

INTEREST OF NONMUSIC MAJORS IN ACCESSING MUSIC KEYBOARDS ON THEIR UNIVERSITY CAMPUS

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On university campuses, piano keyboards generally reside in music departments dedicated to students majoring in music. Such students comprise only a minority of those on the campus who might want to access music keyboards. In view of the potential benefits of keyboard playing, an e-mail survey was conducted to determine the extent of university student interest in music keyboard access on the campus. The survey also aimed to determine interest in technological advantages that computer music keyboard systems could provide, interest in group piano lessons, and preference for keyboard locations. The results revealed that a significant proportion of university students who are nonmusic majors would value new opportunities for acquiring, practicing, or expanding musical keyboard skills. It is argued that fostering such interest could be cost effectively achieved by connecting MIDI keyboards to existing computers distributed throughout the campus.

What percentage of the university student population is interested in having access to a piano on their campus? The following article provides a preliminary answer to the question, an answer that urges the introduction of electronic keyboards into existing computer networks on campuses with a consequent potential positive change in the status quo of music on the campus.

A primary goal of a university is to foster the intellectual growth of its students. The field of music is typically one of many domains for such development. What is unique about music, however, is its intrinsic interest to students. According to Howard Gardner (1993, 1999), music is one of eight or more kinds of intelligence, on par with linguistic, mathematical, spatial, bodily-kinesthetic, interpersonal, intrapersonal, and naturalist intelligences. The intellectual nature of music is consistent with recent cognitive and neuroscientific research that reveals complex brain mechanisms underlying music perception, composition, and performance (e.g., Altenmüller, 2001; Parsons, 2001). Nonmusical benefits to playing music have also been demonstrated (e.g., Aleman, Nieuwenstein, Bocker, & de Haan, 2000; Costa Giomi, 2000; Nilsson & Sundberg, 1985; Schellenberg, 2001). Whereas music perception is a mental activity in which almost anyone can engage, music performance is limited to those individuals with access to a musical instrument.

Of the traditional musical instruments, the piano, provides the greatest versatility, with its wide frequency and dynamic range, and simultaneous access to tones (Parakilis, 2000). The two clefs for piano notation demand complex saccadic integration for reading music. Eye-hand coordination and

manual dexterity are necessary for performance (Kemp, 1996, p.167). Performance also entails concentration, memory, and the cultivation of emotional sensitivity and expression (Repp, 2000). The enormous repertoire of piano music, including transcriptions of orchestral works, means that piano playing can develop both cognitive skills and familiarity with broad domains of knowledge.

These benefits of piano playing obviously are linked to access to an instrument. Unfortunately, acoustic pianos are expensive and cumbersome—attributes that decrease accessibility and portability particularly for university students. In the last decade, however, the development of the electronic piano has provided many functions of the acoustic piano while reducing its impracticalities in terms of cost, size, and weight. With headphones, playing can be an entirely private experience. Whereas a concert classical artist will prefer a fine acoustic instrument, an electric piano has much to offer the nonprofessional. Closely related to the electric piano is a music keyboard controller. When connected to a computer with MIDI (Musical Instrument Digital Interface) capability, software transmits motion characteristics of each key. Accordingly, a tone corresponding to these temporal and pressure characteristics can be synthesized via a sound card housed in a computer equipped with a piano timbre.¹ As in the case of any MIDI instrument, information about pitch, dynamics, and timing produced for the listener can be stored in the computer memory or on a computer disk and played back at any speed. The sound card can create an infinite variety of sounds other than piano sounds.

The MIDI facility enhances the possibilities for music composition and the application of feedback during piano practice. Indeed, innovative piano teaching techniques provide students with access to MIDI files, for example, so that they can hear one hand played by the software and can practice the other hand with it, or they can hear the ideal performance and slow it down for purposes of study or accompaniment. For example, Carolyn Morenus (2001), Keyboard Area Coordinator for Illinois State University, has developed such MIDI files in connection with the well known piano pedagogical materials of Hilley and Olson (2002). The flexibility provided by MIDI supplementary tools exceeds that of audio CD supplements. There are also many commercial software packages for teaching piano skills via a MIDI keyboard. Zeigler (2001) at the Piano Education Page Website lists and reviews over a dozen of these, and this list is by no means exhaustive. Needless to say, the benefits of music technology have been well discussed in general (e.g., Williams & Webster, 1999) and provide the foundation for the present journal, and will therefore not be discussed further here. Our focus is instead specifically on the application of technology to augment access to both pianos and piano pedagogy on university campuses.

Because a piano, acoustic or electronic, supports such a wide variety of musical activities, given students' general interest in music, it would not be surprising to find many students on a college campus interested in learning to play the piano. Yet, provision for this musical interest is not generally

the job of the university. Suppose, however, the costs were less, tuning were not required, space requirements were minimal, and the keyboards themselves made no sound. Would it then be a worthwhile investment for fostering intellectual activities among students?

Many computers purchased by universities are already equipped with MIDI capability and sound cards (e.g., SoundBlaster) as standard equipment. Provision of the piano playing experience only requires a keyboard controller plus an inexpensive MIDI interface added to such computers. Low cost piano/computer technology makes the provision of pianos practical. Before the possibility is realized it would be well to know (a) the degree of interest of the student body in music keyboard use, (b) student views on suitable locations for keyboards, (c) student views on the need to provide a mechanism for formal training, and (d) student interest in the additional opportunities offered by a MIDI keyboard. Also of interest are the characteristics of students who are interested in playing a keyboard on campus compared to those who are not. Have they played a great deal already, or have they never had the opportunity to take lessons, or do they play without having taken lessons?

Historically, piano lessons and piano playing have been linked to female socialization (O'Neill, 1997; Parakilis, 2000). The piano has been regarded as a proper instrument for women while brass instruments are more appropriate for males. O'Neill and Boulton (1996) showed that young girls had stronger preferences for piano, flute, and violin as compared to boys who preferred drums, guitar, and trumpet. Would more women than men be interested in playing piano? Alternatively, men who less often receive piano lessons than women, might have greater demand in order to make up for past neglect. Or in general, those who have never had lessons might have the greatest interest. The primary discipline might also play a role: Association of piano playing with music and the arts might lead students enrolled in arts/humanities as opposed to science program to have more demand for piano playing than students in science or business. On the other hand, traditionally humanists have resisted the use of educational technology (Hansen, 1982), and such resistance might be reflected in a disinterest of arts students in computerized music keyboard access, at least as far as the music technology aspect were concerned. The following study was conducted to answer these issues through a questionnaire.

Method

The Campus Population

The campus on which the study took place serves a primarily liberal arts university having 2650 full-time students (defined as taking 3 courses per term, where 5 is a normal load) and 670 part-time students. Approximately 15% of the students live on the campus in student residences. The student population is fairly homogenous with approximately 90% within a 250 mile geographic radius. The region has a good public school music

education program where music is a compulsory part of the curriculum until grade 6. High schools provide an elective band and vocal program. Music also plays a part in the regional rural culture in which the fiddle and piano have been a focus of family and neighborhood gatherings for generations. The university has a small music department with a total enrollment of approximately 90 students and leads to a degree in music education.

Sampling the campus population. The researchers e-mailed an invitation to complete a questionnaire to an estimated 1330 students (40% of the names in the campus address book). To encourage participation, a small reward was provided through a draw: a CD record certificate, one each for the first one-hundred students who responded. There were 209 of those e-mailed who answered and sent back their answers. With e-mail, the researcher does not know if the message was read or even seen. This is a particular problem with the young transient population of a university campus. Hence, to improve the estimate of the actual return rate, a simple survey was sent to 67 students (e-mail addresses beginning with I or J). These students were asked only to hit the *reply* and *send* function. There were 34 replies (approximately 51%) returned. From this it can be estimated that approximately 50% of the students who were sent the e-mail request to complete the main questionnaire actually read the request. Thus, 665 students might have read the request and further opened the questionnaire file indicated in the e-mail. Thus, 20% of the campus would have been made aware of the questionnaire by e-mail. The 209 replies to the e-mailed questionnaires represent a conservative estimate of a return rate of at least 31% of those who knew about the questionnaire from the e-mail.

A notice about the survey was also placed on the University home page where events are listed, however, the announcement was not prominent. Thus, 38 additional responses to the questionnaire arrived from two sources other than direct e-mail (the Web page announcement, and referrals from other students) making a total response of 247 students.

Questionnaire Items

The questionnaire addressed demographics, past musical experience, expected use of the keyboards, preferred location and time of use of the keyboards, interest in taking free or low cost piano lessons, and the source of the survey information. Finally, for most of the subjects pooled, there was an opportunity to record any additional comment (this item was added after the initial set of questionnaires was sent).

Results

Demographics

There were 151 (61%) females (mean age 21.8 years, $SD = 4.66$) who responded and 96 (39%) males (mean age 21.9 years, $SD = 6.62$). The higher proportion of females mirrors the greater proportion of females in the full-time student body as a whole (64%). The breakdown by gender of

subject and by Faculty is shown in Table 1. Response rate from the faculties is roughly representative of their relative enrollments, however, a slightly greater proportion of science students responded. The respondents represented majors in most disciplines with high concentrations being in biology, psychology, English, and history reflecting the high enrollments in these programs. Smaller programs such as engineering, physics, chemistry, nursing, business, education, and veterinary medicine were also represented. There were four music students who responded, three of whom were male. Their data were excluded from all future analyses. The majority of students lived off campus, 84.0% for females and 93.5% for males.

Table 1

Number of Students of each Gender and Faculty who Responded to the Questionnaire

Faculty	Gender of Respondent		Total	Total on campus
	Female	Male		
Arts	50	31	81	889
Science	56	27	83	720
Business	13	17	30	454
Education	5	5	10	147
Nursing	7	1	8	132
Vet Medicine	15	7	22	228
Other (e.g., MSc)	5	8	13	85 ^a
Total	151	96	247	2655

^aThis number might be deflated in view of the many part time students who have not been counted in this or any other category. Such people, however, are less likely to be on campus outside of classes.

Past Musical Experience

The number of students who did or did not play piano is shown in Table 2, broken down by gender of subject and by those who did or did not play another instrument. There was a slightly greater number of respondents

who played piano (54.3% vs 45.7%), but this difference was not significant in a χ^2 test. A significant majority of females played piano (61.3%) as compared to a minority of males (43.0%), $\chi^2 (1, N = 243) = 7.77, p < .005$. In contrast, a greater percentage of males played an instrument other than the piano (50.5% males vs 42.0% females) but this difference was not significant. Few women played only an instrument other than piano (9.3%) and conversely few men played only the piano (12.9%).

Table 2

Numbers and Percentages of Students who Play Piano and/or Another Instrument

	Females			Males			Total
	Do not play Inst	Play Inst	Total	Do not play Inst	Play Inst	Total	Males + Females
Do not play piano	44 29%	14 9%	58 39%	34 37%	19 20%	53 57%	111 46%
Play piano	43 28%	49 33%	92 61%	12 13%	28 32%	40 43%	135 54%
Total	87 58%	63 42%	150 100%	46 49%	47 51%	93 100%	243 100%

As shown in Figure 1, for those who did play the piano, 27.5% reported never having taken lessons. A greater percentage of males than females were self-taught (i.e., 0 years lessons) and in general received less training than did the females overall. Females accounted primarily for the percentage of respondents who had more than 4 years of lessons and 25.3% of them had more than 7 years of training. In contrast, few males fell into these higher categories. The difference in years of formal piano lessons for females as compared to males produced a significant $\chi^2 (5, N = 131) = 14.33, p < .01$. More extensive piano training for females is also revealed by the

numbers of respondents reporting to have taken piano examinations (typically through the Royal Conservatory of Music, RCM). Of the females, 35.0% had taken exams in contrast to only 19.4% of the males.

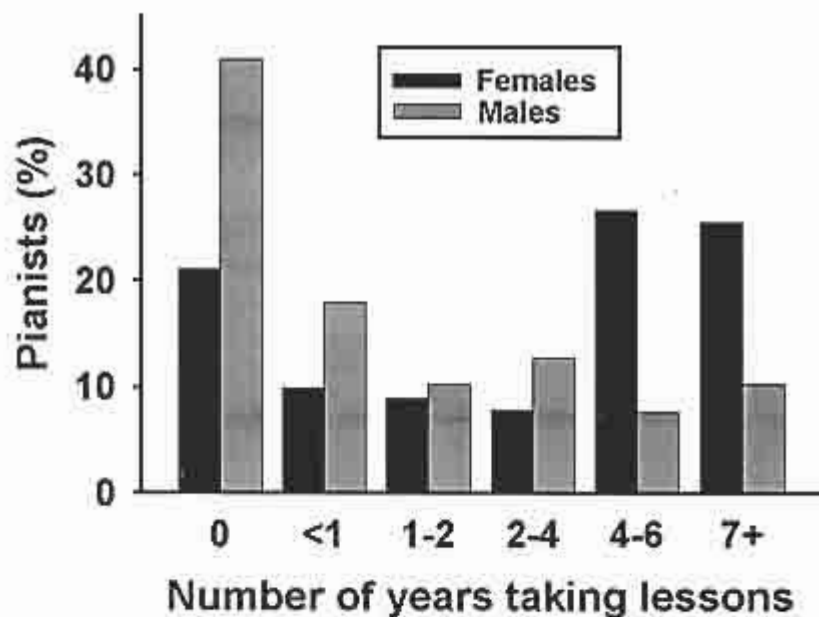


Figure 1. Percentage of male and female pianists as a function of number of years of piano lessons. The "0" on the horizontal axis refers to a self-taught category.

With respect to recency of playing, 10.7% of the pianists had played within the last week (15.8% of the males and 8.6% of the females), a cumulative percentage of 57.3% had played within the last year, and 40.5% had not played for more than three years.

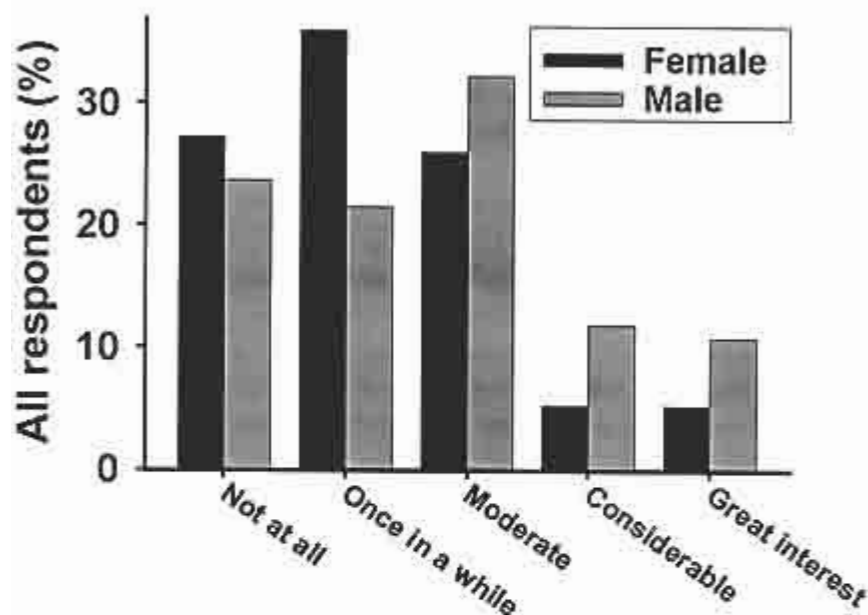
Expected use of the Keyboards

Desire to play of nonpianists. Nonpianists (46.15% of the sample) had been asked to indicate their desire to play the piano. Only 25.9% had no desire at all. The rest expressed some desire, with 41.7% having a moderate level of desire or higher and 22.6% expressing considerable or great interest.

Interest in playing keyboards on campus. All respondents had been asked to indicate their interest in playing an electronic keyboard on campus using headphones. Almost half of all respondents (46.5%) had at least a moderate interest in doing so, 9.9% had a considerable interest, and 11.5% had a great interest. Only 23.9% had no interest, and 29.6% expressed an

interest in doing so at least occasionally. There was no significant difference between those who did and did not already play the piano, according to a χ^2 test.

Exploring sound capabilities. The degree of interest in exploring the sound capabilities of an electronic piano is shown in Figure 2 for males and females. There were proportionally more males than females who used higher categories of interest, $\chi^2(4, N = 243) = 10.43, p < .03$.



Interest in exploring sound-editing and synthesizing capabilities of the keyboard

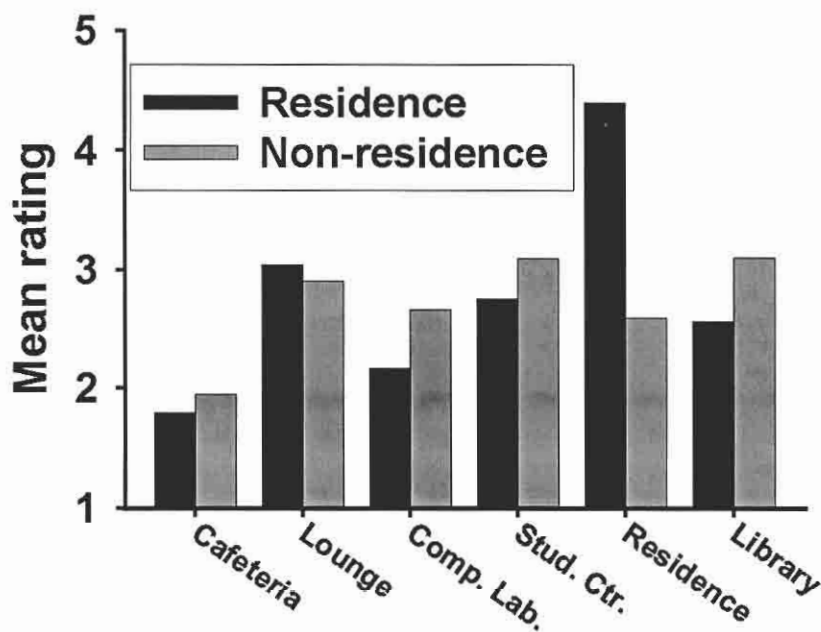
Figure 2. Percentage of respondents showing for each level of interest in exploring the sound editing and synthesizing capabilities of the music keyboard system.

Using Recording capabilities. The majority (58%) of the respondents thought that they would possibly use the recording feature of the electronic keyboard system, and 16% would definitely use this feature. Although more males would be definite users than females (22.6% vs 12%), a χ^2 test was not found to be significant.

Preferred Location and Time

Location. The judged suitability for keyboard placement in six given locations on the campus is shown in Figure 3, broken down for students Cohen/Lamothe

who did or did not live on the campus in the student residences. Not surprisingly, those who lived on the campus expressed more interest in having pianos in the residences than those who lived off campus, but the two groups generally agree on the relative suitability of the other locations, judging the cafeteria as an inappropriate location for a keyboard. For each subject the mean rating for each location was submitted to an ANOVA with one within groups factor of location and one between groups factor of place of residence. The omnibus F for location was statistically significant, $F(5, 175) = 32.8, p < .0001$, as was the interaction with place of residence, $F(5, 175) = 11.08, p < .0001$. An independent t -test revealed significantly greater interest in having pianos in the residences by those who live on the campus as compared to those who lived off the campus, $t(188) = 6.5, p < .0001$.



Potential location of pianos

Figure 3. Mean rating on a 5-point scale (1 = low, 5 = high) of appropriateness of campus locations for the placement of a music keyboard system for respondents who lived in the residence (standard error [SE] for all locations $< .30$) and for those who did not (standard error [SE] for all locations $< .11$).

Time. The mean rated preference on a 5-point scale (1 = never, 5 = very frequently) for playing keyboards increased for later times during the day, for morning: 1.91 ($SD = 1.07$), afternoon 2.59 ($SD = 1.20$), and evening

2.86 ($SD = 1.34$). An ANOVA revealed a significant linear trend, $F(1,191) = 72.95$; $p < .0001$. There was also a small but significant preference for playing on weekdays ($M = 2.89$, $SD = 1.24$) over weekends ($M = 2.63$, $SD = 1.41$), $F(1,193) = 5.51$, $p < .02$.

Interest in Piano Lessons

As shown in Figure 4, the majority of respondents expressed possible interest in low cost lessons. If lessons were free however, interest increased and 28.4% of all respondents would now definitely take lessons as opposed to the 6.6% who expressed definite interest in lessons that had an associated cost. Female nonpianists were more interested in low cost lessons than were male nonpianists, $\chi^2(2, N = 111) = 6.40$, $p < .04$. There was no difference in interest between males and females with respect to free lessons.

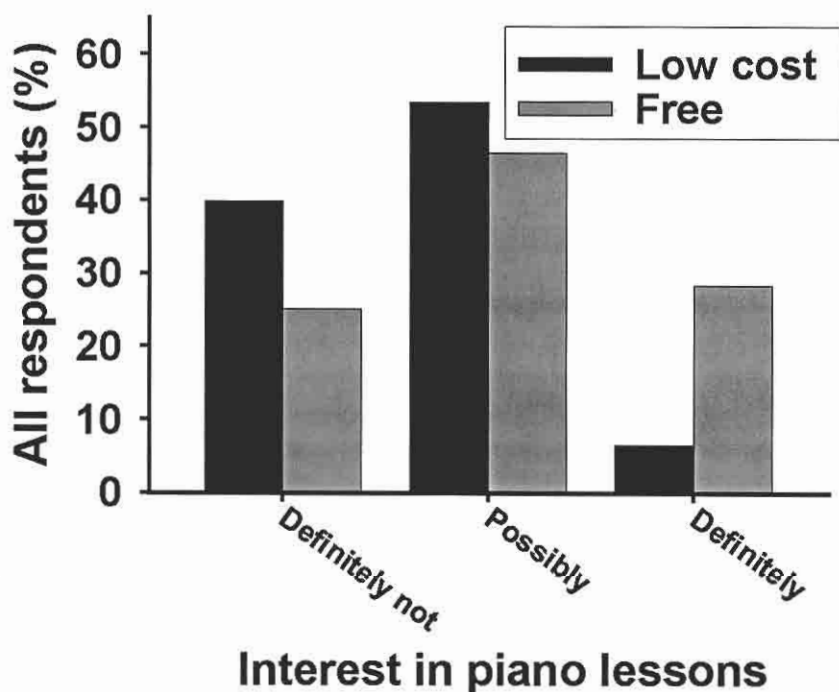


Figure 4. Percentage of respondents for each of three levels of interest in low cost and free piano lessons.

Open-ended Comments

The comments provided additional evidence that the questionnaire resonated with many respondents who had been searching for pianos to play on the campus or who had always wanted the opportunity to learn music. More experienced players commented on the roles that music served for them in

terms of relaxation and stress relief. A complete list of the comments is available from the first author. A few examples follow.

"This would be a great idea - particularly for all of us nonmusic students who still have an interest in 'Recreational' playing."

"I think the ability to have publicly available systems with the ability to compose and save music would be a great idea."

"Unfortunately, I am finished this spring! I would have loved to have this opportunity earlier!"

"This sounds like a great idea! I hope that the keyboards are put in and I would especially love to see free group keyboard lessons become available."

"I have been trying to access a piano/keyboard since I moved in here. Any motion the board made to make these more accessible would be appreciated."

"If you can't get keyboards any time soon would it be possible for the students not in music who know how to play the piano to use the ones in the Steel (music) building."

"I love playing the piano, and have often thought that it would be great to have access to a piano at [the University], as I spend most of my time here. I find it very relaxing and stress-relieving to play the piano, and I would love to be able to perform this activity throughout the day while here at school."

Discussion

The most important finding of this electronic survey is that many students who are not music majors expressed a moderate or greater interest in access to a piano keyboard on their campus. The number of students (123) who were interested in increased keyboard access represents only a sample of possibly less than 30% of the campus who were aware of the survey. Based on this conservative estimate, over 400 students (12.5%) would have an interest in piano access. Such interest cannot possibly be served by regular piano facilities. The written responses to the open ended question are consistent with this finding. Whereas degree of interest in access to keyboards was correlated with already playing piano, $t_{(243)} = .13, p < .03$, and years of lessons, $r_{(129)} = .21, p < .02$, nevertheless there was good indication of interest among those who did not play already as shown by the mean rating of desire to play piano of 2.5 ($SD = 1.18$, 5-point scale).

Males in the present study showed a stronger interest in the sound analysis capabilities of the keyboard systems. A British study by Comber, Hargreaves, & Colley (1993) as described by O'Neill (1997) revealed that boys had more positive attitudes towards, and confidence in using music technology than girls. O'Neill concludes that "music information technology holds an attraction for boys which appears to be encouraging them to participate in music" (p. 51). Our evidence that males showed greater interest in the

technological possibilities of the keyboard system than did females is consistent with this finding.

Consistent with the socialization of females and the general importance of keyboard playing and piano lessons for young girls (O'Neill, 1997; Parakilis, 2000), greater numbers of females reported having studied music, longer prior periods of piano playing, and more and higher Royal Conservatory grades achieved as compared to men. Yet, proportionally more males had learned to play piano without lessons. A Swedish study by Bjurström & Wennhall based on interviews of students between the ages of 16 and 25, discussed by Olsson (1997, p. 292), reports a similar finding.

The expression of student interest in music keyboard access cut across all variables examined. Interest was shared by students in all faculties, of both genders, with less and more university education, and in those living on or off campus. Interest level in responding to the questionnaire and in keyboard access was almost equally distributed across Arts and Science faculties, the largest faculties on the campus. This is surprising because music is more traditionally linked with Arts. The interest from Science might be partially explained by the linkage between music and technology as clearly stated in the survey. Subtle differences were found that were related to the variables investigated. For example, students in residence responded with greater likelihood to use the keyboards on weekends and in the evening, and preferred locating the keyboards in the residence lounges. It is clear that students took the questionnaire seriously and did not respond indiscriminately, as they uniformly agreed that the cafeteria/coffee-shop would be a poor location for the keyboards—in contrast to the other possibilities.

The e-mail survey and the difficulty of estimating the total number of students who knew about the survey require that these results be viewed with caution. Considering the data as a whole, we must also ask to what extent it generalizes to other campuses. The campus is in some ways unique. It represents the only university option for students in a circumscribed geopolitical region. The majority of students have received some basic music education in public school. The university is situated in a somewhat isolated section of the country. Historically, this remote status may have increased reliance on music making for entertainment in the absence of other "big city" distractions. That being said, the campus bears similarities to many other university campuses, in its curriculum offerings, the size of the student body, and the tendency to relegate the available pianos to the music department. In short, although the campus has unique features, it shares much with other campuses. Moreover, the results of the questionnaire regarding gender stereotypes are consistent with findings in England and Sweden as previously referred in the article. Hence, the evidence of interest in keyboard playing on this campus might well generalize to other campuses where, to the best of the authors' knowledge, such potential interest among nonmusic majors has not been explored to date.

From the perspective of methodology, the procedure for electronic data collection would transfer to other campuses and provides a precedent for

other universities or colleges to determine the student interest in provision of piano keyboards on their campuses. Our use of an e-mail survey limits the generality of the findings to students who are comfortable using e-mail and perhaps inflates the general interest of the campus as whole. In other words, students who do not use e-mail may be less likely to take interest in using an electronic musical instrument. However, our aim was to determine whether there would be any interest at all, and in this the e-mail survey was successful.

It is notable that although higher education falls within the mandate of the Music Educators National Convention (MENC), the recent MENC Taskforce on Music and Technology (1999) does not include a section on Universities. The present survey would encourage the extension of the MENC task force guidelines to include universities, in order to foster music education not only for those students who major in music, but also for students who major in other subjects—and who retain or develop an interest in music while at a university. Our results suggest that access to electronic keyboards on a campus might counter traditional impediments to music education that university students might have experienced earlier in their lives: for example, the tendency to offer piano lessons to girls over boys, the stereotype that piano is a feminine instrument, and the notion that electronic music technology is a male domain. Increasing access to electronic keyboards on a campus might cost-effectively augment and equalize opportunities for music in higher education.

While the intrinsic rewards of music would be sufficient to warrant increasing the availability of keyboards, the potential nonmusical cognitive, social, and personal benefits that might arise from increased involvement remain to be explored. However, new research in cognition and neuroscience supports the view that music activates a variety of areas of the brain. The positive benefits of such activation in young adults, particularly with regard to the enhancement of learning in other domains, remains to be investigated. While researchers investigate these issues, the intrinsic value of music alone seems sufficient to warrant the introduction of more music keyboards throughout a campus. The results of the present survey suggest that this effort on the part of university campuses could begin to revolutionize how music is thought of in a university educational context.

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Author Note

Appreciation is extended to the University of Prince Edward Island Computer Services Department for enabling the submission of the questionnaire, and to Dr. Marion Hannaford, Associate Registrar, for cooperation in provision of information about the student body. We thank Dr. Bradley Frankland for comments on a previous version of this paper.

Endnote

¹ For example, according to the MIDI convention, the number 60 represents Middle C, 61 is the C# above, etc. Depressing Middle C on the keyboard generates information about four main parameters: (a) on or off, (b) pitch, (c) key velocity (related to force and amplitude of a note), and (d) channel, a method for indicating timbre differences (see Roads, 1996, pp. 969-1017).