Math Apprehension of Public Relations Students: AN EXPERIMENT

Alexander V. Laskin
ALaskin@gmail.com
Quinnipiac University-Connecticut

Hilary Fussell Sisco
Hilary.FussellSisco@quinnipiac.edu
Quinnipiac University-Connecticut

INTRODUCTION

It has been established that communication-related anxiety affects students' performance in the communication discipline and beyond (McCroskey, 1976). On the other hand, there is little evidence about how communication students, and more specifically, public relations students, are affected by their apprehension of mathematics. Since the undergraduate research course has become a standard in the public relations curriculum almost every public relations student will encounter some form of math in his or her educational careers. In addition, as the public relations field expands into more specialty areas it is imperative for students to address their apprehension in order for them to be prepared and successful in their fields. This study attempts to identify if there is a causal relationship between math apprehension and the choices students make regarding their education and their chosen profession.

LITERATURE REVIEW

Math apprehension is simply the fear or anxiety associated with approaching math problems. Scholars believe that one of the inherent issues of this type of apprehension is a lack of self-efficacy. Students, whether founded or not, believe they don't have the capabilities to handle math problems therefore they impede their own performance. Research (Maier & Curtin, 2005) supports that self-efficacy (the belief in one's own ability) in mathematics affects classroom performance, grades, course enrollment and even choice of major. A lack of self-efficacy has also been shown to limit student's educational and career choices (Richmond & Roach, 1992). Students may be missing opportunities to excel in certain fields based on the misperception that they aren't good at math.

Although some proposed that college students are anxious of testing in general rather than math specifically, studies have found that there is a larger amount of math anxiety than overall test anxiety in college students (Dew, Galassi & Galassi, 1984). Math apprehension can arise from a variety of sources throughout a student's education. Research demonstrates that problems often arise because of poor instruction, complex texts without simple directions and the feeling that there can only be one right answer to a math problem (Shodal & Diers, 1984). These issues often build up and escalate pushing students further behind in their mathematical ability, therefore increasing their anxiety about math. Medical studies have found that a physical response isn't seen during the actual math performance but rather, "the anticipation of math is painful" (Lyons & Beilock, 2012, p. 5).

Overwhelmingly, math apprehension is defined as a psychological barrier rather than an issue of ability. Studies show that "math anxiety occurs relatively frequently among college students" (Betz, 1978, p. 447). Hackett (1985) found that "gender-related socialization influences in combination with amount of mathematics preparation predict level of mathematics achievement, which is, in turn, predictive of mathematics-related self-efficacy" (p. 53).

Math apprehension has been studied almost exclusively in the undergraduate research methods course in the communication discipline. Baus and Welch (2008) found that "math anxiety and low math self-efficacy probably inhibit performance in the methods course" (p. 295), although the methods course isn't considered a math intensive course. In their assessment of undergraduate research courses Frey and Botan (1988) found that the largest problem across the board in teaching the course was "statistical apprehension/bias" (p. 253). Stacks and Hickson (1992) explain this type of anxiety further, in that "many communication students really fear statistics and relate the research methods course to a statistics course" (p. 353) – even though statistics generally play a minor role in the undergraduate research course. In the research methods course, statistics is typically supplemental and only emphasized in final analyses. Furthermore, the statistics covered in this course rarely advances past the basic mathematics skills students are required to obtain in their general education curriculum. Regardless, Maier and Curtin (2005) found that "math anxiety is a real and relevant force that needs to be reckoned with in the research methods course" (p. 357). These authors support the argument that it is important for instructors to address math apprehension in their research

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communication courses. But this need goes beyond the research course. Public relations educators need to prepare students for multiple opportunities in their fields – this includes opportunities that may seemingly involve mathematics.

As the discipline of communication continues to grow, it is essential to address apprehension as it relates to specific fields. For example, Maier (2003) discusses apprehension in journalism and how it transforms from the journalism classroom to the profession. He suggests "the problems that journalists experience with numbers may be as much a matter of perception as they are of math ability or knowledge" (p. 931). In his study, journalists had average mathematical competencies but lacked the confidence in their own abilities. A recent study (Cusatis & Martin-Katzer, 2010) of national journalism programs found that journalism students receive minimal math training outside of the basic general education requirements. In addition, the authors found that "the average journalism student's mathematical skills were rated as 'poor' or 'fair' by 70.2% of journalism chairs" (p.356).

Studying mathematics anxiety can be especially important among communication students because it seems quite prevalent in the communication discipline. Maier and Curtin (2005) proclaimed that students perhaps pursued communication related majors "in part because they thought they could avoid doing math" (p. 356). By extension, we suggest that students might avoid certain specializations simply because they believe they are math intensive and they perceive that they cannot take such a class, they cannot make a career in such a profession, they aren't capable enough to succeed in such a profession, and that such profession isn't a good professional choice for them. If the math components were removed, we believe students would be more likely to enroll in such a class, pursue a career in such a profession, feel more confident in their capabilities to succeed in such profession and perceive such a profession to be more suitable for them.

This study, thus, proposes the following hypotheses:

H1 *After math anxiety is minimized, students are more likely to enroll in a class perceived to be math-intensive.*

H2 *After math anxiety is minimized, students are more likely to express interest in pursuing a career in a profession perceived to be math-intensive.*

H3 *After math anxiety is minimized, students are more likely to perceive themselves as more capable of succeeding in a profession perceived to be math-intensive.*

H4 *After math anxiety is minimized, students are more likely to consider a profession perceived to be math-intensive as a good choice for them.*

METHOD

To test its hypotheses, the study relies on the experimental design. Previously, apprehension in the field of communication has primarily been studied either as a case study (Maier, 2003; Maier & Curtin, 2005) or a survey (Frey & Botan, 1988; Baus & Welch, 2008) with a student sample. Experimental methods may be better suited to measure the impact of math anxiety on students' educational choices.

This study seeks to identify a causal relationship between math anxiety and the decisions students make in selecting a class or selecting their careers after college. Experiments are the only research method capable of testing if such a causal relationship truly exists. Wimmer and Dominick (2003) explain: "Experiments help establish cause and effect. Although some researchers argue whether we can ever really prove a cause-and-effect link between two variables, the experiment is undoubtedly the best social science research method for establishing causality" (p. 219). Stacks adds "experimental designs allow the researcher the control necessary to precisely specify and manipulate the source or message characteristics he or she is interested in comparing" (2002, p. 265).

The experiment is carried out following double-blind experimental design: neither subjects nor researcher know who is assigned to a control group and who is assigned to an experimental group. This, according to Babbie (2010), eliminates any possibility of researcher or participant biases. Such an approach also allows for random assignment of subjects into control group and experiment group. Randomization is "a powerful tool for eliminating the influence of extraneous variables" (Wimmer & Dominick, 2003, p. 224).

To test the proposed hypotheses, the study first asked public relations students which of the seven public relations specializations students consider the most math-intensive (PRSA, 1988). Since the answer was consistently investor relations, investor relations was selected as the focus for the experiment. There is a general lack of understanding among students about what is involved in the profession of investor relations except for the perception that it is a very math-intensive profession. Laskin (2009) reports that education in investor relations is virtually non-existent – even mentions of investor relations in public relations classes are rare. In addition, despite this lack of education, investor relations as a professional function has grown as one of the top communication functions in modern companies. Investor relations is the highest paid public relations specialization, investor relations professionals are often considered part of the top-management team and have a seat at the proverbial table, and investor relations has a significant impact on the corporate bottom-line (Laskin, 2011).

The participants for the study were undergraduate public relations students at a medium-sized private university in the northeastern part of the United States. The study's protocol was approved by the University's Institutional Review Board. The participation in the study was voluntary and no benefits were provided to students for their participation. The subjects were given a pre-test questionnaire with four questions asking how likely they would be to enroll in an investor relations class, how likely they would be to have a career in investor relations, how likely they would be to consider investor relations as a good choice for them, and how capable they perceive themselves of working in the investor relations field. All the questions were measured on a 10-point scale with 0 being strongly disagree and 10 being strongly agree. After that, students received a print-out about investor relations – although all the print-outs seemed to be the same, there were actually two types of

print-outs: for the control group and for the experimental group. The assignment of students to these groups was randomized. The print-out for the experimental group included an extra paragraph designed to minimize math anxiety of students about investor relations. After reading the print-outs, the subjects in both control and experiment groups completed the same questionnaire again.

RESULTS

The study recruited 48 participants with 24 being randomly assigned to an experimental group and 24 to a control group in double-blind fashion. The first hypothesis asked whether students would be more likely to enroll in the investor relations class, if their math anxieties were minimized. Based on the results of the experiment, the likelihood to enroll in the investor relations class was higher for students who were exposed to the experimental treatment (M = 7.33) than for students who were in the control group and thus weren't exposed to the experimental manipulation (M = 4.83).

TABLE 1 ***Likelihood to enroll in an investor relations class***

	Mean	N	St.Dev.
Control	**4.83**	**24**	**2.51**
Experiment	**7.33**	**24**	**2.37**

To analyze if the difference between two groups was statistically significant, the independent samples t-test was conducted. The results of the t-test indicated that the difference between the groups was statistically significant ($t(46) = 3.54$; $p = .001$). As a result, Hypothesis 1, *after math anxiety is minimized, students are more likely to enroll in a class perceived to be math-intensive*, was supported.

The second hypothesis asked whether the students would be more likely to pursue a career in investor relations if their math anxieties were minimized. Based on the results of the experiment, the likelihood to pursue a career in investor relations was higher for students who were exposed to the experimental treatment (M = 5.58) than for students in the control group not exposed to the experimental manipulation (M = 3.21).

TABLE 2 ***Likelihood to express interest in pursuing a career in investor relations***

	Mean	N	St.Dev.
Control	**3.21**	**24**	**2.19**
Experiment	**5.58**	**24**	**2.41**

The results of the t-test indicated that the difference between the groups was statistically significant ($t(46) = 3.57$; $p = .001$). As a result, Hypothesis 2, *after math anxiety is minimized, students are more likely to express interest in pursuing a career in profession perceived to be math-intensive*, was supported.

The third hypothesis asked whether the students would be more likely to perceive themselves as capable of performing duties of the investor relations professionals if their math anxieties were minimized. Based on the results of the experiment, the likelihood to feel capable about the investor relations profession was higher for students who were exposed to the experimental treatment (M = 6.33) than for students not exposed to the experimental manipulation (M = 4.96).

TABLE 3 ***Likelihood to perceive themselves as capable of performing investor relations duties***

	Mean	N	St.Dev.
Control	**4.96**	**24**	**2.18**
Experiment	**6.33**	**24**	**2.28**

The results of the t-test indicated that the difference between the groups was statistically significant ($t(46) = 2.14$; $p = .038$). As a result, Hypothesis 3, *after math anxiety is minimized, students are more likely to perceive themselves as more capable of succeeding in a profession perceived to be math-intensive,* was supported.

The last hypothesis asked whether students would be more likely to perceive the investor relations profession as a good choice for them, if their math anxieties were minimized. Based on the results of the experiment, the likelihood to perceive investor relations as a good choice was higher for students who were exposed to the experimental treatment (M = 5.46) than for students who were in the control group and thus were not exposed to the experimental manipulation (M = 3.67).

TABLE 4 ***Likelihood to perceive the investor relations profession as a good choice***

	Mean	N	St.Dev.
Control	**3.67**	**24**	**2.04**
Experiment	**5.46**	**24**	**2.15**

To analyze if the difference in the means between these two groups was statistically significant, the samples t-test was conducted. The results of the t-test indicated that the difference between the groups was statistically significant ($t(46) = 2.99$; $p = .001$). As a result, Hypothesis 4, *after math anxiety is minimized, students are more likely to consider a profession perceived to be math-intensive as a good choice for them*, was supported.

CONCLUSIONS

Apprehension in the classroom has proven to be a significant problem for educators. In discussing communication apprehension McCroskey (1976) states "students must communicate to learn. Those who communicate less, learn less" (p.9). This study has taken the apprehension influence into the realm of mathematics. The results of the experiment suggest that math apprehension actually influences students' choices of classes. In fact, students became more likely to enroll in a class perceived to be math intensive once they knew that no math was actually involved and the difference was statistically and meaningfully significant as it represented more than a quarter of the scale used for the measurement. The same was true for the selection of the profession. Once students learned that no math skills were required, all other variables held equal, they became more likely to consider pursuing a career and more likely to view this profession as a good choice for them. Thus, it is important for instructors in public relations to address student apprehension. Baus and Welch (2008) suggest that instructors should encourage group projects, assert learning outcomes, and give pep talks to increase students' self-efficacy about mathematics.

The findings of this study suggest that simply informing students of the mathematical nature of courses, majors, and professions might help reduce their apprehension, which perhaps supports the literature that explains math apprehension as an issue of anxiety rather than ability. Indeed, there is a legitimate need for math skills in public relations for research, budgeting, and communicating financial information, yet without knowing what exactly is involved in each of these areas, students' expectations may lead to an unwarranted anxiety causing students to avoid any math related activity altogether. As educators, we should provide students with information so they can reduce their apprehension and make clear choices based on their own interests rather than fear of math.

The study also had its limitations: it was based on one communication specialization and focused only on identifying relationship between math apprehension and students' choices. Future research should explore the effect of apprehension in the various subfields and specializations of communication majors. Other methods such as surveys, interviews, and focus groups should also be employed to describe the population, identify the reasons behind the apprehension, and discuss potential solutions.

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