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Anxiety and Efficacy: Are They Related to Students' Choice of Major?

Camille Johnson
Western Kentucky University

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ANXIETY AND EFFICACY: ARE THEY RELATED TO STUDENTS' CHOICE
OF MAJOR?

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Acknowledgements

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Research suggests that anxiety characteristics play a role in determining the courses students choose in college. Other research suggests that efficacy may play a similar role as well. The purpose of the present study was to investigate the relationship between anxiety and efficacy and choice of major for English and mathematics majors. Ninety-nine undergraduate and graduate students from Western Kentucky University (49 males and 50 females) participated in the study. All participants were officially declared mathematics (or mathematics-related, i.e., computer science) or English majors. Instruments included a measure of mathematics anxiety, mathematics efficacy, writing efficacy, writing anxiety, facilitating anxiety, debilitating anxiety, trait anxiety, and a background information sheet. Results showed that mathematics majors had significantly lower mathematics anxiety scores and
higher mathematics efficacy scores than English majors. Also, English majors had significantly higher writing efficacy scores than mathematics majors. Gender differences were found with women having significantly less writing anxiety and more mathematics anxiety than men. These findings suggest anxiety and efficacy do play a determining role in college students’ choice of major.
Chapter 1

Introduction

Anxiety and Efficacy Constructs

Anxiety has been defined by Spielberger (1983) as a state “characterized by subjective feelings of tension, apprehension, nervousness, and worry, and by activation or arousal of the autonomic nervous system” (p. 4). Efficacy is defined as beliefs about one’s own capabilities to perform certain actions at particular desired levels (Bandura, 1986). Many studies have shown that anxiety affects behavior (Alpert & Haber, 1960; Gross, 1990; Spielberger, 1983). Others have suggested that efficacy affects behavior (Bandura, 1977; Bandura, 1986; Hackett, 1985). These two constructs are often discussed together because it is difficult to talk about anxiety without also examining efficacy. Researchers have long viewed them as interdependent (Bandura, 1977). It has been suggested that the more efficacy one feels, the less anxiety an individual will feel (Bandura, 1977). The following review of the literature will begin with an introduction of the concept of math anxiety, and research on the construct will be
presented. Next, math efficacy will be discussed. Also, the research on writing anxiety and efficacy will be offered. Research will also be presented about how these variables influence students’ choice of major. Finally, two newer constructs, facilitating and debilitating anxiety, will be defined and discussed.

Mathematics Anxiety

Mathematics anxiety is an area that has been studied extensively. Many researchers suggest that mathematics anxiety is related to students’ previous performance in mathematics as well as the amount of preparation that they have had in mathematics (Brush, 1978; Hembree, 1990; Tobias, 1980). Alexander and Cobb (1987) examined mathematics anxiety among 197 college students in order to gain a better understanding of mathematics anxiety as a developmental phenomenon. They found that students who had the lowest performance in mathematics and the least amount of preparation in mathematics were the students who had the highest levels of mathematics anxiety.

In another study of 171 students, Hunsley and Flessati (1988) examined the differences between math- and non-math-anxious individuals. They found that the individuals who were math-anxious received lower marks in mathematics and
recalled a greater number of negative experiences in mathematics than did the non-math-anxious students. The results of this study support the notion that negative experiences in mathematics, lower grades in math, and a limited math background are precursors for high levels of mathematics anxiety.

An interesting theory about mathematics anxiety by Tobias (1980) is the idea that individuals are math-anxious because of their “prior training.” She suggests that individuals, particularly women, believe that mathematical ability is a gift rather than a skill that can be developed. Because individuals do not believe they have the gift, these individuals do not believe they will succeed in mathematics. Tobias reports that most people who are math-anxious think that individuals who can do math can do it instantly. They think that math able individuals do not have to work at it; instead they can think of the “right” formula with little thought (Tobias, 1980).

There are many ideas about the reasons why individuals have high levels of mathematics anxiety; however, there is no consistency in the literature about how to accurately assess or treat math anxiety (Tobias & Weissbrod, 1980).
It is difficult to discuss mathematics anxiety without also examining mathematics efficacy. Math-anxious students usually have low confidence in their ability to perform adequately in mathematics (Hunsley, 1987). It is suggested that mathematics-anxious individuals are anxious about mathematics because they do not believe that they have adequate mathematics skills. As with mathematics anxiety, mathematics self-efficacy is related to past academic performance. Unlike the negative relationship with mathematics, the relationship between past performance and mathematics efficacy is a positive one. The more experience individuals have had in mathematics, the more confident they feel about the mathematics ability (Luzzo, Hasper, Albert, Bibby, & Martinelli, 1999; O’Brien, Martinez-Pons, & Kopala, 1999).

In one study examining the relationship between mathematics anxiety and mathematics self-efficacy among 290 college students, Cooper and Robinson (1991) found that not only is past performance positively correlated with mathematics efficacy but it was also negatively correlated with anxiety about mathematics. The students who had a lot of experience with mathematics had the highest levels of
mathematics efficacy and the lowest levels of mathematics anxiety.

The effect of successful performance is an important factor in increasing one’s self-efficacy in mathematics. The more successful achievements in mathematics people experience, the greater their confidence in their mathematical ability. Hackett, Betz, O’Halloran, and Romac (1990) examined this idea in their study about effects of performance on self-efficacy in 149 college students. Results of the study suggest that task performance significantly and strongly influenced individuals’ task self-efficacy ratings. Also, the individuals who had stronger successes and successes over a period of time had stronger and higher levels of efficacy to perform the task. These results suggest that the most effective way to have a strong sense of mathematics self-efficacy is to have strong, successful experiences with mathematics over a period of time.

Writing Anxiety

Writing anxiety, defined by Grundy (1985) as “the general state of an individual with trepidation about writing,” (p. 153) is an area that has not been studied extensively until more recently. Because anxiety about
specific areas has become more of an issue, writing anxiety has received more attention. Writing anxiety has been suggested as an impediment to writing for many people (Salovey & Haar, 1990). More and more, researchers have identified individuals with writing anxiety and have suggested various assessments of and treatments for alleviating writing anxiety (Daly & Miller, 1975a; Salovey & Haar, 1990).

In examining writing anxiety, Grundy (1985) provides possible explanations for why individuals experience writing anxiety. He suggests that writing is the process of putting our feelings into words, and that for some individuals that is a difficult process. Writing also depends on grammatical knowledge. He asserts that individuals who fear writing feel certain that they have been taught to write but somehow failed. This concept may not be the case. Writing is a skill that needs to be developed and refined; not being able to write just means that one has not had enough practice or has not had enough instruction. Like mathematical ability, writing is a skill that needs to be developed and practiced. It is not a skill that just "comes" to people.
Grundy also suggests that individuals who have writing anxiety do not realize that writing is work; it requires thinking ability and these are things that develop with use. Grundy states, "Most skills improve with use, and those who avoid writing, whatever their baseline level of competence, must inevitably become worse writers than they would otherwise would have been" (p. 156). Understanding these ideas about writing anxiety can lead to a reduction in writing anxiety if individuals can see that like any other skill, the ability to write can be learned. It is not a gift that only few enjoy.

**Writing Efficacy**

As with mathematics anxiety and efficacy, writing anxiety must also be discussed with writing efficacy. Research has shown that the higher one's writing efficacy, the lower one's anxiety (Pajares & Johnson, 1996). Researchers have demonstrated that writing efficacy is a strong predictor of one's writing outcomes (Meier, McCarthy, & Schmeck, 1984; Zimmerman & Risemberg, 1994). It has also been reported that the higher one's efficacy, the higher the writing skill (Schunk & Swartz, 1993). That information clearly illustrates that efficacy is an important construct in writing performance.
In one study by Parajes and Johnson (1996), 181 high school freshmen completed a writing apprehension questionnaire and then wrote a 30-minute essay. Analyses of the results suggest that students’ previous writing accomplishments were a strong indicator of their writing self-efficacy. Furthermore, their self-efficacy about writing had a strong effect on their writing anxiety: the more confident they were about their writing, the lower their writing anxiety. The results also suggested that writing efficacy is a strong predictor of writing performance. Therefore, one’s self-confidence in writing appears to be directly related to one’s writing anxiety and writing performance. These findings can be interpreted to indicate that individuals’ beliefs about their own competence in writing is as important as their actual writing performance.

An interesting aspect of writing self-efficacy was examined by Schunk and Swartz (1993) in their study of writing self-efficacy and feedback. These researchers conducted two experiments with 60 fifth-grade students and 40 fourth-grade students in order to explore the effects of feedback on children’s performance during writing instruction. The feedback let the children know if they
were making progress toward their goal of learning to use a writing strategy and included such statements as: "You’re learning to use the steps," and, "You’re doing well because you followed the steps in order" (p. 342). The researchers found that the children who received strategy instruction and feedback about their progress outperformed children who did not receive strategy instruction and feedback on posttest skill, efficacy for improvement and progress. The researchers concluded that students who receive strategy instruction and feedback about their writing progress develop more confidence in their writing abilities than individuals who do not receive strategy instruction or feedback about their writing progress. They also concluded that students’ talking about their writing and getting assistance while developing writing skills not only increases their efficacy for writing but also reduces their writing anxiety.

**Choice of Major**

It has been suggested by many researchers that individuals who possess high amounts of mathematics anxiety and low levels of mathematics self-efficacy choose college majors that have relatively low mathematics requirements (Singer & Stake, 1986; Ware, Steckler & Leserman, 1985). In
her study of 117 college students, Hackett (1985) examined the role of mathematics self-efficacy in the choice of a college major. Her administration of several instruments offered seven variables involved in the choice of mathematics related careers: gender, Bem Sex Role Inventory masculine score, years of high school math, ACT math score, mathematics self-efficacy, math anxiety score, math relatedness of declared major. Although several of these variables were significantly correlated with math relatedness of declared major, the two highest were mathematics self-efficacy ($r = .50$, $p < .001$) and mathematics anxiety ($r = .44$, $p < .001$). Based on the analyses of these correlations and self-efficacy theory, Hackett developed a causal model path analysis. This model suggests that previous experience in mathematics directly relates to mathematics self-efficacy, and mathematics self-efficacy and mathematics anxiety directly relate to choice of major.

There has been research suggesting that individuals who are math-anxious avoid college majors that have substantial mathematics requirements. However, there is little research on the idea that individuals who are writing-anxious avoid college majors that have high amounts
Facilitating/Debilitating Anxiety

Facilitating and debilitating anxiety was investigated by Alpert and Haber (1960) when they developed a scale to measure specific types of anxiety. Individuals who are identified as "facilitators" indicate that they are facilitated by anxiety. In other words anxiety helps them to perform better. These individuals typically work better under pressure. In contrast, individuals who are labeled as "debilitators" report that they are hindered by anxiety. In other words, anxiety hurts their performance; their performance decreases when they feel high amounts of anxiety.

In a previous study by Johnson and Sgoutas-Emch (1997) a group of 38 psychology students were labeled as either high or low facilitators. The majority of the psychology majors were found to be high facilitators, suggesting that there may be something about the psychology major that attracts individuals who are facilitated by anxiety. The researchers conjectured that there may be groups of individuals in particular majors who possess characteristics of a facilitator or a debilitator. This
conjecture leads to the following questions: Are facilitators or debilitators over represented in certain majors? In particular, are there significant differences between mathematics and English majors in the number of facilitators and/or debilitators in each group?

Statement of the Purpose and Hypotheses

The purpose of this study was to investigate if students who choose majors, mathematics and English, have different levels of mathematics and writing anxiety and efficacy.

Hypothesis 1

Compared to the mathematics (or mathematics-related) majors, English majors will have high levels of anxiety about mathematics and little confidence in their ability to do mathematics.

Hypothesis 2

Mathematics students will have high levels of writing anxiety and low efficacy about writing as compared to English majors.

Hypothesis 3

There will be differences between English and mathematics majors as regards facilitating and debilitating anxiety.
Chapter 2

Method

Participants

The participants for the present study were 99 undergraduate and graduate students from Western Kentucky University. The students were either declared as mathematics majors or mathematics-related (i.e., computer science majors, N = 61, 40 males and 21 females) or English majors (N = 38, 9 males and 29 females). The average age of the participants was 22, \( \text{SD} = 3.01 \) years. Ninety-three percent (N = 92) of the participants were Caucasian, 2\% (N = 2) were African-American, 3\% (N = 3) were Asian-American, and 2\% (N = 2) of the participants denoted “other” when asked about their ethnicity.

 Originally, there were 103 students who participated in the study, however, four were dropped from the study (from the English group) because their age was at least seven standard deviations above the entire group mean age. This exclusion did not alter the results of the statistical analysis.
Materials

All participants were required to complete the following questionnaires that were distributed in a packet:

Consent Form. This form (see Appendix A) explained the study to the participants and asked for their voluntary participation. It also outlined the potential risks and benefits of participating in the study.

Background Information Sheet. This form (see Appendix B) contained items that asked participants the number of mathematics and English classes taken in high school and college. It also contained items that asked about demographic information such as age, gender, year in school, socio-economic status, ethnicity, and major. Only those who reported being mathematics or English majors were included in the study.

State and Trait Anxiety. The State-Trait Anxiety Inventory (see Appendix C), a measure of general anxiety for adults, determines the level at which an individual tends to perceive stressful situations as threatening and the level of anxiety an individual is experiencing at that particular time (Spielberger, 1983). The questionnaire used in this study measured trait anxiety and consisted of 20 items. The higher the score the greater the anxiety a
person reported. The overall median alpha coefficient of the questionnaire has been reported as .90. The inter-reliability was computed for the current study using Cronbach’s alpha and it was shown to be .91.

**Achievement Anxiety.** The Achievement Anxiety Test (see Appendix D), developed by Alpert and Haber (1960), is a self-report scale designed to determine whether an individual is helped or hindered by anxiety. This questionnaire is divided into two separate anxiety scales: facilitating and debilitating. The facilitating anxiety scale consists of 9 items and the debilitating anxiety scale consists of 10 items. The higher the debilitating score, the more anxiety hinders the respondent; and the higher the facilitating anxiety score, the more anxiety facilitates the respondent. These scales are independent as one can score high on both. The inter-reliabilities of the facilitating and debilitating questionnaires for the current study were computed using Cronbach’s alpha, .79 and .87, respectively.

**Mathematics Anxiety.** The Math Anxiety Rating Scale (see Appendix E), developed by Suinn (1972), is a self-report scale designed to determine whether an individual is anxious about mathematics. The questionnaire is a shortened
version (39 items) of the original scale, which consisted of 98 items (Richardson & Woolfolk, 1980). Higher scores signify more perceived mathematics anxiety. The reliability of the questionnaire has not been reported. The inter-reliability, computed using Cronbach’s alpha, for the present study was shown to be .98.

Math Self-Efficacy. The Math Self-Efficacy Scale (see Appendix F), developed by Betz and Hackett (1993), is a self-report scale designed to measure an individual’s level of confidence toward mathematics. The Mathematics Self-Efficacy Scale consists of 34 items and indicates a high level of efficacy when the score is high. The scale is divided into two parts with three subscales (the first part containing the first two subscales and the second part containing the third subscale). The three subscales are as follows: Tasks, Problems, and Courses. The internal consistency reliability value of the total questionnaire has been reported as .96, .92, .96, and .92 for the Tasks, Problems, and Courses subscales, respectively. The inter-reliability was computed for the current study using Cronbach’s alpha, and it was shown for the total scale to be .96, .88, .88, and .95 for the three subscales, respectively.
Writing Anxiety. The Writing Apprehension Test (see Appendix G), developed by Daly and Miller (1975a), is a self-report scale designed to measure an individual’s anxiety toward the task of writing. The questionnaire consists of 26 items and a high score indicates a high level of anxiety. The reliability has been tested: the split-half method (top to bottom) indicated a reliability of .94 and the test-retest (over a week) indicated a reliability of .92. The inter-reliability was computed for the current study using Cronbach’s alpha and was shown to be .97.

Writing Efficacy. The Writing Self-Efficacy Scale (see Appendix H), developed by Haar (1982), is a self-report scale designed to measure an individual’s level of confidence toward the task of writing. The questionnaire consists of 20 items with a high score indicating a high level of confidence about writing. The internal consistency reliability of the scale has been reported to be greater than .70. The inter-reliability was computed for the current study using Cronbach’s alpha and was shown to be .94.
Procedure

Upper division math or English classes were visited to find participants for the present study. Students were told that their participation was voluntary and had no bearing on their grade in their class if they decided not to participate. Extra credit was given to any one who accepted a packet and completed the forms within the allotted time period.

It was explained that all the information collected during and after the study would be kept in a locked file cabinet with only the researcher having access. The participants were also told that number codes were to be used instead of students’ names to provide further confidentiality. The packets were labeled with the researcher’s address and the students were asked to complete the forms on their own time within a three-week period. Fifty-seven completed packets were not included in this study because their declared major was not mathematics or mathematics-related or English.

Once all packets were returned, the data were entered into the computer and all questionnaires were scored.
Chapter 3

Results

Demographics

Table 1 presents the means for all of the variables across major and gender. As one would expect, preliminary examination of the data revealed that many of the variables were significantly related to the major of the participant. First, as seen in Table 1, the English group had more English classes in college, $\overline{M} = 11.14$, $SD = 5.07$ and in high school $\overline{M} = 4.37$, $SD = .85$ than did the mathematics group, $\overline{M} = 2.82$, $SD = 1.50$ and $\overline{M} = 3.98$, $SD = .47$, respectively. There were significant differences in major for both number of mathematics courses taken in college, $F (1,95) = 66.55, p < .001$, and in high school, $F (1,95) = 23.83, p < .001$. In both cases, the mathematics majors took more courses related to mathematics than did the English majors. No other differences were found for either variable. Comparisons made across the English related variables in the study showed patterns similar to those found with the mathematics variables. Significant
Table 1

Means for all Dependent Measures for Major and Gender

<table>
<thead>
<tr>
<th>Measures*</th>
<th>English</th>
<th>Mathematics</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>TA</td>
<td>40.00</td>
<td>38.31</td>
<td>38.02</td>
<td>39.92</td>
</tr>
<tr>
<td>FAC</td>
<td>25.61</td>
<td>26.46</td>
<td>24.82</td>
<td>27.47</td>
</tr>
<tr>
<td>DEB</td>
<td>23.66</td>
<td>23.48</td>
<td>23.46</td>
<td>23.63</td>
</tr>
<tr>
<td>MATHHS</td>
<td>3.53</td>
<td>4.52</td>
<td>3.96</td>
<td>4.33</td>
</tr>
<tr>
<td>MATHCOL</td>
<td>1.47</td>
<td>5.87</td>
<td>3.30</td>
<td>5.08</td>
</tr>
<tr>
<td>MA</td>
<td>109.39</td>
<td>86.93</td>
<td>102.62</td>
<td>88.35</td>
</tr>
<tr>
<td>ME</td>
<td>115.13</td>
<td>145.38</td>
<td>124.66</td>
<td>143.06</td>
</tr>
<tr>
<td>ENGHS</td>
<td>4.37</td>
<td>3.98</td>
<td>4.14</td>
<td>4.13</td>
</tr>
<tr>
<td>ENGCOL</td>
<td>11.14</td>
<td>2.82</td>
<td>8.06</td>
<td>3.86</td>
</tr>
<tr>
<td>WA</td>
<td>45.71</td>
<td>71.56</td>
<td>58.72</td>
<td>64.61</td>
</tr>
<tr>
<td>WE</td>
<td>91.97</td>
<td>76.61</td>
<td>85.24</td>
<td>79.71</td>
</tr>
</tbody>
</table>

*TA = trait anxiety, FAC = facilitating anxiety, DEB = debilitating anxiety, MATHHS = number of mathematics courses taken in high school, MATHCOL = number of mathematics courses taken in college, MA = mathematics anxiety, ME = mathematics efficacy, ENGHS = number of English courses taken in high school, ENGCOL = number of English courses taken in college, WA = writing anxiety, WE = writing efficacy.
differences were found between majors regarding the number of English classes taken in college, $F(1, 95) = 96.39, p < .001$ and high school, $F(1, 95) = 9.59, p < .004$. 

**Hypothesis 1**

It was hypothesized that compared to the mathematics (or mathematics-related) majors, English majors would have high levels of anxiety about mathematics and little confidence in their ability to do mathematics.

To ascertain differences in mathematics anxiety and mathematics efficacy, two-way analyses of variance (ANOVA) were performed with major (English versus mathematics) as one variable and gender (male versus female) as the other. Table 2 displays the ANOVA tables for mathematics anxiety and efficacy by major and gender. Significant main effects for major were found for mathematics anxiety scores ($F(1, 95) = 4.52, p < .04$). The English group ($M = 109.39, SD = 40.75$) reported significantly greater levels of mathematics anxiety than did the mathematics group ($M = 86.93, SD = 29.11$). No other significant effects were found for mathematics anxiety.

As Figure 1 illustrates, there was a significant interaction between gender and major on mathematics efficacy scores ($F(1, 95) = 8.66, p < .005$), demonstrating
Table 2

Analysis of Variance for Major and Gender for Mathematics Anxiety and Mathematics Efficacy

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mathematics Anxiety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major (M)</td>
<td>5180.01</td>
<td>1</td>
<td>5180.01</td>
<td>4.52*</td>
</tr>
<tr>
<td>Gender (G)</td>
<td>1993.86</td>
<td>1</td>
<td>1993.86</td>
<td>1.74</td>
</tr>
<tr>
<td>M x G</td>
<td>2607.59</td>
<td>1</td>
<td>2607.59</td>
<td>2.28</td>
</tr>
<tr>
<td>Residual</td>
<td>108813.06</td>
<td>95</td>
<td>1145.40</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>124088.44</td>
<td>98</td>
<td>1266.21</td>
<td></td>
</tr>
</tbody>
</table>

**Mathematics Efficacy**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major (M)</td>
<td>10392.37</td>
<td>1</td>
<td>10392.37</td>
<td>29.12***</td>
</tr>
<tr>
<td>Gender (G)</td>
<td>2654.01</td>
<td>1</td>
<td>2654.01</td>
<td>7.44**</td>
</tr>
<tr>
<td>M x G</td>
<td>3089.63</td>
<td>1</td>
<td>3089.63</td>
<td>8.66**</td>
</tr>
<tr>
<td>Residual</td>
<td>33902.21</td>
<td>95</td>
<td>356.87</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>59631.66</td>
<td>98</td>
<td>608.49</td>
<td></td>
</tr>
</tbody>
</table>

Note. *p < .05. **p < .01. ***p < .001.
Figure 1. Mean Facilitating Score.
that female and male mathematics majors have the highest levels of mathematics efficacy with relatively little difference between them. However, a large difference between female and male English majors was noted with female English majors having the lowest mathematics efficacy by far (M = 109.21, SD = 22.28 and M = 134.22, SD = 28.45, respectively). Significant main effects for both major, F (1,95) = 29.12, p < .001, and gender, F (1,95) = 7.44, p < .009, were found for mathematics efficacy scores. As expected, the English group reported significantly less mathematics efficacy (M = 115.13, SD = 25.83) than did the mathematics group (M = 145.38, SD = 15.02). In addition, males in the study reported having significantly higher mathematics efficacy (M = 143.06, SD = 18.62) than did the females (M = 124.66, SD = 26.58).

Hypothesis 2

It was hypothesized that mathematics students would have high levels of writing anxiety and low efficacy about writing as compared to English majors. To ascertain differences in writing anxiety and writing efficacy, again, two-way analyses of variance (ANOVA) were performed with major (English versus mathematics) as one variable and gender (male versus female) as the other. Table 3 displays
### Table 3

**Analysis of Variance for Major and Gender for Writing Anxiety and Writing Efficacy**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Writing Anxiety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major (M)</td>
<td>13788.60</td>
<td>1</td>
<td>13788.60</td>
<td>36.63***</td>
</tr>
<tr>
<td>Gender (G)</td>
<td>354.71</td>
<td>1</td>
<td>354.71</td>
<td>.94</td>
</tr>
<tr>
<td>M x G</td>
<td>109.92</td>
<td>1</td>
<td>109.92</td>
<td>.292</td>
</tr>
<tr>
<td>Residual</td>
<td>35757.05</td>
<td>95</td>
<td>376.39</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>52070.91</td>
<td>98</td>
<td>531.34</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Writing Efficacy</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Major (M)</td>
<td>4437.30</td>
<td>1</td>
<td>4437.30</td>
<td>32.42***</td>
</tr>
<tr>
<td>Gender (G)</td>
<td>5.60</td>
<td>1</td>
<td>5.60</td>
<td>.04</td>
</tr>
<tr>
<td>M x G</td>
<td>2.54</td>
<td>1</td>
<td>2.54</td>
<td>.02</td>
</tr>
<tr>
<td>Residual</td>
<td>13003.53</td>
<td>95</td>
<td>136.88</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18544.75</td>
<td>98</td>
<td>189.23</td>
<td></td>
</tr>
</tbody>
</table>

**Note.**  
*p < .05.  **p < .01.  ***p < .001.
the ANOVA tables for English anxiety and efficacy by major and gender. Significant differences were recorded as regards both writing anxiety and writing efficacy measures. A significant difference in major was found, $F(1,95) = 36.63$, $p < .001$, indicating that the English group reported having significantly less writing anxiety ($M = 45.71$, $SD = 14.82$) than did the mathematics group ($M = 71.56$, $SD = 21.72$). Also, the majors had significantly different scores on the writing efficacy scale, $F(1,95) = 32.42$, $p < .001$. As predicted, the English group had significantly higher writing efficacy ($M = 91.97$, $SD = 7.39$) than did the mathematics group ($M = 76.61$, $SD = 13.54$). No main effects for gender or interaction effects were found for either of these variables.

Finally, a discriminant analysis was performed to examine the predictive value of efficacy and anxiety measures regarding choice of major. As shown in Table 4, use of three predictors (i.e., mathematics efficacy, writing efficacy, and writing anxiety) resulted in correct classification of student by major 85.9% of the time ($p < .05$). Mathematics anxiety did not significantly contribute to the prediction of participant major.
Table 4

**Discriminant Analysis for Predicting Major**

<table>
<thead>
<tr>
<th>Actual Major</th>
<th>Predicted Major</th>
<th>ENGLISH</th>
<th>MATHEMATICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGLISH</td>
<td></td>
<td>78.9*</td>
<td>21.1</td>
</tr>
<tr>
<td>MATHEMATICS</td>
<td></td>
<td>9.8</td>
<td>90.2</td>
</tr>
</tbody>
</table>

*Percent

Note. 85.9% of the TOTAL group was correctly classified.
Hypothesis 3

It was hypothesized that there would be differences between English and mathematics majors as regards facilitating and debilitating anxiety. To ascertain differences in general anxiety, facilitating anxiety, and debilitating anxiety, two-way analyses of variance (ANOVA) were performed with major (English versus mathematics) as one variable and gender (male versus female) as the other. There were no significant gender or major effects for general anxiety.

The overall score was 38.96, SD = 10.86 suggesting a relatively low level of anxiety for all of the participants. As illustrated in Figure 2, a significant interaction effect was found as regards facilitating anxiety $F(1, 95) = 7.87, p < .007$. Male English majors reported being slightly more facilitated by anxiety, $M = 31.67, SD = 3.71$, than did female English majors, $M = 23.72, SD = 6.11$.

Further, a significant main effect for gender was found for facilitating anxiety with $F(1,95) = 8.67, p < .005$. As seen in Table 1, the males reported being facilitated significantly more by anxiety ($M = 27.47, SD = 6.23$) than the females ($M = 24.82, SD = 5.96$). However,
Figure 2. Mean Debilitating Score.
within the English major male English majors reported being more facilitated by anxiety than did female English majors, $M = 21.67, SD = 1.24$ and $M = 23.72, SD = 1.13$, respectively. No significant effect was found for major.

As seen in Figure 3 debilitating anxiety scores showed a significant interaction, $F(1,95) = 7.62, p < .008$, with female English majors reporting being more debilitated by anxiety ($M = 25.17, SD = 8.14$) than were male English majors ($M = 18.78, SD = 7.26$) and male mathematics majors ($M = 24.73, SD = 8.56$) being more debilitated by anxiety than were female mathematics majors ($M = 21.10, SD = 5.51$). No significant main effects were found.

These results suggest that the female English majors had the lowest facilitating scores and the highest debilitating anxiety scores. In other words, this group reported that anxiety hindered their performance and did not help them ($M = 23.72, SD = 6.11$ and $M = 25.17, SD = 8.14$, debilitating and facilitating scores, respectively). Conversely, the male English majors displayed an opposite effect reporting that anxiety helps them ($M = 31.67, SD = 3.71$ and $M = 18.78, SD = 7.26$, facilitating and debilitating scores, respectively).
Figure 3. Mean Mathematics Efficacy Score.
Chapter 4

Discussion

Past research has shown that anxiety affects performance and efficacy (Daly & Miller, 1975a; Grundy, 1985; Meier, McCarthy, & Schmeck, 1984; Salovey & Haar, 1990; Speilberger, 1983). Specifically, mathematics anxiety has been shown to affect individuals’ confidence and performance in mathematics (Cooper & Robinson, 1991; Hembree, 1990; Speilberger, 1983; Tobias & Weissbrod, 1980). The present study’s findings were consistent with the past research. However, this investigator extended the research by examining the two specific types of anxiety and efficacy (mathematics and writing) together.

The purpose of this study was to investigate if students with majors related to mathematics and writing have different levels of anxiety and efficacy in these areas. The purpose was also to investigate if people possess certain characteristics that are associated with particular majors.
Hypotheses

Hypothesis 1

First, it was hypothesized that, compared to mathematics or mathematics-related majors, English majors would have high levels of anxiety about mathematics and little confidence in their ability to do mathematics. The results of this study did in fact show that English majors had the highest levels of mathematics anxiety and the lowest levels of mathematics efficacy as compared to the mathematics majors. As one would have expected, the English majors had fewer mathematics classes in high school and in college than did the mathematics students. Also, the results indicated that the mathematics majors had lower levels of mathematics anxiety and higher levels of mathematics efficacy.

Hypothesis 2

It was also hypothesized that mathematics students would have high anxiety and low efficacy about writing. And, in fact, that was the finding. Mathematics majors had the highest levels of writing anxiety and the lowest levels of writing efficacy. As one would have expected, the mathematics majors had fewer English classes in high school and in college than did the English students. The analyses
of the data also revealed that, as one would expect, the English majors had significantly less anxiety about writing than did the mathematics majors. The English majors also had significantly higher levels of writing efficacy than did the mathematics majors.

Discussion of Hypotheses 1 and 2

The results of this study may indicate that individuals may choose their course of study based on their lack of confidence in their abilities in other subjects. In this study, individuals who were confident in mathematics reported having less anxiety about mathematics but reported having high levels of anxiety about writing and little confidence in their writing abilities. And these individuals also had more experience in mathematics and less experience in writing classes (recall that this group had more math classes and less English classes in high school and in college). The suggestion is that these individuals are choosing classes that they feel more confident in and less anxious about the subject matter. This funding provides support for the notion that experiences in a subject help to increase one’s confidence in that subject. Further, more experience also helps decrease the level of anxiety about a subject and,
therefore, increases the individual’s likelihood of again choosing courses in that subject area.

In the same respect, individuals who are confident in their writing abilities reported having higher levels of mathematics anxiety and little confidence in their mathematical abilities. These findings are consistent with the research that suggests individuals who have more experience with a subject not only feel less anxiety about that subject but they also feel more confident in their abilities in that subject matter (Alexander & Cobb, 1987; Cooper & Robinson, 1991; Pajares & Johnson, 1996; Salovey & Haar, 1990; Tobias, 1980). In one study, Pajares and Johnson discovered that when examining efficacy and performance, men and women differed significantly as regards their confidence about writing when their actual performance was the same. This finding provides support for the notion that increasing self-efficacy may be a key factor in having more options for a choice of major for students.

Salovey and Haar (1990) have suggested that alleviating writing anxiety is not just about developing the skill for writing. It is also about increasing one’s confidence and decreasing one’s anxiety about writing. As
we have seen through the literature, reducing one’s anxiety is directly related to increasing one’s efficacy (through skill development) and decreasing one’s anxiety (through increasing positive experiences with the subject). Further studies should investigate whether this lack of confidence is based on reality or whether individuals underestimate their potential. Then attempts can be made to reduce that anxiety about those subjects that make them anxious as well as to change their self-concept and increase their self-esteem regarding that subject. Then not only would there be more choices for a major and eventually a career but also selecting a major would actually be a choice, not a forced choice driven by high levels of anxiety.

**Hypothesis 3**

Finally, it was hypothesized that there would be differences between English and mathematics majors in facilitating and debilitating anxiety. The analyses revealed no significant differences. However, there was an interaction effect between gender and major. Male mathematics majors were more facilitated by anxiety in general than the male English majors. A reason for this result may be that, within males, mathematics majors may
view themselves as working well under pressure, whereas the English majors may not feel as they are as able to cope. On the other hand, mathematics majors may also feel, due to societal expectations of mathematics-related fields, as though they are supposed to be more facilitated by anxiety. Men may feel that the mathematics-related fields may be stereotyped as being more stressful and under high pressure than the English-related fields.

As regards debilitating anxiety, again, there was no significant difference across the two majors, but there was a significant interaction effect. The female English majors were more debilitated by anxiety than the female mathematics majors. Also, the male mathematics majors were more debilitated by anxiety than the male English majors. Recall that this group also reported being more facilitated by anxiety. Thus, male mathematics majors reported being more facilitated as well as more debilitated by anxiety. It seems counterintuitive that one can be facilitated and debilitated by anxiety, but recall that these constructs are not mutually exclusive. Because there is little research on these constructs it is difficult to interpret these findings. This area needs to be investigated further.
Another aspect that needs consideration when discussing facilitating and debilitating anxiety is deciding whether or not to reduce anxiety. If individuals are facilitated by anxiety then reducing anxiety for that individual may not be the goal. The key is first determining whether the individual is facilitated or debilitated by anxiety. Then the determination can be made as to whether or not it is in the best interest of that student to reduce his/her anxiety.

Predictors

Three of the four main variables (the two types of efficacy and writing anxiety) proved to be strong predictors of choice of major. Mathematics efficacy, writing anxiety, and writing efficacy resulted in correct classification about 86% of the time. This result suggests that these constructs may be strong classification predictors in the selection of fields of study for college students. This result is consistent with hypotheses one and two suggesting that students may in fact be choosing majors in which they have had some experience in and have more confidence about that subject matter.

Mathematics anxiety was not found to be a predictor variable, the reason may be that many students, regardless
of major, feel some amount of mathematics anxiety thereby making prediction hard to detect, on that basis alone, as to what field they will choose to study.

Gender Differences

Other interesting findings of this study that were not hypothesized were the significant gender differences across the variables. There were significant gender differences across the number of English classes taken in college. Women took significantly more English classes than did men. Another study has reported similar gender differences with regard past experience with English. Meier, McCarthy, and Schmeck (1984) found that women outperformed men with regard to their writing. Although they did not examine the number of English classes taken, they did examine performance and found that there were significant gender differences.

Also, there were significant gender differences across facilitating anxiety. Overall, the males reported being more facilitated by anxiety than the women. One explanation for this result may be that, in general, men are either used to working under pressure and therefore can perform better under high anxiety-provoking situations, or, men may rely on that extra “push” of anxiety to work on tasks.
Another explanation for these results may be a sociability factor. Men may not be any more facilitated by anxiety than women, but men may not be as willing to acknowledge their anxiety as women. Men and women may be equally facilitated by anxiety, but women may not feel the social pressure that men do about admitting the effects of anxiety. Women may feel more “free” to acknowledge the negative effects of anxiety.

Another explanation may be that women are accustomed to feeling high levels of anxiety and, therefore, do not necessarily notice that they are functioning under high levels of anxiety. In other words, they may be so used to anxiety that they no longer notice its presence. This pattern may cause women to report lower levels of anxiety.

And finally, a possible explanation may be that women feel as though society expects that they will not function “under pressure” as well as men. Because of societal views, women may feel as though the expectation is that they do not perform as well as men in high-pressure situations.

There were also significant gender differences across mathematics efficacy. Overall, males reported having higher mathematics efficacy than did women, regardless of their major. There are two possible reasons for this gender
difference. One reason, that men have a higher sense of mathematical ability than women, is consistent with the literature (Hackett, Betz, O’Halloran, & Romac, 1990; Hyde, Fennema, Ryan, & Frost, 1990; Matsui, Matsui, & Ohnishi, 1990; Randhawa, 1994). Another reason may be because there were significantly more men in the mathematics major group (40) versus men in the English major group (9); recall that male mathematics majors had higher levels of mathematics efficacy.

**Limitations**

This study has limitations that need to be addressed. First, the sample was self-selected. The results cannot be generalized to all individuals in the mathematics, mathematics-related and English majors. The results may be applied only to individuals who are willing to participate in a study.

Second, the sample sizes were very small for each of the groups. Recall that there were only 9 men who were declared as English majors. A more even balance of males and females in each group would make the interaction between gender, anxiety and efficacy potentially easier to interpret.
Additionally, there may have been a sociability factor that affects participants’ reporting about anxiety. Due to social pressures, men may have been less likely to admit to or be aware of experiencing high levels of anxiety; and men may have been more likely to say that they work well under highly-anxious situations because of social desirability. In the same respect, women may have felt as though they were supposed to report that they do not work well under highly-anxious situations. These social desirability factors are difficult to control for and may have influenced the results of this study.

Finally, the levels of participants’ experience were not controlled for. Because we know that an individual’s past experience with a particular subject affects his/her anxiety and efficacy about that subject, past experience is a factor that must be considered. Data were collected inquiring about how much experience each participant had with each subject (English and mathematics). However, the overall levels of experience for each group were not equivalent. This limitation makes interpretation of the anxiety and efficacy measures difficult.
Directions for Future Research

In future research, attempts should be made to obtain equal numbers of males and females in each of the mathematics and English groups. Also, the individuals' past experience should be considered when forming the groups. It may be advantageous that the individuals' experience with a particular subject matter be relatively the same for each of the groups.

If the results of this study are accurate, topics for further research should include examining and developing techniques to reduce individuals' anxiety about topics that they avoid, while, at the same time, helping them increase their confidence in that subject area. Research abounds about how to reduce anxiety (Hembree, 1990; Sime, Ansorge, Olson, Parker, & Lukin, 1987; Sgoutes-Emch & Johnson, 1998; Tobias, 1980; Tobias, 1978; Wadlington, Austin, & Bitner, 1992). Many techniques have been suggested such as meditation, journal writing, mental imagery, and relaxation techniques. There are also recommended techniques for increasing one's efficacy in a particular domain (Bandura, 1977; Bibby & Martinelli, 1999; Cooper & Robinson, 1991; Luzzo, Hasper, Albert, Schunk, & Swartz, 1993; Tobias, 1980; Zimmerman & Risemberg, 1994). These include practice,
mental imagery, support from others, and positive experiences with the subject matter. However, at this point, this researcher knows of no technique that combines these two ideas to work together. If a technique can be developed that incorporates the ideas about both anxiety and efficacy then perhaps we would see a more balanced spread of individuals in all occupational and educational domains.

**Conclusion**

The findings of this study suggest that, as suspected, individuals who experience high levels of anxiety about a particular subject matter may avoid college majors with substantial amounts of requirements in that discipline. Whether it is mathematics or writing, individuals may avoid majors that require them to take these high anxiety-provoking classes. These results, although seemingly obvious, are very significant because many people think that it is the mathematics-related majors that are avoided. This study points out that other fields that cause anxiety may also be avoided. Thus, it is not just important to reduce anxiety about mathematics, as many suggest, but to reduce anxiety about any academic area in which an individual perceives as anxiety-provoking.
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APPENDIX A

CONSENT FORM
Consent to Investigational Procedure

I, ____________________________, hereby authorize or direct Camille Joy Johnson or associates of her choosing, to perform the following procedure (described in general terms).

For this study you will be asked to fill out a series of questionnaires. This may take up to forty minutes of your time.

**Title of the Study:**
“Attitudes Toward Math and Writing.”

**Purpose of the Study:**
The purpose of the present study is to examine college students' opinions and feelings toward mathematics and writing.

**Risk to the Participants:**
All data will be kept confidential and there are no risks to your well being.

**Benefits to the Participants:**
Volunteers who wish to participate may receive extra credit in their classes.

**Statement that Participation is Voluntary:**
I understand that my participation in this study is voluntary and that I have the right to withdraw my participation at any point during the collection of my data. There will be no consequences to the participants who do not wish to partake in the study.

I, undersigned, understand the above explanations and on that basis, I give consent to my voluntary participation in this research.

__________________________________________
Signature of the Participant                             Date

__________________________________________
Signature of Parent or Guardian (needed only if the participant above is a minor)

__________________________________________
Location (e.g., Bowling Green, KY)

__________________________________________
Signature of the Principal Researcher                  Date

__________________________________________
Signature of Witness                                     Date
APPENDIX B

BACKGROUND INFORMATION SHEET
Background Information

Code__________________

Age: _______  Gender: _______  Year in School (e.g., FR, SO, JR, SR):

Major: _____ MATH
       _____ ENGLISH
       _____ COMPUTER SCIENCE

Ethnic Background: _____ Caucasian
             _____ African American
             _____ Asian American
             _____ Native
American/Indian
             _____ Hispanic/Latino
             _____ Other

Would you consider your family to be: _____ Upper Class
             _____ Middle Class
             _____ Low Income

# of ENGLISH classes in HIGH SCHOOL ____________________________
# of MATH classes in HIGH SCHOOL ______________________________
# of ENGLISH classes in COLLEGE ________________________________
# of MATH classes in COLLEGE _________________________________
APPENDIX C

TREAT ANXIETY QUESTIONNAIRE
Questionnaire

Read each question carefully. Please answer the most appropriate answer on a scale from A-D.

A = Almost Always  B = Often  C = Sometimes  D = Almost Never

1. I feel pleasant.
2. I feel nervous and restless.
3. I feel satisfied with myself.
4. I wish I could be as happy as others seem to be.
5. I feel like a failure.
6. I feel rested.
7. I am "calm, cool, and collected."
8. I feel that difficulties are piling up so that I cannot overcome them.
9. I worry too much over something that really doesn't matter.
10. I am happy.
11. I have disturbing thoughts.
12. I lack self-confidence.
13. I feel secure.
15. I feel inadequate.
16. I am content.
17. Some unimportant thought runs through my mind and bothers me.
18. I take disappointments so keenly that I can't put them out of my mind.
19. I am a steady person.
20. I get in a state of tension or turmoil as I think over my recent concerns and interests.
APPENDIX D

FACILITATING/DEBILITATING ANXIETY QUESTIONNAIRE
Read each question carefully. Please answer how anxious each situation makes you feel on a scale from A-E.

A= Always       B= Often       C= Neutral       D= Sometimes       E= Never

21. Nervousness while taking an exam hinders me.

22. I work most effectively under pressure, as when the task is very important.

23. In a course where I have been doing poorly, my fear of a bad grade cuts down my efficiency.

24. When I am poorly prepared for an exam or test, I get upset, and do less well that even my restricted knowledge should allow.

25. The more important the examination, the less well I seem to do.

26. While I may (or may not) be nervous before taking an exam, once I start, I seem to forget to be nervous.

27. During exams or tests, I block on questions to which I know the answers, even though I might remember them as soon as the exam is over.

28. Nervousness while taking a test helps me to do better.

29. When I start a test, nothing is able to distract me.

30. In courses in which the total grade is based mainly on one exam, I seem to do better than other people.

31. I find that my mind goes blank at the beginning of an exam, and it takes me a few minutes before I can function.

32. I look forward to exams.

33. I am so tired from worrying about an exam, that I find I almost don't care how well I do by the time I start the test.

34. Time pressure on an exam causes me to do worse than the rest of the group under similar conditions.

35. Although "cramming" under pre-examination tension is not effective for most people, I find that if the need arises, I can learn material immediately before an exam, even under considerable pressure, and successfully retain it to use on the exam.
36. I enjoy taking a difficult exam more than an easy one.

37. I find myself reading exam questions without understanding them, and I must go back over them so that they will make sense.

38. The more important the exam or test, the better I seem to do.

39. When I don't do well on a difficult item at the beginning of an exam, it tends to upset me so that I block even easy questions later on.
APPENDIX E

MATHEMATICS ANXIETY QUESTIONNAIRE
Read each question carefully. Please answer how anxious each situation makes you feel on a scale from A-E.

A = Very Much  B = Much  C = A fair amount  D = A Little  E = Not at all

40. Thinking about an upcoming math test one day before.
41. Picking up a math textbook to begin a difficult reading assignment.
42. Opening a math book and seeing a page full of problems.
43. Studying for a math test.
44. Thinking about an upcoming math test one week before.
45. Taking an examination (quiz) in a math course.
46. Listening to a lecture in a math course.
47. Starting a new chapter in a math book.
48. Signing up for a math course.
49. Picking up the math textbook to begin working on a homework assignment.
50. Thinking about an upcoming math test one hour before.
51. Realizing that you have to take a certain number of math classes to fulfill the requirements in your major.
52. Not knowing the formula needed to solve a particular problem.
53. Taking the math section of a college entrance exam.
54. Being given a homework assignment of many difficult math problems which is due the next day of class.
55. Being given a "pop" quiz in a math class.
56. Listening to another student explain a math formula.
57. Working on an abstract math problem, such as: "If \( x = \) outstanding bills, and \( y = \) total income, calculate how much you have left for recreational expenditures."
58. Getting ready to study for a math test.
59. Hearing a friend try to teach you a math procedure and finding that you cannot understand what he or she is telling you.

60. Walking on campus and thinking about a math course.

61. Taking an examination (final) in a math course.

62. Reading a formula in chemistry.

63. Watching a teacher work a math equation on the blackboard.

64. Looking through the pages of a math text.

65. Solving a square root problem.

66. Walking into a math class.

67. Having to use the tables in the back of a math book.

68. Walking to math class.

69. Talking to someone in your class who does well, about a problem and not being able to understand what he or she is explaining.

70. Thinking about an upcoming math test five minutes before.

71. Being asked to explain how you arrive at a particular solution for a problem.

72. Receiving your final math grade in the mail.

73. Reading and interpreting graphs or charts.

74. Tallying up the results of a survey or poll.

75. Doing a word problem in math.

76. Sitting in math class and waiting for the instructor to arrive.

77. Being called upon to recite in a math class when you are prepared.

78. Buying a math textbook.

79. Asking your math instructor to help you with a problem that you don't understand.
APPENDIX F

WRITING ANXIETY QUESTIONNAIRE
Read each statement carefully and choose your responses from the scale below.

A = Strongly Agree  B = Agree  C = Uncertain  D = Disagree  E = Strongly Disagree

80. I avoid writing.
81. I have no fear of my writing being evaluated.
82. I look forward to writing down my ideas.
83. I am afraid of writing essays when I know they will be evaluated.
84. Taking a composition course is a very frightening experience.
85. Handing in a composition makes me feel good.
86. My mind seems to go blank when I start to work on a composition.
87. Expressing ideas through writing seems to be a waste of time.
88. I would enjoy submitting my writing to magazines for evaluation and publication.
89. I like to write my ideas down.
90. I feel confident in my ability to clearly express my ideas in writing.
91. I like to have my friends read what I have written.
92. I’m nervous about writing.
93. People seem to enjoy what I write.
94. I enjoy writing.
95. I never seem to be able to clearly write down my ideas.
96. Writing is a lot of fun.
97. I expect to do poorly in composition classes even before I enter them.

98. I like seeing my thoughts on paper.

99. Discussing my writing with others is an enjoyable experience.

100. I have a terrible time organizing my ideas in a composition course.

***USE SCANTRON # 2***

1. When I hand in a composition I know I’m going to do poorly.

2. It’s easy for me to write good compositions.

3. I don’t think I write as well as most other people.

4. I don’t like my compositions to be evaluated.

5. I’m no good at writing.
Please read each question carefully and choose the response that most applies to how confident you feel about each item.

Complete Confidence = A  Much Confidence = B  Some Confidence = C
Very Little Confidence = D  No Confidence at all = E

6. Add two large numbers (e.g., 5379+62543) in your head.

7. Determine the amount of sales tax on a clothing purchase.

8. Figure out how much material to buy in order to make curtains.

9. Determine how much interest you will end up paying on a $675 loan over 2 years at 14 3/4% interest.

10. Multiply and divide using a calculator.

11. Compute your car's gas mileage.

12. Calculate recipe quantities for a dinner for 3 when the original recipe is for 12 people.

13. Balance your checkbook without a mistake.

14. Understand how much interest you will earn on your savings account in six months, and how that interest is computed.

15. Figure out how long it will take to travel from Columbus to Chicago driving at 55 mph.

16. Set up a monthly budget for yourself taking into account how much money you earn, bills to pay, personal expenses, etc.

17. Compute your income taxes for the year.

18. Understand a graph accompanying an article on business profits.

19. Figure out how much you would save if there is a 15% mark-down on an item you wish to buy.

20. Estimate your grocery bill in your head as you pick up items.

21. Figure out which of 2 summer jobs is the better offer: one with a higher salary but no benefits; the other with a lower salary but with room, board, and travel expenses included.

22. Figure out the tip on your part of a dinner bill total split 8 ways.

23. Figure out how much lumber you need to buy in order to build a set of bookshelves.
APPENDIX H

MATHEMATICS EFFICACY QUESTIONNAIRE
Please rate the following college courses according to how much CONFIDENCE you have that you could complete the course with a FINAL GRADE of “A” or “B”.

Complete Confidence = A  Much Confidence = B  Some Confidence = C  
Very Little Confidence = D  No Confidence at all = E

24. Basic College Math
25. Economics
26. Statistics
27. Physiology
28. Calculus
29. Business Administration
30. Algebra II
31. Philosophy
32. Geometry
33. Computer Science
34. Accounting
35. Zoology
36. Algebra I
37. Trigonometry
38. Advanced Calculus
39. Biochemistry
APPENDIX I

WRITING EFFICACY QUESTIONNAIRE
Please answer how CONFIDENT you feel that you could complete the following writing tasks.

A = Extremely Confident     B = Moderately Confident     C = Slightly Confident
D = Not at all Confident     E = I don’t think I could complete the task

40. Write a brief report (1-3 pages) in two days, on a subject you know well.
41. Write a text of a 10 minute speech or oral presentation in 1 day.
42. Write a list for yourself in 5 minutes.
43. Write a short business letter in 20 minutes.
44. Write a short story in two weeks.
45. Write a consumer’s letter of complaint in 20 minutes.
46. Write an article to be published in a magazine or journal in 6 weeks.
47. Write a “newsy” letter in 40 minutes.
48. Write a report (10-15 pages) on a subject you know well in 1 week.
49. Write an autobiography in 15 months.
50. Write an essay for a contest in 2 days.
51. Write a long business letter in 45 minutes.
52. Write a book in 1 year.
53. Write a letter to the editor in 2 hours.
54. Write a note to a stranger in 5 minutes.
55. Write a long report (25-40 pages) in 3 weeks, on a subject that you know well.
56. Write a long treatise about your special interest or hobby in 6 months.
57. Write a long-overdue thank you note in 20 minutes.
58. Write an entry in a diary or personal journal in 30 minutes.
59. Write a short formal memo in 10 minutes.
APPENDIX J

HUMAN SUBJECTS BOARD APPROVAL
In future correspondence please refer to HS9806, September 18, 1997

Ms. Camille Joy Johnson
Department of Psychology
Western Kentucky University

Dear Ms. Johnson:

Your research topic “Anxiety and efficacy: Are they related to students’ choice of major?” has undergone review by the Western Kentucky University IRB for human subjects of research and it has been determined that risks to subjects are: (1) minimized and reasonable; and that (2) research procedures are consistent with a sound research design and do not expose the subjects to unnecessary risk. Reviewers determined that: (1) benefits to subjects are considered along with the importance of the topic and that outcomes are reasonable; (2) selection of subjects is equitable; and (3) the purposes of the research and the research setting is amenable to subjects’ welfare and producing desired outcomes; that indications of coercion or prejudice are absent, and that participation is clearly voluntary.

In addition, the IRB found that: (1) informed consent will be sought and documented from each prospective subject; (2) provision is made for collecting, using and storing data in a manner that protects the safety and privacy of the subjects and the confidentiality of the data; and (3) that appropriate safeguards are included to protect the rights and welfare of the subjects. Please store all data securely at an on campus location for a minimum of three years.

Your research therefore meets the criteria of Expedited review under the institutional human subjects protocol and is approved. Copies of your request for human subjects review, your application, and this approval, are maintained in the Office Sponsored Programs at the above address. Please report any changes to this approved protocol to this office. A request to update the protocol or inform the HSRB of the conclusion of the project will be sent to you a year from now.

Our best wishes for your research.

Sincerely,

Philip E. Myers, Ph.D.
Director, Office of Sponsored Programs and
Human Subjects Coordinator

c: Dr. Anthony Norman
   Human Subjects File

HSApprovalCamilleJohnson