asked six open-ended questions on a survey questionnaire (see Appendix A). Summary statements for each of the questions will be followed with several representative samples of student comments.

Question 1: In what ways did your anxieties for this course increase or decrease during the semester?

In responding to this question, among 37 participants in this study, 17 students demonstrated that their anxiety has been decreased with the instructor's willingness to assist students' questions or concerns, quality materials designed to help students understand, instructor's high but reasonable expectation to the students, caring learning environments, and positive results of the exams. Ten students answered that anxiety increased. When the difficulty of topics increased, during the test and when preparing the exams, dealing with new terminologies and delayed homework assignments, the students said that they felt increased anxiety. Eight students answered that test and/or homework anxiety existed but these factors were reduced with the instructor's attitudes. The others (n=2) pointed out time demands outside class and lots of terminology that impacted their level of anxiety.

Anxiety decreased (n=17)

The instructor was open to questions and willing to assist

The teacher made the material easy to understand

Anxiety decreased as the content was presented in a detailed and repeatable format

My anxiety decreased because I became more and more comfortable using SPSS and taking 's exams

As grades increase, anxieties have decreased

Anxiety increased (n=10)

Anxiety increased as the difficulty of topics increased

During the tests, anxiety increased

Whenever I met new & very unfamiliar terminologies, the level of anxieties increased

I feel more anxiety when I prepared for exam

Test and/or homework anxiety but reduced these with instructor's attitudes (n=8)

My anxiety increased on the nights of the exams because I was worried I would not remember all the symbols...but my anxiety were lower during regular class night because helped me feel that I could understand statistics.

Anxiety increased due to my minimal computer skills. Anxiety decreased by instructor's clear explanation of material and his testing using what he taught and review the material to prepare for the test.

Anxieties increased when an exam was present and when assignments were due. Other than these times my anxiety was normally low.

Others (n=2)

Time demands outside class

Lots of terminology that was cumulative in nature

In summary, students felt uncomfortable and experienced anxiety. Gradually the instructor's willingness and well-structured quality online materials to assist the students'

concern related to statistics per se low-self esteem, exams, and assignments resulted in reducing the students' anxiety.

Question 2: In what ways did this Stat 1 class impact your motivation for academic achievement?

Concerning this question, 26 students mentioned that statistics class impacted their motivation for academic success. Specific factors they mentioned were grade points, preparation for future research skills, the instructor's prompt assessments and thorough feedback, and the students' increased self-confidence to take risks. Three students mentioned that statistics class did not much impact the students' motivation for academic success. One student answered that statistics class lowered the students' motivation for academic success.

Statistics class impacted the students' motivation for academic success (n=26)

The grade in the statistics class is what motivated me

Getting a good grade on the first test and on the first SPSS really motivated me to try harder and not give up

Even though this class was difficult and required a lot of study time I would like to learn more because it will affect my research skills in the future

.....'s prompt assessment and thorough feedback motivated me to study and achieve

I feel that I am comfortable with a subject now that I wasn't before. I am more willing to take risks

Statistics class did not much impact the students' motivation for academic success (n=3)

Not much. I like to do well in all classes

Not much. I have a lot of material already

Not much. I only wanted to pass

Statistics class lowered the students' motivation for academic success (n=1)

My motivation for academic achievement was lowered because of the need to balance course work, family and full-time employment.

In summary, most students reported they had been influenced by this Statistics 1 class in terms of academic achievement and motivation in their individual intellectual inquiry.

Question 3: In what ways did the use of technology impact your class performance, including three exams and six assignments?

Regarding this question, 29 students answered that the use of technology helped and improved their performance in preparing three exams and six assignments in the ways that the students can easily follow guidelines the instructor provided on Blackboard, focus on the content rather than keeping up with notes, and feel confident using the computer and running the SPSS. Five students answered that the use of technology negatively impacted their performance. One student said that the use of technology did not impact their performance.

The use of technology helped and improved my performance in preparing three exams and six assignments (n=29)

I appreciated the way explained all steps in doing SPSS carefully and thoroughly. Also I appreciated having the PowerPoint presentations on the Web so I could print them out and take notes on them. It helped me have all study materials another web as well as the assignments. Helped to keep me organized

Very easy to use. I could concentrate on the content and not on keeping up with notes I printed them off Blackboard.

I have more confidence using it and the computer.

It helped me improve my class performance and ability for statistical analysis.

The use of technology negatively impacted my performance (n=5)

I wasn't very good with the SPSS program and feel it negatively impacted my performance.

It was a real "push" to come to the lab to use SPSS.

Many times I couldn't remember what things were nominal, ordinal, etc (basic concepts are confusing to run SPSS).

I am extremely frustrated at the SPSS program and it was hard.

Honestly, I hate technology, but I hate math more.

The use of technology did not impact my performance (n=1)

I was very proficient technology and computers. I have or had a strong aversion to learning the SPSS program—only because I know I will never use it in anyway in the future. I just wanted to be able to interpret research.

In summary, negative impacts to use technology in this class indicate that math concepts are relevant to some students' attitudes to use SPSS and technology even though majority of students said that the use of technology helped and impacted positively their performance in preparing three exams and six assignments.

Question 4: Were there any instructional strategies used in this statistics I class that you would encourage other instructors to implement? Please describe.

Under the fourth question, 31 students pointed out significantly greater impacts in online syllabus design the instructor developed to share with other teachers, such as all materials on the web and well-constructed PowerPoint slides, additional online resources and use of links on website group discussion, and posting all information needed for all assignments in a very detailed and logical manner with real life examples. Three students mentioned the teacher's expectations and attitudes, such as simple, but clear expectations, availability of professor for student questions and attitude was amazing, and diligence of instructor to assist student to understand in their tasks. One student viewed test reviews and another attributed the instructional strategies used in this class to be the natural giftedness of the professor to deal with such complicated material. One student irrelevantly answered that she/he did not like Power Point presentations.

Online syllabus design and benefits for students (n=31)

The use of online material for instruction and posting lecture materials online was very useful

Liked the Power Point presentation of notes so I could "listen" to the lecture and understand to do so

No fixed textbook. Reading links on the blackboard gave me a lot of new ideas

Power Point decks with the important concepts and lectures were provided to all of us as references. This lessened the need for note taking. We could focus on additive notes and ever you've received a strong base

I benefited from the guided practice implemented in the on-campus computer lab

Power point, Blackboard, posting all information needed for all assignments in a step-by-step logical manner and very detailed with examples from real life.

Teacher's expectations and attitudes (n=3)

Yes, clear, crystal clear expectations

Simple explanations. Availability of professor for student questions and attitude of professor was amazing

Diligence of instructor make me to actually UNDERSTAND homework instead of just doing it

The instructional strategies (n=2)

Test reviews

The instructional strategies used in this class seemed to be more of a gift that the professor has for dealing with such complicated material. I do not know if the effectiveness can be mimicked. The instructor definitely has it

Others (n=1)

In general, I do not like Power Point presentations. They do not do an effective job of conveying knowledge, when compared to group assignments or other active learning techniques.

In summary, apparently, the instructor's high but reasonable expectations, caring attitudes, and well-designed online syllabus and relevant online learning materials were demonstrated as the very important implemental factors that other teachers are encouraged to apply.

Question 5: Do you think technology scaffolds what you learn in a positive way? Why or why not?"

Under this fifth question, nine students said that technology scaffolded what they learn in a positive way, three students said that technology did not scaffold what they learn in a positive way, twenty three students did not respond to this question because under the fifth question there are several questions I assume.

No responses (n=23)

Technology scaffolded what I learn in a positive way (n=9)

Makes learners easier with better access to resources

Provides real world application

Easier to communicate and obtain instruction. I love having everything used in this easily accessible

Technology did not scaffold what I learn in a positive way (n=3)

I do not grow up with computers so I found assignments difficult

No

Others (n=2)

I learned a totally foreign software to me.

Yes and no. No in that when you are not sure how to use it. Things get more difficult and time consuming.

In summary, even though 23 students did not answer this question, partly the first author assumes this is due to the structure of the question including a main question and three sub-question categories. Nine students explicitly stated that technology supported what they learn in a positive way.

Question 5.a. What problems, if any, did you experience accessing Blackboard to obtain online reading and learning materials and prepare for class activities and exams? Be as specific as possible.

For this question, 31 students said that there were no problems with Blackboard. Four students expressed that when the school server systems had some problems, they faced problems. The other two students pointed out effectively using digital internet connection and a personal computer at home.

No problems with accessibility to Blackboard (n=31)

No problems with Blackboard

It is easier to use and faster than my dial up connection at home

No problem experienced

I love having everything used in class easily accessible

Problems with accessibility to Blackboard (n=4)

Only a couple of times when the school server was down

Not being able to get on when server was down

I have a slow modem at home--- long wait time

Others (n=2)

Some of the listing are labeled more clearly than others.

The most important pieces need to use blackboard successfully is a digital internet connection and a personal computer at home.

In summary, except for technological problems in school server systems and personal computer at home, the students were able to easily access to the Blackboard system and reach the resources.

Question 5.b. Do you prefer to have required textbooks in this class or online, free materials?

Here, 31 students preferred to have free online materials. One student preferred to have a required textbook. Two students liked both a required textbook and free online materials.

The other students indicated some elements that may be irrelevant.

I prefer to have online free materials in this class (n=31)

Online free materials

Save trees

I prefer to have a required textbook (n=1)

I prefer to have textbooks because selecting materials among several online resources makes me confused.

I like both (n=2)

I like both. If the book is good I like to retain it as a reference. I like a hard copy and printing out 500-1,000 pages of online material isn't really free since it takes time and toner.

I think online materials are good, however a book that will explain in better and more details will help a lot in understanding at the material.

Others (n=3)

It does not matter

I think the required material should be the student SPSS software. Just need to make the purchase process easier.

In summary, most of the students indicated that they want to have free online materials even though several students liked both.

Question 5.c. Please describe the "pros" and "cons" of using technologies, such as opening Power Point slides, printouts, and hands-on calculation.

Responding to this question, 21 students described the pros of using technologies to be easily obtainable and easy to follow, eight students described both the "pros" and "cons" of using technologies, pointing out the fact easier and faster and the worry about losing interaction with other students. Five students described the "cons" of using technologies, such as discomfort in using the technologies and loss of focus why they do what they do. Other factors are described with necessity of a prior knowledge to use Power Point.

The "pros" of using technologies (n=21)

Very helpful to have Power Point

Allow more time to listen to instruction

I appreciate and benefit from the visuals to help me organize the information in my head

It was very easy to use the technology

The “cons” of using technologies (n=5)

I think the goal of the “paperless classroom” hampered students’ ability to learn

It is difficult when you are relying on technology and some part of it fails

Forces people to use them if not comfortable and good

Both (n=8)

Pros—easy to organize and take notes on. I am so glad we had SPSS and did not have to use EXCEL or do it by hand. Cons—If I did not sit close I couldn’t see

Pros—easy to access and less papers. Cons must have Power Point at home

Pros: time saver, cheaper, easily accessed. I do not have to carry books on my bike.

Cons: I get lazy

Others (n=3)

A prior knowledge to how to work with Power Point is needed before coming to class

In summary, the important factors the pros of using technologies insisted indicated ease in using technologies, more time spent listening to the instructor, and mapping out with visual tools provided with technologies. Several factors concerning the cons of using technologies were related to students’ laziness and accessibility to the technology at home and technical problems in case the server is down.

Question 6: Do you think Blackboard is good as a tool to disseminate information in online or offline courses? Why or why not?

Here, 32 students answered that the use of Blackboard as a tool to disseminate information in online or offline courses worked very well. Two students were neutral in this question. Three students were categorized in others, such as no response and comparing the instructor with others.

The use of Blackboard as a tool to disseminate information in online or office courses worked very well (n=32)

It was great

I appreciate having easy access to grades and assignments online

Excellent way to communicate with class

Liked that grades and announcements were quickly available

It is a very effective way. I would encourage all the instructions to do so

Neutral (n=2)

It is a tool but no means on all-encompassing one

Continue use as long as sources are not flooded again

Others (n=3)

Too many instructors are unskilled in its use and offer times expect timely posts from students, but not this instructor. Others fail to stay up to date themselves on grades, etc.

In summary, the use of Blackboard as a tool to disseminate information in online or offline course worked very well and provided the students with excellent resources in a very effective way

Four subcategories were present under the sixth question.

Question 6.a. how would you describe the instructor's relationship with the students?

For this question, 35 students stated that the relationship between the instructor and the students was a very positive one. Only one student answered negatively about the relationship between the instructor and the students.

The instructor's relationship with the student is described in a very positive way (n=35)

Professional. Showing personal interest by learning names and asking conversational questions. Focus on the lesson and start class with small talk concerning family, hobbies, and university issues

Wonderful and great. Very attentive, helpful, patient, enthusiastic, and energetic.

Great instructor

Excellent. Receptive and open to changes, always willing to help, a knowledgeable.

The instructor is an asset to UMKC

Make sure all students are understanding the objectives of the course

Very thoughtful and caring

Professional with an approachable way

Excellent-friendly-respond in a positive and timely manner to questions or concerns

The instructor's relationship with the students is described in a negative way (n=1)

The instructor was a bit over heads as times. Very often the students were confused, but were unable to think of how to ask their question. Otherwise, he was very friendly, helpful, and gave timely feedback assignments.

Others (n=1)

In summary, except for one student and the other who did not answer this question, 35 students viewed the instructor as very thoughtful, open, helpful, knowledgeable, and available in a timely manner. Even one student who described negatively the relationship between the instructor and the students stated that the instructor was very helpful and friendly.

Question 6.b.1. What correspondence, if any, did you use in this course with the instructor? (e.g., email, phone, face-to-face?)

For this item, 22 students corresponded with the instructor through email and face-to-face, ten students through email, two students through email, face-to-face, and phone, one student through email and phone, two students through face-to-face.

I corresponded with the instructor through email and face-to-face (n=22)

I corresponded with the instructor through email (n=10)

I corresponded with the instructor through email and face-to-face, and phone (n=2)

I corresponded with the instructor through email and phone (n=1)

I corresponded with the instructor through face-to-face (n=2)

I corresponded with the instructor through phone (n=0)

In summary, most of students corresponded with the instructor through more than one communication ways.

Question 6.b. 2. If yes, when and how often did you send emails to the instructor? Did this exchange impact your learning?

Sixteen students answered that they sent emails to the instructor 5-10 times, ten students sent emails to the instructor 2-3 times, five students marked that they sent emails to the instructor more than 10 times, two students sent emails to the instructor once, and four students indicated others.

I sent emails to the instructor 5-10 times (n=16)

When having trouble assignments, it impacted positively
It was very efficient way of communicating
Email exchange helped me communicate with the instructor before or after class
I can get responses about my questions as soon as possible
No impact to learning in sending emails

I sent emails to the instructor 2-3 times (n=10)

The instructor was helpful in explaining things and in telling me what I missed on assignments
It impacted my learning by getting my questions answered quickly
Encouraged me to keep trying and that the instructor wanted me to learn
It was very helpful

I sent emails to the instructor more than 10 times (n=5)

Weekly or at least weekly. It had a significant impact in my learning
24 times during semester. Helped with my learning immediately
Great way to facilitate communication

I sent email to the instructor once (n=2)

Only for enrollment issue
Only once it gave me a small amount of information

Others (n=4)

No email exchange
Nothing mentioned to email frequency

In summary, the more frequently students exchanged emails with the instructor, the more positive were the comments that they made.

Question 6. c. Do you think the instructor communicated effectively with students? Please be specific.

Thirty four students answered that the instructor communicated effectively with students, such as very clear and concise instruction and nonjudgmental way in class, return of email in a timely manner, very fluent and very knowledgeable to ideas and concepts, and reasonable expectations, help the students whenever they are needy. One student answered that the instructor did not communicate effectively with student. The other two students' ideas belong to others.

The instructor communicated effectively with students (n=34)

Yes, return of email was prompt
Yes, the instructor was very approachable during and after class
Yes, he is very precise in his communication which helped make things very clear
His help on homework in the lab was terrific
Direct, effective, compassionate and real
The instructor tried to see what my problem was and how he could help

The instructor did not communicate effectively with students (n=1)

Very often the students were confused, otherwise the instructor was friendly, helpful, and gave timely feedback on assignments.

Others (n=2)

I have extremely high math anxiety and I even fainted in class once. However, I think I did o.k. because this class is more of a logic class to me than a math class.

In summary, the instructor communicated very effectively with the students and assisted the students to meet their real needs in classroom and a lab in a timely manner and friendly ways.

Findings

Based on the instructor's six characteristics: 1) Ability to communicate statistics at a level that students can understand; 2) Desire to provide the students with quality online learning materials; 3) Multiple teaching strategies; 4) Interpersonal skills for interaction with students; 5) Ability to use technology; and , 6) Dedication to provide online and offline feedback to students, the data collected by survey questionnaires and interviews were analyzed. Based on the results of the instructor's survey (**see Appendix B**), most of all, the teacher beliefs about learning were demonstrated to be a very important factor. This faculty member believed that study skills that include good learners' characteristics were: 1) willingness to take risks, 2) a strong drive to communicate with peers and the teacher, 3) asking for help when the learner needs help, 4) practicing to learn more about things associated with statistics contents and realities, 5) monitoring progress, and 6) making connections within experiences and interests. These characteristics can influence students' motivation and reduce anxiety in the statistics class and increase students' self-confidence to complete their six assignments and to pass three exams and finally develop their performance and master necessary skills. Based on his beliefs about learning, the online curriculum was designed and quality learning materials were provided to allow the students to engage the content at a level that they can understand and to communicate with the teacher through technologies and face-to-face interaction. Also, the teacher focused on helping students understand rather than memorizing formula. The instructor also placed emphasis on content related to statistics findings and realities in a graduate level statistics course.

The teacher's interpersonal skills, including warmth, caring, the ability to listen well, and availability to students through emails and online dialogues, made the students feel comfortable to communicate with the teacher and ask for help to clarify what they need to know about in given classroom tasks and move beyond to apply what they learn to read-world situations.

Even though the class size was large with an enrollment of 50 students, students worked in collaborative environments with a well-equipped computer lab and a roomy classroom that had 50 laptop computers available. Ease in accessing quality on-line resources and teacher's immediate feedback allowed the students to share what they found to be problematic in completing their assignments and to prepare for exams. Except for two students, they strongly demonstrated their academic success in this graduate level statistics course.

Finally, these six factors resulted in empowering students to learn and reducing their statistics anxiety while preparing for three exams and six assignments with the instructor's guidance.

Implications

Findings in this study were interpreted to mean that using an online syllabus, online instructional technologies, and the instructor's six characteristics can maximize the students' motivation and reduce anxieties in a graduate level statistics class. Further research needs to be conducted by using technologies as a means to better provide the students with instructional online curriculum at levels that students understand and that synchronically and asynchronously allows the learners to access quality online learning materials that consider multiple intelligences (Gardner, 1983) and empowers them to "know about" (Barab & Duffy, 2000, p. 28). Also, technology as a means to mediate the learners' inner thought into doing activities should be used in practical collaborative environments and in conditions that

consider the levels at which the teacher and the learners understand one another. As Robbins (2003) wrote that “learning results through meaningful activity” (p.76) and “the basic components of Russian activity theory are activity=act=operation” (p. 76) and “ the corresponding conditions are need=motive=goal” (p. 76), the practical implication the author insists upon is to empower the individual learners toward “self-regulation” (Robbins, 2003, p. 67) and “self-actualization” (Maslow, 1987 pp. 158-167). These six factors result in empowering students to learn and reducing their statistics anxiety while preparing for three exams and six assignments with the instructor’s guidance which stresses the expressive quality of self-actualizing creativeness rather than problem-solving or product-making quality, and this helps learners grow. Finally, as this research demonstrates, a good teacher communicates in ways that allow the students to see, hear, and touch and conceive “the world [that] is a symbolic world in the sense that it consists of conceptually organized, rule-bound belief systems about what exists [different from statistically significant findings], about how to attain goals, about what is to be valued” (Bruner as cited in Leontiev, 2003, p. 20) The learners should know what they need know about and what they do not know in socially culturally constructed learning environments and through meaningful activities. Again, technology is a tool and as Gunter (2001) stated, to close the teaching and learning technology gap between where we are and where we need to be in the 21st century, instructional design and curriculum should be focused on preparing the students to participate in using technologies to learn. In this sense, the study the authors investigated is a case that demonstrates how technology use and teacher attitudes reduced statistics anxieties and impacted the student motivation, reflecting a literature review that indicates “only a few researchers have investigated ways to reducing statistics anxiety” (Onwuegbuzie & Wilson, 2003, p. 202).

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Appendix A

Survey (Open-ended questions) to students

1. In what ways did your anxieties for this course increase or decrease during the semester? Please explain.
2. In what ways did this Stat 1 class impact your motivation for academic achievement?
3. In what ways did the use of technology impact your class performance, including the three exams and six assignments?
4. Were there any instructional strategies used in this statistics class that you would encourage other instructors to implement? Please describe.
5. Do you think technology scaffolds what you learn in a positive way? Why or why not?
 - a. What problem, if any did you have any problems accessing Blackboard to get online reading and learning materials to prepare for class activities and exams? Be as specific as possible.
 - b. Do you prefer to have required textbooks in this class or online, free materials?
 - c. Please describe the “pros” and “cons” of using technologies, such as PowerPoint slides, printouts, and hands-on calculation.
6. What are your thoughts regarding the use of Blackboard as a tool to disseminate information in online or offline courses?
 - a. How would you describe the instructor’s relationship with the students?
 - b. What correspondence, if any, did you use email to access the instructor in the statistics class?
(e.g., email, phone, face-to-face?)
If yes, when and how often did you send emails to the instructor? Did this exchange impact
your learning?
 - c. Do you think the instructor communicated effectively with students? Please be specific.

Appendix B

Interviews questions to the teacher

1. How do you assess students' learning?
2. Do you address students' anxieties relative to your course?
3. Can you describe your personal philosophies, strategies, beliefs about student learning and your own metacognitive processes that impact this Statistics I class?