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GENDER DIFFERENCES AND THE COMPUTER SELF-EFFICACY OF PRESERVICE MUSIC TEACHERS

William I. Bauer
Case Western Reserve University

Three research questions were formulated for this study: (a) What is the computer self-efficacy of preservice music teachers, (b) Are there any relationships between the computer self-efficacy of preservice music teachers and their prior experiences with computers, and (c) Are there gender differences in the computer self-efficacy of preservice music teachers? Participants, 114 music education majors at a large midwestern university, completed the Computer Self-Efficacy (CSE) Scale (Cassidy and Eachus, 2001). Following data analysis, it was determined that participants had "good" computer self-efficacy. Significant positive correlations were found between self-efficacy scores on the CSE Scale and participants' overall experience with computers (r = .652, $p < .01$), hours per week of computer use ($r = .537$, $p < .01$), and number of software packages previously used ($r = 502$, $p < .01$). Finally, a significant difference ($p < .017$) was found between the computer self-efficacy mean scores of male ($M = 139.91$) and female ($M = 126.64$) participants.

Today's music educators are beginning to utilize technology for music teaching and learning in a variety of ways (Bauer, 1999; Reese and Rimington, 2000; Taylor and Deal, 2000). Demanding technology standards for all teachers are being developed by organizations such as the International Society for Technology in Education (ISTE, 2001) and adopted by accrediting agencies such as the National Council for Accreditation of Teacher Education (NCATE, 2001). In addition, professional music organizations have outlined technology competencies for music teachers (Technology Institute for Music Educators, 2001), as well as recommendations for curriculum and scheduling, staffing, equipment, materials/software, and facilities for technology based music learning (MENC, 2001). The skills and pedagogy for the appropriate and effective implementation of technology in school music programs are beginning to be required courses of study for preservice music teachers (Deal and Taylor, 1997).

While expectations for competencies with technology in music teaching and learning are growing, not all individuals may be equally comfortable with these new approaches. Self-efficacy is a person's "beliefs about their capabilities to exercise control over their own level of functioning and over events that effect their lives" (Bandura, 1993, p. 118). Self-efficacy perceptions can affect an individual's feelings, motivation, and behavior. Highly self-efficacious people tend to visualize themselves as being successful, establish ambitious goals for themselves, and have strong commitments to reaching those goals. In contrast, people with low self-efficacy may attribute their poor personal performances on a task to low aptitude,

when in fact this may not be the case. Perceptions of low self-efficacy frequently result in avoidance of the situation or task in question, and also gravitation towards alternatives that people believe they can handle (Bandura, 1993). Self-efficacy is contextual to specific situations or tasks (Schunk, 1985).

Researchers have examined self-efficacy in relation to many areas including general academic achievement, careers, spirituality, teaching, and computer technologies (Pajares, 2001). In their review of literature related to computer self-efficacy, Olivier and Shapiro (1993) identify four ways that perceptions of self-efficacy are formed. The strongest source of these perceptions is an individual's performance accomplishments. If a person is successful at something, his or her self-efficacy increases. A second source of information for self-efficacy is vicarious experience. Seeing positive models can help an individual believe that he or she can also be successful. Verbal persuasion is a third contributor to self-efficacy. Encouraging and reassuring individuals that they have the requisite abilities or aptitude for success can increase their efficacy beliefs; however this information source usually is not sufficient by itself to maintain a high efficacy level. The fourth and weakest source of efficacy information is emotional arousal. When someone is anxious, self-efficacy perceptions will tend to decrease.

The importance of performance accomplishments in establishing self-efficacy beliefs is echoed in studies specifically examining self-efficacy and computers. Torkzadeh and Koufteros (1994) reported an increase in the computer self-efficacy of 224 undergraduate students following training. A positive relationship between experience with computers and computer self-efficacy was also found by Hill, Smith, and Mann (1987) in a study involving 133 female undergraduates. In addition, gender differences in computer self-efficacy have been noted by researchers. Miura (1987) found that male college students had a higher level of computer self-efficacy than female students. Many other researchers report similar findings (Hattie, 1990; Murphy, Coover, and Owen, 1989; Robbins, 1986; Cassidy and Eachus, 2001).

Technology is becoming an increasingly prominent tool for music teaching and learning. Rigorous standards in technology are being required for new teachers. Therefore, it becomes an important consideration of music teacher education programs to utilize effective strategies for developing undergraduate music education students' knowledge, skill, and comfort with technology. Since self-efficacy perceptions can affect an individual's feelings, motivation, and behavior, the computer self-efficacy of students may be an important consideration when helping preservice music teachers become adept at utilizing technological tools. Knowing someone's self-efficacy as it relates to computers can help one to develop strategies for assisting that person in developing computer skills (Olivier and Shapiro, 1993).

Research Questions

Three research questions were formulated for this study: (a) What is the computer self-efficacy of preservice music teachers, (b) Are there any relationships between the computer self-efficacy of preservice music teachers and their prior experiences with computers, and (c) Are there gender differences in the computer self-efficacy of preservice music teachers?

Method

Participants

Participants were 114 music education majors at a large Midwestern university. Their ages ranged from 17 - 47 years, with a mean age of 19.81 years, and their gender was distributed between 41% males and 59% females. Freshmen comprised 44% of the participants, 27% were sophomores, 15% juniors, and 14% were senior students.

Measurement Instrument

The measurement instrument used was the Computer Self-Efficacy (CSE) Scale (Cassidy and Eachus, 2001). The instrument's purpose is to provide a measure of the self-efficacy perceptions of individuals in relation to computer technologies. The internal consistency of the CSE Scale is high (alpha = .97) as is its test-retest reliability ($r = .86$, $p < .0005$). The scale's authors also report strong construct and discriminant validity for the instrument.

The CSE Scale consists of two parts. The first section collects basic demographic information on participants and explores their prior experience with computers. Questions regarding prior experience are answered dichotomously and on Likert-type scales. The second half of the questionnaire consists of 30 statements that participants respond to on a 6-point semantic differential scale ranging from 1, *strongly disagree* to 6, *strongly agree*. The statements are phrased both positively and negatively. An example of a positive statement is "Computers make me much more productive." A typical negatively stated item is "Computers are far too complicated for me." A total self-efficacy score is calculated by summing the values from each of the 30 statement responses, with possible scores ranging from 30 to 180.

Procedure

Participants, who were volunteers, completed the Computer Self-Efficacy (CSE) Scale. The CSE Scale was scored by the researcher according to the instructions provided by Cassidy and Eachus (2001). Data from the questionnaire were entered into the SPSS statistical software program and analyzed to answer the research questions.

Results

Participants' mean self-efficacy score on the CSE Scale was 132.11. Scores ranged from 51 to 179 with a standard deviation of 27.99. To determine if there were significant relationships between participants' prior experience with computers and their scores on the CSE Scale, a Pearson correlation coefficient was calculated between their self-efficacy scores and their reported overall experience with computers, hours per week of computer use, and the number of software packages with which they reported previous experience. Significant positive correlations were found between the total score on the CSE Scale and participants' overall experience with computers ($r = .652, p < .01$), hours per week of computer use ($r = .537, p < .01$), and number of software packages previously used ($r = 502, p < .01$).

Finally, to examine possible gender differences in the computer self-efficacy of the participants, a *t*-test was calculated between the scores of male and female participants. A significant difference ($p < .017$) was found between the computer self-efficacy scores of the male and female participants. Male participants had a significantly higher computer self-efficacy score than female participants (see Table 1).

Table 1

t-test Comparing the CSE Scale Scores of Male and Female Participants

Participants	*N*	Mean	*SD*	*F*	*t*
Male	47	139.91	22.54	5.906	2.552
Female	67	126.64	30.23		

Note. $p < .017$

Discussion

The CSE Scale documentation provides no norms for scores. However, if the range of possible scores is divided into quartiles (quartile 1 = 30 through 68, quartile 2 = 69 through 105, quartile 3 = 106 through 143, quartile 4 = 144 through 180), one could group scores into four categories: "poor" self-efficacy, "fair" self-efficacy, "good" self-efficacy, and "excellent" self-efficacy. Using these categories, the computer self-efficacy scores for the participants in this study ranged from poor (51) to excellent (179),

with a computer self-efficacy mean score of 132.11 ("good"). While college music education professors need to be particularly aware of students with low perceptions of computer self-efficacy in order to adequately assist these students' in their development of comfort and confidence with computer knowledge and skills, in general, the preservice music educators in this study appear to have a computer self-efficacy that would seem to allow success in using computers.

Similar to previous research, strong positive correlations between prior computer experience and computer self-efficacy were found in the present study. Music teacher educators should seek to find out their students' background experiences with computers. Then they should develop an appropriate sequence of computer and music related experiences for students. If collegiate music education students achieve success while regularly using computer technologies, they may be more likely to feel sufficiently efficacious in this area and eventually use computers when teaching their own students. However, if the acquisition of computer related skills in music is not intentionally taught, leaving students to figure out these areas on their own, there may be a good chance that some students will not develop sufficient efficacy to incorporate computer-based experiences in their instructional practice.

The gender differences in computer self-efficacy also mirror the findings of other studies. Collegiate music education instructors need to be especially cognizant of female students when utilizing computers in teaching and learning. Females may have significantly less self-efficacy with computers than their male counterparts. Care needs to be taken to meet the needs of female students so that they too will develop the self-efficacy necessary to be able to effectively utilize computer related technologies in music teaching and learning.

College music education professors should keep in mind the four factors important in the development of self-efficacy discussed by Olivier and Shapiro (1993). Success in performance can be facilitated by a carefully sequenced series of computer experiences that are designed to ensure that students will be successful as they build skill in the use of computers for music teaching. Collegiate teachers can also provide positive models for students by using technology in their own teaching. The teacher needs to constantly encourage and reinforce students that they are capable of being successful with computers. Finally, when working with computers, the music education instructor needs to help students stay relaxed, and facilitate non-threatening computer experiences, since emotional arousal can interfere with the development of self-efficacy.

Summary and Conclusions

It seems logical that the computer self-efficacy of music education students at any particular university may vary somewhat based on the prior experiences students have had with computers. These experiences might be

dependent on the socioeconomic background of students and the opportunities they had to use computers in K-12 school settings. They may also be related to the types and availability of computing resources in the local university setting. Further studies should explore these possibilities.

Undoubtedly, computer related technologies will continue to become more prominent in music education contexts, just as they are growing in importance in society in general. As music teacher educators work to help preservice teachers acquire the knowledge and skills necessary to meet challenging new technology standards and become fluent in the use of computer technologies for their teaching practice, they need to be aware of the role of self-efficacy in this process. In addition, female students may require special considerations. A properly sequenced curriculum, positive technology models, reassurance and encouragement, and a relaxed, nonstressful approach to this process may help most students develop and maintain a strong computer self-efficacy. In turn, this should provide these individuals with the motivation to confidently and effectively use technology as a tool for helping their future students learn about music.

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