

In pursuit of a holistic learning environment: the impact of music in the medical physiology classroom

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Modell HI, DeMiero FG, Rose L. In pursuit of a holistic learning environment: the impact of music in the medical physiology classroom. *Adv Physiol Educ* 33: 37–45, 2009; doi:10.1152/advan.90149.2008.—A holistic learning environment is one that nurtures all aspects of students' learning. The environment is safe, supportive, and provides opportunities to help students deal with nonacademic as well as academic factors that impact their learning. Creation of such an environment requires the establishment of a supportive learning community. For a variety of reasons, establishing such a learning community of first-year medical students can be challenging. This communication presents one approach to meeting this challenge in a medical school Human Physiology course. Steps were taken at the beginning of the course to create the community, and activities designed to reinforce these efforts were incorporated into the course as it progressed. Two pilot studies were conducted to test the hypothesis that providing students with a participatory music experience may help to promote a holistic learning environment by helping them restore a sense of balance to their emotional well-being as well as reinforce a sense of community in the classroom. Student response to these activities indicated that these efforts provided emotional support during stressful periods during the quarter, helped promote a feeling of safety within the environment, and reenergized the class during long class sessions. This project illustrates that each instructor, within the confines of his/her own classroom, can make a significant contribution to achieving a holistic learning environment for his/her students.

meaningful learning; learning community; music in the classroom; medical student stress

A HOLISTIC LEARNING ENVIRONMENT is one that nurtures all aspects of students' learning. The environment is safe, supportive, and provides opportunities to help students deal with nonacademic as well as academic factors that impact their learning. Promoting a holistic learning environment requires a broader interpretation of the principle that the instructor's job is to help the learner to learn.

In the context of a particular discipline (e.g., physiology), helping the learner to learn implies that the role of the instructor is to assess the knowledge and skill base of students and their ability to apply that knowledge and those skills to solve problems relevant to the discipline. Following this assessment, the instructor helps students recognize the limitations of their mental models and helps them revise those mental models (9).

However, in the context of a holistic learning environment, helping the learner to learn includes creating an environment where factors that are not directly related to the discipline but that may impact learning are recognized, and steps are taken to help the learner deal with these factors. For example, nonaca-

demically aspects of students' lives such as physical health, responsibilities related to parenting, financial needs, stress related to the demands of other components of the curriculum, and stress related to domestic situations may impact learning negatively (6). It is not reasonable to expect the instructor to resolve these issues; however, it is reasonable to expect faculty members to offer understanding and encouragement and to help the student develop strategies for meeting course requirements in the face of these challenges. It is also reasonable to expect instructors to incorporate course activities aimed at facilitating development of a supportive learning community among students to help reduce the negative impact of some of these factors.

Building a supportive learning community to promote a holistic learning environment is challenging for a variety of reasons, not the least of which is the past academic history of students. For example, preprofessional students view their learning environments as being very competitive. In addition, students who are accustomed to teacher-centered learning environments seldom engage the content in ways that are familiar to students who have performed in student-centered environments. The goal of their learning is often aimed at short-term retention of information conveyed by the instructor rather than applying that information to solve novel problems (i.e., engaging in meaningful learning). Hence, the learning strategies adopted by these students are often not consistent with long-term retention (3). As a result of this prior experience and their successful performance in content-oriented rather than process-oriented courses, many students are reluctant to participate in community-based, process-oriented learning aimed at promoting meaningful learning.

The purpose of this communication is to describe how we have approached meeting this challenge and how we have incorporated music into our strategy for creating a holistic learning environment.

Before describing our classroom activities, however, it is beneficial to describe our student population.

The Students

Our population consisted of ~100–115 students in the first year of a 4- or 5-yr program in naturopathic medicine at Bastyr University. The program culminates with a Doctor's degree in naturopathic medicine (ND). These students share some common characteristics with their cohort in allopathic medical schools:

- Entry requirements for the program, with the exception of the Medical College Admission Test requirement, are consistent with entry requirements for most allopathic medical schools. Hence, these students were typically above average to superior college students.

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- The preclinical curriculum shares common features with common allopathic medical programs. The first year focuses on a traditional, discipline-based approach to the basic sciences along with an introduction to various aspects of naturopathic medicine and ancillary medicine (e.g., traditional Chinese medicine). In the first quarter, students typically take Biochemistry, Human Physiology, Anatomy, Histology, Naturopathic Clinical Theory, and Clinic Entry for a credit load of 23 credits requiring ~32 contact hours/wk.
- Like their allopathic cohorts (13, 14, 18), students in the first year of this program experience a considerable degree of stress arising from a variety of factors. They perceive the quantity and complexity of information that must be mastered in the first year to be overwhelming. They adopt learning strategies that were successful in their undergraduate studies for acquiring information but are inadequate for learning to integrate and apply information (e.g., problem solving). They fail to adopt appropriate time-management strategies for dealing with the academic load and personal relationships. Many have a fear of failure that overshadows their learning. In addition, the financial constraints imposed by being a full-time student in a professional school in many ways exacerbate the stress created by these factors.

The first-year Human Physiology curriculum consists of two educational units. The first unit, which is the focus of this communication, spans two 10-wk quarters. The course is conducted in two sections, each of which meet for 7 h/wk (two 2-h sessions and one 3-h session). Students remain in the same section for the duration of the course.

Building the Community

Achieving a holistic learning environment in which meaningful learning occurs requires creation of a safe space in

which students will take the intellectual risk of revealing their mental models and their approach to building and testing those models without fear of being “wrong” or sounding “foolish” (12). This safe space enables students to build a supportive learning community where the goal of the community is to ensure that each member derives maximum benefit from the learning experience. The first step in creating this space is ensuring that members of the community share the same expectations for the learning experience. The next steps involve establishing a set of guidelines for community classroom behavior and establishing mechanisms to enhance communication between community members and the instructor.

The first week of the course focuses on these steps. The first activity of the course is intended to match expectations of the instructor and students (9, 11). Students are asked to describe the instructor’s role and the students’ role in the classroom on 3 × 5-in. index cards. The anonymous responses on the cards are then read and discussed with the class. Through this discussion, the expectations of the instructor with regard to the design of the course are made clear, student expectations consistent with the design of the course are reinforced, and stated expectations that are not consistent with course goals are redirected.

A framework for the learning community is then developed. Following an exercise that demonstrates that we engage in meaningful learning by building, testing, and refining mental models (9), students work in small groups (3–8 students) to develop a Statement of Purpose for the classroom. The small-group proposals are presented to the class, and the class negotiates a final Statement of Purpose for the course. A sample Statement of Purpose developed by one section of the course is shown in Table 1.

With the Statement of Purpose in mind, students again work in small-group discussions to propose guidelines for classroom behavior that they believe will promote a safe, supportive

Table 1. *Statement of Purpose and behavioral guidelines*

<i>Statement of Purpose</i>
The purpose of our learning environment is to create a safe, respectful, fun, creative, friendly, and open forum for discussion, learning, and critical thinking. In this safe environment, we expect each individual to be able to contribute and have his/her prior knowledge challenged. We will offer support in a nonjudgmental fashion that encourages intellectual growth. The ultimate goal is not only to learn but to create social and professional connections based on patience and respect.
<i>Guidelines</i>
<ol style="list-style-type: none"> 1. Turn off cell phones or other noise makers before entering the classroom. 2. Arrive to the workshop on time. 3. Be prepared to contribute to the workshop. <ul style="list-style-type: none"> ●Preview exercises scheduled for the day. ●Ask questions—be willing to take risks. ●Acknowledge when things don’t make sense. 4. Encourage participation—in small-group discussions, ask for the opinions of those that are quiet. 5. Listen, don’t just hear. 6. Recognize that everyone has his/her own experiences and perspectives that influence what questions they will ask and their interpretation of what is said. <ul style="list-style-type: none"> ●Seek clarification. 7. Respect others’ opinions. <ul style="list-style-type: none"> ●Be open minded. ●Use your words kindly. ●Play “Devil’s advocate,” but don’t be the Devil! ●Allow others to finish speaking before adding comments. 8. Have a sense of humor. 9. Have fun!

Shown is an example of the Statement of Purpose and behavioral guidelines negotiated by one section of a medical physiology course.

learning environment. Suggested topics for discussion include respect, communication, trust, cooperation, and positive reinforcement. Each group is asked to draft no more than 10 specific action statements that they believe should govern community behavior. The results of the small-group discussions are presented to the class for further discussion, and a set of guidelines for the community is established by consensus. An example set of behavioral guidelines is shown in Table 1.

A line of communication between the student and instructor is initiated on the first day of class when the instructor provides each student with a 3 × 5-in. index card and invites students to tell him anything that they feel will help him understand their needs as students. Responses to this request generally yield information about students' past history, hobbies, learning styles/difficulties, and enthusiasm for embarking on their medical school journey. Subsequently, students are required to submit an index card at the end of each class session with their name, the date, and questions, comments, or anything else that they would like to share with the instructor. If the student has no comment, s/he submits a card containing only his/her name and the date. This practice is explained as a way for the instructor to keep a "learning journal" for each student, providing information that may help him/her better assess the student's progress and better determine how s/he can best help the learner to learn. The cards are treated as confidential communications. Comments received cover a wide spectrum of topics. Students may pose questions related to the physiology being discussed, provide reactions (both positive and negative) about the class activities of the day, voice concerns about other courses, share information related to their physical health, or share information about their personal lives that may be impacting their academic work. They also routinely comment on the confusion or clarity that they experience as a result of the day's classroom/course activities. Depending on the number and nature of the comments, queries may be answered during the next day's class session, advice or reassurance regarding curriculum issues may be offered during the

next day's class session, or, if the questions or issues are best handled in a confidential manner, they may be addressed individually through an e-mail response or a meeting with the student. E-mail responses often consist of a few words of encouragement and reassurance regarding course outcomes. Sample writings illustrating the spectrum of comments received from students are shown in Table 2. As is evident from this small sampling, this vehicle serves as a valuable tool for continuous classroom assessment (1).

Expanding our classroom practice aimed at promoting active learning in the classroom (9) by incorporating these community building activities has, in general, resulted in a higher level of student participation that occurs earlier in the course than in previous years.

Music as a Vehicle for Promoting a Holistic Learning Environment

Music is universally recognized as a vehicle for promoting community building. Examples of the power of music in this context range from cultural and religious practices from nearly all parts of the world to the protest movements of the 20th century (e.g., labor, civil rights, the Vietnam war). Music has also been shown to be effective as a means of reducing stress in a variety of situations (4, 7, 8, 16, 17). It seems reasonable to assume, therefore, that incorporating music experiences into classroom practice can contribute to the goals of a holistic learning environment. For example, we adopted the practice of playing music in the classroom before class and during class breaks some years ago to create a more welcoming atmosphere (9). Current and former students routinely comment on the positive aspects of this practice.

In times of celebration and in times of crisis, music has traditionally been one means of unifying community and lifting spirits. Singing in church, singing at summer camp, singing or playing an instrument in elementary, middle, or high school, dancing, listening to, or singing along with a live performance are all experiences with which most students can identify in a

Table 2. *Examples of comments submitted on daily comment cards*

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- What I learned today: Hemoglobin is awesome!
 - I think I'll need to look over this again on my own. It seems I need to see and hear things a million times before it clicks.
 - Everything O.K. On G-37 of the learning guide, how did we calculate numbers in row D?
 - I love it when we sing!! I just wanted to confirm if all binding sites on hemoglobin need to be filled up before partial pressure changes?
 - Well, the new roommate is working out way better than the last. A happy home makes for a happy person, so this is good. As for the homework, I mistaked [sic] partial pressures with fractions. How are they different?
 - I feel sad about my exam result. I thought I did decently but apparently not. Will be going through the answer guide this weekend . . . perhaps an appointment with you next week?
 - All good right now. Have a great weekend! Thanks.
 - I really enjoyed following 95% of class today! Still working on yesterday's material to digest.
 - It is finished . . . my house closed escrow and recorded last Friday. Ahh . . . peace . . .
 - Paying attention to class discussion rather than taking a bunch of notes really helps me understand the concepts!
 - Nothing now, thanks.
 - I may have to miss class tomorrow, so don't talk about anything important, Okay?
 - Hi Dr. Modell! The transport of CO₂ in the blood is a pretty amazing system! I love how things work out so beautifully!
 - Obviously frazzled today. Too long a story for this card. Thanks for the chocolate.
 - I need to draw more pictures and flow diagrams, but my predictions are getting better.
 - Working through the problem step by step in class helped a lot. So, we just make a hypothesis and see if it explains the data.
 - I just have to get through the next 10 days so that I can sleep, relax, and meditate. I'm tired.
 - Did you watch Grey's Anatomy this week? Why did that guy's exposed carotid artery explode?
 - I'm super stressed out—not sleeping, not focusing well. Nervous. Help. Scared. Frustrated.
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These examples illustrate the spectrum of comments submitted by students on 3 × 5-in. comment cards handed in at the end of each class session. Comments included questions related to the topic being discussed in class, reactions to the day's activities, the student's state of well-being, and other information that students wanted to share.

positive way. It is reasonable, therefore, to propose that providing students with a participatory experience that includes music may help restore a sense of balance to their emotional well-being and may reinforce a sense of community. Based on this rationale, we have recently conducted two informal research pilot studies to explore the efficacy of incorporating additional music experiences into our classroom practice as a means of promoting the holistic learning community. The goal of the first experience was to provide an emotional release while, at the same time, reenergizing the students during a time of high stress during the quarter. The goal of the second experience was to reenergize students during long class sessions in a way that might contribute to the sense of community and to the safety of the environment. It is important to recognize that the course structure, as well as other factors, prohibited running these pilot studies as formal, controlled experiments in which pre- and postintervention data are compared. Outcome assessment in these studies is based on unsolicited comments submitted by students on their daily comment index cards.

Pilot study 1. Two guest faculty members were invited to interact with the physiology class for this study. F. DeMiero is a jazz educator who has directed jazz and community choirs for over 40 yr. L. Rose is an accomplished pianist and vocalist whose personal philosophy is focused on emphasizing positive attitudes and actions. She also has had extensive experience as a community choir director.

Pilot study 1 consisted of two experiments conducted in 2 successive years during the first quarter of the first educational unit of the Human Physiology curriculum. The first experiment was conducted during midterms week of the fall 2006 quarter. This is a week where stress levels are very high for first-year students. Exams scheduled during the week included the anatomy lecture (theory) midterm on Thursday morning, the histology midterm late Thursday afternoon, and the anatomy laboratory (practical) midterm on Friday. No physiology exam was scheduled during this time. Enrollment in the physiology course consisted of two sections of ~55 students each. One section normally met for 3 h on Tuesday afternoon, and one section normally met for 3 h on Thursday afternoon. For this experiment, students enrolled in the Tuesday section did not meet during their usual meeting time. Instead, both sections met together during the Thursday 3-h afternoon session. Students were not given prior information regarding the content or format of the session.

During the first 50-min period, the guest faculty members (F. DeMiero and L. Rose) were introduced to the group, and sheet music was distributed to the class. F. DeMiero began the session by sharing stories about the role that music played in his family as a child and in the ensuing years, how he was first introduced to making music in a school setting, and the importance that music has played in his life. He then gave a brief introduction to the sheet music and began having the group sing the song as a single group. He then divided the students into harmony parts, and they learned to sing the song in four-part harmony. All students, regardless of whether or not they had prior experience reading music and singing in formal music groups, participated in this four-part arrangement of a blues tune.

After a 10-min break, the students were reseated in an “in the round” arrangement centered on a piano. During the next

hour, L. Rose led the session. She interspersed the performance with questions to individual students about why they had chosen this path and what their “passion” was, responses to students’ questions about her career and outlook on life, and reflections on how each person can reach his/her potential and make meaningful contributions to his/her communities. Music selections included some pieces that were in response to students’ stated preference of music, and some included having students join in singing.

After a second 10-min break, both guest faculty members helped the students learn a second song for which sheet music was provided. The session was concluded at 3:50 PM. However, a group of students (20–25 students) remained in the room for up to an additional hour to meet, speak with, and express their appreciation for the session individually with the guest faculty members. The usual request for 3 × 5-in. comment cards was not made at the end of this class period.

The second experiment was conducted during the fall 2007 quarter. Because of scheduling issues, it was not possible to repeat the experiment as it was conducted in the previous year. In this iteration, students had two sessions with guest faculty members. The first (*session A*) occurred on Monday of midterms week. As in 2006, exams for anatomy theory, histology, and the anatomy laboratory were scheduled during this week. As in 2006, no physiology exam was scheduled. F. DeMiero worked with each section of the class (50–55 students/section) for one-half of a 2-h class period. The students were not given prior indication that this class period would be different than the usual classroom workshop. As in the earlier experiment, F. DeMiero shared life experiences and his philosophy regarding the role that music plays in our lives and the importance of setting appropriate priorities in personal and professional relationships. After this introduction, he distributed sheet music containing a four-part vocal arrangement of a song, and, for the remainder of the hour, the group learned the song. At the conclusion of these class periods, 3 × 5-in. comment cards were collected according to the normal classroom practice.

The second session with guest faculty members (*session B*) occurred on the final Thursday meeting of the course for the quarter before finals week. Exams scheduled for finals week included final exams for biochemistry, histology, anatomy theory, and the anatomy laboratory as well as the midterm exam for the two-quarter human physiology educational unit. As in the first experiment the previous year, the two sections of the course met together for a 3-h period. Prior information regarding the purpose and format of this class meeting was not provided. The students were told only that attendance was required and that both course sections would meet together.

The first hour was devoted to the course instructor answering questions regarding topics covered during the quarter and providing advice about how to approach the challenges of the upcoming finals week. In the remaining 2 h, students sat in an “in the round” configuration centered on the piano, as in the first experiment, and L. Rose led the session. She performed music, and, interspersed among the music, she interacted with the students. She asked them about their life paths and their approach to school and achieving balance in their lives, and she discussed issues raised by them regarding her life experiences and philosophy. One student, for example, asked how one knows when he or she is successful.

During the final 30–40 min of the session, after a request by the students to sing songs of the season, L. Rose led a sing-along that included *Frosty the Snowman*, *Winter Wonderland*, and a song with which the class was familiar from earlier in the quarter (see *pilot study 2*). The routine request for 3 × 5-in. comment cards was made at the conclusion of the class period. As in the first experiment, a group of students remained after the session to engage in further one-on-one interactions with the guest.

PILOT STUDY 1 RESULTS. The premise underlying the experimental sessions was that these sessions would further help develop the sense of community that initial course activities were intended to promote. Furthermore, the sessions would help students reexamine their current stressors in the broader context of their lives and provide an emotional release for the stress that had been building since the beginning of the quarter. An important part of this process was that the students should have fun.

Student behavior in the three experimental sessions was consistent. Reactions to the “stories” that the guest faculty members told and the response to questions that the faculty members asked regarding the students’ motivations, their priorities, and their past experiences included occasional tears and much laughter. After the first experimental session, some students commented that they hadn’t seen some of their colleagues smile before that day. In addition, the groups participated in the singing activities with great enthusiasm. The fact that many students remained to interact further with the visitors after those sessions where the room and time constraints allowed it also attests to the impact that the sessions had on the students.

Student comment cards were not collected after *experiment 1*, and neither section of the course had scheduled meetings on Friday. Hence, the next opportunity to obtain student feedback regarding the experience was the following Monday’s regularly scheduled class time. Monday’s workshop activities were focused on course material, and no specific discussion of the previous Thursday’s class session was held. However, ~50% of the students submitted cards after the Monday class that included comments about the previous Thursday’s experience. These comments are shown in Table 3. In their comments, the students expressed appreciation for the musical experience, for the inspirational nature of the interaction with the guests, and for the faculty member’s demonstrating concern for the students’ well-being.

Approximately 30–35% of the students attending sessions in *experiment 2* submitted comments regarding these sessions. These comments are shown in Tables 4 and 5. In addition to echoing the previous year’s comments, these students specifically commented on the singing experience and the emotional lift that it gave them.

Pilot study 2. The first-year ND curriculum at Bastyr University includes scheduled classes from 8:00 AM until 6:30 PM and, in some cases, later in the evening. The Human Physiology course meets in the afternoons. The course is designed as a series of workshops in which student participation is an integral part of the learning environment. On many days, the energy level of the students is low and may impact negatively on the degree to which students engage in workshop activities. Based on the positive response to the participatory singing sessions in *pilot study 1*, it was hypothesized that incorporating

a brief participatory singing experience into workshop activities may raise the energy level of the group and facilitate participation at times when the energy level of the group is low. To test this hypothesis, brief sing-along periods were conducted when the class energy was low or near the end of a particularly difficult day. Words to a song were projected on the screen, a recording of the song was played, and the class sang along with the recording. Sing-alongs were initiated by student request or when an assessment by the instructor suggested a break of this type may be beneficial. These sing-along periods occupied no more than 5–10 min of class time.

Songs chosen for the sing-along repertoire were generally upbeat and fell into one of several categories: they were “fun” songs familiar to most students from elementary/middle school, camp, or other venues where group singing was experienced (e.g., *The Rainbow Connection*, *The Bare Necessities*, or *Sing*); they had an upbeat message (e.g., *I’d Like To Teach the World To Sing*, *You’ve Got A Friend*, *That’s What Friends Are For*, and *Tomorrow*); or they emphasized a connection with naturopathic philosophy (e.g., *The Garden Song* and *The 59th Street Bridge Song*).

PILOT STUDY 2 RESULTS. Student responses to the sing-along breaks were positive. Students appeared reenergized and participated more in the discussion after the experience. Student comment cards on these days supported this impression. In addition to the usual physiology questions and expressions of confusion with the material, these cards invariably included several comments expressing appreciation for the singing. The positive impact on the community was further exemplified by the class response on the final day of the course. During the final class period of both sections in the spring 2007 quarter, discussion of the course material was concluded with ~20–25 min remaining in the period. Rather than dismissing the class early, both sections requested that the time remaining be spent singing.

Discussion

In a recent communication, we proposed a set of first principles for promoting meaningful learning (12). In a learning environment supporting meaningful learning, students practice applying the information that they are acquiring to solve real-world problems (9). To be successful, this must be a safe environment in which students will take the intellectual risk of revealing their mental models and their approach to building and testing those models without fear of being “wrong” or sounding “foolish.” In this communication, we expanded the concept of a safe environment to include activities directed at addressing non-academic factors that may impact learning. For students to progress successfully on their learning journey, support must be provided to help them deal with a range of issues that may interfere with their learning. We propose that one way to meet this challenge is through the development of a holistic learning environment. In such an environment, faculty members and students work together to build a learning community that provides encouragement and emotional support when necessary, helps community members achieve balance between their academic and nonacademic pursuits, and provides opportunities to grow in their learning.

The steps that we described to initiate community building require an investment of class time. Some instructors might

Table 3. *Unsolicited comments regarding pilot study 1, experiment 1*

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- Thanks for Thursday! (3 cards)
 - Thank you so much for the amazing concert. It inspired me to seek out more opportunities to hear jazz. Maybe you'll see me at Jazz Alley sometime.
 - Thanks for a nice experience on Thursday. I loved it.
 - The singing ceremony was great on Thursday. I enjoyed it.
 - The fact that you organized the event in the chapel was more meaningful than anything that was said there. Thank you.
 - Thanks for the music last week: MUCH APPRECIATED!
 - Thanks for last Thursday's session—completely unexpected.
 - Thanks so much for the concert on Thursday. I am glad I didn't miss such a wonderful opportunity to hear quality live music and to listen to some inspirational people.
 - Thank you very much for planning the music last Thursday. It was beautiful and I think helpful for all of us.
 - The music stuff was great. Thanks.
 - Thank you for Thursday. It was very helpful in relaxation. It opened me up and let some emotions come out.
 - Thursday was great! Thank you for the experience.
 - Thank you for Thursday! It was very inspirational.
 - Thank you for last Thursday . . . that was such a moving and enjoyable experience.
 - I'd like to thank you and Joshua for our gift last week. She was wonderful and the jazz lessons/information made a concert this weekend way more meaningful.
 - I really appreciated you allowing us to have Thursday in the chapel and to get a break from our academics. I felt I didn't get as much out of it as I would have liked only because I didn't feel well and had a headache. But I did enjoy it and am grateful for it. Thanks again!
 - Thank you for Thursday. It was great.
 - Thursday's experience was wonderful. It really reminded me that music is an essential part of my life and that I need to rejuvenate it. Thank you!
 - I enjoyed our chapel meeting on Thursday. I didn't do any schoolwork this weekend and it was really nice. Instead I went to a costume party and a concert this weekend.
 - Enjoyed the singing.
 - Thursday's event was excellent. It put things back in perspective and the Gross Lab midterm was not such a big deal. Thank you!
 - I appreciated last Thursday's class.
 - Thank you sooo much for Thursday—'twas fun and fantastic! It made me miss my musical friends back in NC, but it was great!
 - Thank you for Thursday. I enjoyed it. It helped me realize that I should keep singing. I very much enjoyed the singing we did in the chapel. It was rejuvenating to the spirit.
 - Thank you for the music (I thought I took my score home, I was humming the tunes). I think I'll haul out my keyboard and guitar (folk/classical).
 - The class last week was very inspirational. It instilled a sense of peace into my life at midterms. Also, it brought to life how important it is to do something that you are passionate about. Thank you!
 - I put more music into my life this weekend. THANKS for the inspiration from you and your friends.
 - Thank you very much for last Thursday's class.
 - Thank you so much for Thursday's concert and Louise Rose! I feel happy to be here and reassured that I am in a nurturing learning environment.
 - Thank you so much for taking care of our souls and spirits on Thursday. I felt invigorated and like I could breath deeply again. I am feeling a bit behind in here after midterms last week.
 - Thank you for the unique class on Thursday. (I am kind of sick right now so I am afraid my words of thanks may be lacking.) It was one of the best "classroom" experiences I have had throughout my education and I wanted to be sure to say thank you.
 - I just want to say thank you again for Thursday. It was so special. You should do that every year.
 - Thank you so much for Louise Rose and Frank! I enjoyed both of them very much.
 - I really needed the jazz break on Thursday—thank you. It was nice to be reminded that we have lots of important people, goals, situations, and enjoyable activities in our lives and that our tests are not so terribly important in the big picture. After that reminder, I went home and didn't study. I just made a nice dinner and enjoyed the evening. I also took my old choir practice CD and put it in my car and sang with it all weekend.
 - Thanks for the nice break on Thursday!
 - I want to thank you again for the nice surprise on Thursday. It gave me the strength and confidence to prepare for Friday's midterms and then get home without stressing over them.
 - Just wanted to say, "Thanks," again for Thursday. It was wonderful.
 - I really appreciated last Thursday's class.
 - Dr. Modell—thank you sooo much for the beautiful "experiment" last Thursday. Both individuals, especially Miss Rose—she really inspired me!
 - Thank you so much for arranging such a relaxing and inspirational Thursday for us. I am grateful for it—it helped me perform in my exam the next day. I will remember that day for the rest of my life.
 - Listening to the music was awesome!
 - I want to thank you for bringing Louise Rose to us. She is an inspiration. Thank you for being in tune with our needs—it really means a lot.
 - I wanted to thank you for arranging the program on Thursday. It was exactly what I needed. I think it should be done every year for 1st years. Thank you very much.
 - Thank you very much for the session on Thursday; it was truly an experience that I think I needed after a week of midterms and is something I will never forget. It helped me to focus my mind on other things besides work and after I was able to concentrate better on the studying I had to do later that day. Maybe we can incorporate dancing along with singing in the future.
 - The concert at the chapel was amazing. It totally made my day. Truly I was having a tough day of midterms and hearing the music and singing with my class was inspirational and relaxing.
 - Thank you for last Thursday. I was going through some hard personal issues and listening to beautiful people with beautiful voices really helped me out. Timing couldn't have been better.
 - I just wanted to say thank you on Thursday's session. It was a great break for me before my Histology midterm. I felt much better after the session. Once again, thank you so much.
 - I am very grateful for last Thursday. I thought that it was a wonderful release from the stress that accompanies midterms.
 - I forgot to tell you how much I appreciated the midterms class in the chapel. I think you should ABSOLUTELY do it every year for the 1st years and the timing was perfect. So were the guests. Thanks!
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Shown are unsolicited comments submitted on comment cards during the class meeting after *pilot study 1, experiment 1*. Fifty-two comments were received.

Table 4. *Unsolicited comments from pilot study 1, experiment 2, session A*

- Thanks for the class today—I am sure it was pretty obvious that today’s class hit home (first all the talk about Italian Mothers—in which case all [I] could think about was my Grandma, she’s the typical Italian grandma) and then the song. The words and meaning really hit a soft spot for me in many ways. First, I’m a New Yorker and know many people who died in 9/11 (all of whom were heroes) and secondly, was my grandma, she’s my hero on so many levels. . . . So just wanted to say thanks and thanks for the tissues!
- I really enjoyed the singing. It was such a nice break [from] all the craziness.
- Singing was so much fun! Thank you!
- I miss the piano. I don’t have one out here. So yesterday after class, I went in the chapel to play and they had the pianos locked. (sad face)
- I liked singing. (2 cards)
- Thank you for the music break on Monday.
- Thanks for the guest and music!
- Thanks for the song—We loved it—I think this a rough week for all of us.
- Thanks for the singing. Grace has never been happier!
- Thank you for the singing. You have definitely sparked “something”.
- Loved singing with everyone! Great timing!
- Thank you for the singing!
- Tell your friend that he inspired me. I haven’t lifted up my voice in quite some time. What a relief! Job well done, Modell. Thanks.
- Thank you! Singing is one of my favorite ways to release and have fun! Something that falls off the plate easily.
- I loved the singing!
- Although I wasn’t sure where we were going with the choir thing, I really enjoyed the break. Actually, I love singing and would like to join a choir . . . or maybe be a back-up singer.
- Loved the singing today.
- I think that it is interesting that your friend mentioned that as we get older we grow more interdependent. I was thinking about that same thing last night. It felt good to sing again. I noticed I was nervous at first, but then didn’t care and actually had fun letting my voice out.
- Singing was awesome. Thank you!! I feel like I got a chance to relax a little and do something enjoyable, like singing!
- I had so much fun singing!! It was such a wonderful experience!
- I truly enjoyed the singing. I really appreciate how you value balance in life. Thank you!
- Thanks for the song!
- Oh, I love to sing. Blue skies, smiling at me . . . nothing but blue skies, do I see . . .
- Thanks for allowing us to sing. It was a great stress reliever.
- Thanks for the music.
- Thanks for class today. Singing is not something I usually do. It is outside my comfort zone, but I really enjoyed it today.
- Singing’s great. We should do more. Thanks.
- The singing was wonderful. Mr. D was a great teacher. But it was hard for me to think about physio after singing. Maybe we could do singing in the 2nd half of class!
- I didn’t realize that singing could be a great stress reducer!
- I really appreciated the music break.
- Dr Modell: Thanks for the singing/music today. It was a tough day.

Shown are unsolicited comments submitted on comment cards at the end of the class period after *pilot study 1, experiment 2, session A*. Thirty-two comments were received.

argue that investing this time compromises their ability to “cover the content” of the course. However, if the goal of the course is to promote meaningful learning rather than disseminate a body of information, the return on the investment is considerable. Students are more willing to engage in productive discussion of the concepts presented and explore the mental models that they are developing. Discussions held early in the course provide a foundation for the concepts and models that are considered later in the course. As the course progresses, students are more likely to recognize key concepts and apply them to more complex models. They begin to recognize that, indeed, life is cumulative, and the relatively simple mental models built early in the course of study are applicable to more complex models built later. The result is that, in this type of course, more content can often be covered rather than less (5).

Our two pilot studies suggest that music provides a valuable tool for achieving the goals of a holistic learning environment. Music has long been advocated as a stress management tool, and the health benefits of music form the basis of the allied health field of music therapy. Use of music has also been advocated to improve learning in classroom situations (10). The rationale for conducting our first pilot study was based on a desire to provide first-year medical students with an experience that would help reduce stress, provide an opportunity to reflect on how to establish an appropriate balance between their

academic load and the rest of their lives, and introduce or reintroduce them to the positive role that music can play in their lives. In addition, it was vital that this experience contribute to the sense of community that was considered critical to optimizing meaningful learning.

These goals provided guidelines for the design of the experience. Although the expectation was that the students would enjoy the performances, it was important to recognize that the purpose of the sessions was not solely to entertain. It was to engage the students in a variety of activities that would contribute to reaching the goals. To help foster the sense of community and the feeling of safety within the community, it was critical that attendance be restricted to members of the class. Furthermore, it was important that all class members attend. Hence, the sessions were included in the course schedule as an “attendance-required” event. However, students were not given prior information about the purpose and content of these sessions. It was felt that the sessions would have a greater impact if the students were expecting the usual classroom workshop activities. Furthermore, if students thought that the session was not “essential” to course content, they might decide to skip the session in favor of catching up on studying for other courses even though the sessions were listed as attendance-required activities.

Table 5. *Unsolicited comments from pilot study 1, experiment 2, session B*

- My most sincere thanks.
- Thursday's class in the chapel was an important day for me at Bastyr. It was a reminder of why I am here and what life is really about. Thank you. (submitted with a take-home exam the following Monday)
- That was wonderful. Thank you!
- Thanks so much for this wonderful afternoon.
- Thanks for inviting Louise to come to class!
- Awesome! Thanks Modell!
- Thanks so much Dr. Modell!
- Thank you so much for bringing Ms. Rose to us.
- I thank you for today's guest in that you invited her to come. This has made my day.
- The singing was fun. Thanks.
- Thank you!! (3 cards)
- Thank you for having Louise Rose!!
- Thanks Modell. Louise Rose was great. She was really encouraging.
- Thank you! I appreciate all your creative processes, even if it makes me emotional!
- Thank you *so* much for bringing Louise. She is wonderful! It was a very meaningful and uplifting experience—and lots of fun too!
- Huge thanks for asking Louise Rose to share with us!!
- Thanks for the music today! I really enjoyed it.
- Thanks for organizing the music. She has a true gift. Can I ask why? Just wondering. It seems these things have a deeper meaning for you—maybe you could share sometime.
- Thank you for today. (2 cards)
- Louise was so fun and this was a very nice way to end the first quarter of this 4–5 year journey. So, thank you very much.
- I like singing in class. Thank you for the opportunity.
- Hi Dr. Modell! Thanks for the awesome last workshop! I really appreciated it.
- I had a wonderful moment today. Thanks.
- Thank you for this day of November 29, 2007. Louise was great.
- Modell, thank you (again) for today's gift of Louise and earlier in this quarter with Frank.
- That was awesome!
- I love Louise!
- Thanks!
- Again, thank you for this and for keeping us calm and relaxed. I appreciate it!
- La La La La LaLaLaLa La La La La (reference to a sing-along that Louise led)
- Thanks! This 2 hours with Louise was a gift!

Shown are unsolicited comments submitted on comment cards at the end of the class period after *pilot study 1, experiment 2, session B*. Thirty-four comments were received.

It is important to remember that our pilot studies were informal research efforts. Course structure, time, and resources did not allow the strict research protocol that would be expected in an educational laboratory setting. In addition, it was not possible to administer pre- and postassessments of stress levels or other assessment tools that might provide specific data related to the impact of these sessions on learning or exam performance. However, the unsolicited written comments from the students (Tables 3–5) do provide valuable information regarding the experience. The fact that half of the students participating in the first session felt strongly enough about the experience to submit comments several days later attests to the significance of the impact that the session had on them.

Although fewer students submitted comment cards related to the sessions from *experiment 2*, they still represented a significant portion of the population. Also, the fact that about one-third of students attending the second session of *experiment 2* felt strongly enough to submit a card on the last day of the quarter is a further indication of the impact that the session had on these students. Essentially none of the feedback contained negative comments about the sessions. It is doubtful that the practice of putting names on the cards discouraged negative comments because students are encouraged during the quarter to express negative as well as positive feelings on the cards, and they generally do. We must conclude, therefore, that if students viewed the sessions in a negative way, they did not report their views for other reasons. The comment cards and the unsolicited positive verbal feedback about these studies that

we continue to receive up to 2 yr later indicate that, at least in the short term, these sessions achieved the initial goals.

Incorporating brief sing-along sessions in regularly scheduled class periods (*pilot study 2*) provided a different experience from the *pilot study 1* sessions and did not require “special” time or logistical arrangements. The sing-alongs were not necessarily preplanned. When the energy level in the class seemed to be in need of a boost (e.g., when the students seemed fatigued from a long day of classes or when they appeared to lose focus for other reasons), a few minutes were devoted to singing. Student responses to this practice indicated that these brief sessions also had a positive impact on the learning environment. Students reported that the singing built a sense of camaraderie within the group that helped to contribute to a willingness to participate in class discussion. Student behavior after the sing-along demonstrated the change in the energy level in the group.

The sing-alongs can also help establish a mood that helps the students confront challenges in a positive way. For example, the first written quiz in the physiology course is a “diagnostic quiz.” In contrast to a “standard” exam designed to assess what students know and can do, the diagnostic quiz is designed to reveal aspects of the course performance goals with which students are encountering difficulties. Performance on this quiz is generally well below students’ expectations. The exercise, however, provides a valuable learning tool for them. To help emphasize the positive aspects of this type of testing, a sing-along session was conducted just before the graded quiz-

zes were handed back. The song chosen for this session was Ac-Cent-Tchu-Ate The Positive. The song, written by Johnny Mercer and Harold Arlen, is up-tempo and admonishes the listener to “ac-cent-tchu-ate the positive, e-lim-ma-nate the negative, latch on to the affirmative, and don’t mess with mister in-between.” Students had fun with the song, and, when the quizzes were returned, they seemed more inclined to focus on how to use the exercise as a positive learning tool rather than viewing the results as a negative reflection of their academic capabilities.

Student response to introducing music into this physiology course indicates that building community and providing emotional support goals were met. However, did these activities improve the learning of physiology or did the pilot study experience improve exam performance in the other courses? This question is complex, and attempts to assess the impact of these activities on learning are left to future studies. Before meaningful experiments to measure learning outcomes can be designed, the type of learning to be assessed must be defined. For example, are we concerned about short-term acquisition and recall of physiology facts or are we interested in learning that is directed toward a long-term ability to solve physiological problems? The goal of meaningful learning is the latter. Assessment of this type of learning is best achieved with longitudinal studies, but designing such studies that provide adequate controls for confounding factors is difficult at best.

Some insights regarding the impact of the music activities may be provided by the cognitive psychology literature. Bjork (3) reviewed the design of training programs and concluded that these programs, whose design is often consistent with common classroom practice, are often much less effective than they could be. Designs that seemed to be detrimental to short-term retention of information (e.g., distributing practice sessions over time rather than grouping sessions by task) improved long-term retention and facilitated performance on tests that required subjects to solve problems based on their general understanding of the content. One type of design favoring long-term learning included “interference” activities in which the learner was distracted from the learning task for a time and then returned to the task at hand. Incorporation of these activities, while creating “difficulty” for the learner, has been shown to enhance long-term performance. The sing-along activities in this study could be considered such a distraction and, if so, could contribute to the long-term goal of a meaningful learning environment.

The concept of a holistic learning environment is based on the recognition that students have both academic and nonacademic stressors that can negatively impact their learning. If we are to help the learner to learn, we must help students minimize the influence of these stressors on their learning. Some medical schools have attempted to address this issue by incorporating stress management courses in the curriculum (6, 15). However, this project demonstrates that much can be accomplished to address holistic learning at the individual course level. Furthermore, it demonstrates that music can provide a powerful tool

for addressing this challenge within the framework of the individual classroom. By incorporating activities similar to our sing-along periods into classroom practice, we can provide ongoing opportunities to reinforce the importance of maintaining balance in students’ lives, help promote a positive learning experience for our students, and, potentially, engage students in ways that help develop skills for the long-term application of the physiological models that are the focus of our physiology courses. The important message of this project is that each instructor, within the confines of his/her own classroom, can make a significant contribution to achieving a holistic learning environment for his/her students and that this can be accomplished with a minimum investment in resources and time.

GRANTS

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