

THE INFORMAL CLASSROOM: EVALUATING THE EFFECTS OF A
CONTINUING MEDICAL EDUCATION PROGRAM ON SCIENCE LEARNING
AND ATTITUDES IN MEDICAL STUDENTS, RESIDENTS AND PHYSICIANS

by

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STATEMENT OF PERMISSION TO USE

In presenting this professional paper in partial fulfillment of the requirements for a master's degree at Montana State University, I agree that the MSSE Program shall make it available to borrowers under rules of the program.

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ABSTRACT

Continuing medical education programs play an important role in disseminating current scientific and clinical information to our medical and health care community adult learners. This research study aimed to evaluate the effects of our education programs on science learning and attitudes, observe preferred learning environments and adult learning theories, and to update our evaluation process. The data revealed that learning method preference is dependent on the content of the education program, and that many of our programs, specifically those based on science concepts, followed that preference. Because many of our programs followed the preferred learning style for that specified content, we saw positive observations throughout those programs. This data will help to revitalize our programs, in turn, helping to meet our educational goals and those goals set forth for our members.

INTRODUCTION AND BACKGROUND

Project Background

For the past year and a half, I have been managing continuing medical education programming under the conference management department of the Texas Medical Association (TMA) in Austin, Texas. The Texas Medical Association is the nation's largest state medical society. Our 47,000 physician and medical student members work together every day to improve the health of all Texans through partnerships with our county medical societies and other state-wide organizations. The Texas Medical Association provides a voice and is a strong advocate for Texas physicians throughout our legislative process, provides learning opportunities focused on aiding physicians and students toward new scientific, clinical and practical discoveries; and to help in providing strategies that will continue to foster a strong patient and physician relationship. Our membership is culturally diverse as it encompasses physicians and medical students from all over the state of Texas. More specifically, the educational programs in which I manage at our annual conference, TexMed, have an educational attendance average of between 800-1000, with an overall conference average attendance of 2500. The average age of our attendee is estimated at 56, ranging from 20 to 90 years of age. Average medical student attendance is 4%, with residents at 9%, and practicing physicians making up the majority. Physicians in a variety of specialties attend our educational programming. The percentage of female versus male attendees is 25% and 75%, respectively. The following specialties are typically represented at our annual conference: Allergy, Anesthesiology, Family Medicine, Pediatrics, among others. Medical students represented at our annual conference also range from across the state, attending from

various medical school universities across Texas. With this wide range of experience and expertise, our learning environments are rich with innovative ideas and skills to be shared.

In my current position, I oversee an average of ten to fifteen science and clinically-based continuing medical education (CME) programs each year.

According to the National Institutes of Health, CME consists of educational activities which serve to maintain, develop, or increase the knowledge, skills, and professional performance and relationships that a physician uses to provide services for patients, the public, or the profession. In general use, CME refers to educational events that have been approved for CME credits. CME credits are important to physicians because some states (as Texas) require a specified number of credits annually to maintain medical licenses, and because more hospitals require a specified number of credits for their physicians to remain credentialed to see patients. CME credits are authorized by the American Medical Association Physician Recognition Award (NIH).

Several educational programs I manage include the following topics: 1) allergy, asthma, and immunology; 2) anesthesiology; 3) quality and patient safety; 4) colon and rectal surgery; 5) emergency medicine; 6) endocrinology; 7) geriatric medicine; 8) occupational medicine; 9) ophthalmology; 10) otolaryngology; 11) pain medicine; 12) public health; 13) physical medicine and rehabilitation; and 14) psychiatry, to name only a few. Each program is referred to as a track. Each track is organized by a physician program chair(s) that I or my CME coordinators work with individually to develop. TMA has established an efficient process in order to assist in this aspect of the planning phase, and asks

physicians to submit objectives, needs assessment and a gap analysis of their track, ensuring the information that is being learned is current and useful for our membership base.

After my first year observing the programs, I noticed there were varying learning environments and techniques in which were being utilized throughout the program tracks. The techniques utilized ranged from demonstrations, panel discussions, lectures, and case study reviews. As with many learning environments, attitudes and engagement, not only with the content being addressed, but with fellow students becomes a central part of the learning process. If students are not introduced to information in an appropriate manner, this may have an effect on how much that learner then takes from the lesson. So, I chose to focus on building an environment-based learning profile for those techniques, looking to understand and explore how those environments affect science learning and attitudes among our attendees. Post assessments, surveys and observations were analyzed to provide insight into the outcomes of each learning environment.

Focus Question

Concern about learner engagement and the possibility of understanding how certain environments could enhance the learning experience led me to my primary focus question: What are the effects of continuing medical education programs on adult student learning in science and clinical topics?

For my sub questions, I am also interested in learning how various learning techniques and environments affect attitudes about science, and to explore if a learner's engagement levels change while taking part in any of those various techniques. For

example, does a student take home a better understanding of the content in one setting over another?

CONCEPTUAL FRAMEWORK

Continuing medical education programs play an important role in helping physicians stay atop the changing medical environment. “Organized continuing medical education (CME) developed as a significant physician response to rapid changes,” that occurred following World War II (Stein, 1981, p. 103). Since then, CME programs have assisted physicians with tackling new innovations in biomedical research, facility and equipment upgrades, and new regulations and policies that affect health care (Stein, 1981). Continuing medical education programs are based on many adult learning techniques as a way to incorporate a process that is based on learner needs. Change, as opposed to learning, as an end goal makes the assessment of these programs somewhat challenging. In order to ensure that a physician has incorporated a learned idea in a session, follow-up assessments and evaluations are needed. This can make evaluation of programs challenging, but nonetheless, should be an important factor of the success of each program year after year. How to evaluate the success of a program is one of my hopes in starting the initial stages of this capstone project. I plan to continue my evaluation of the programs here at Texas Medical Association, and ensure that a complete closed system is produced in order to evaluate the overall success of our programs.

Theories on adult learning began with Malcolm Knowles in the US, where his ideas on adult education fell in alignment with the idea of andragogy, which means man-leading as opposed to pedagogy, meaning child-leading. He theorized that adult learning

was based on learners being self-directed (Russell, 2006). Characteristics of adult learners as theorized by Knowles are as follows:

- “Adults are internally motivated and self-directed [adult learners will invest time and energy in their own learning if they feel that it will ultimately help them meet their professional and personal goals]
- Adults bring life experiences and knowledge to learning experiences [physicians are able to network, teach and learn from other’s experiences in the right learning environment]
- Adults are goal oriented [this correlates with the first statement and enhances motivation to learn a certain topic]
- Adults are relevancy oriented [given choices on which programs they would like to attend, physicians are able to attend those topics and presentations that are most relevant to their current professional endeavors]
- Adults are practical [simulation and case study techniques are beneficial to these learners]
- Adult learners like to be respected [an appropriate level of difficulty is important for this characteristic” (QOTC, n.d.).

Also known are reasons that adult learners take part in these experiences, is to create change in their professional environment. When comparing these teaching environments to childhood school-age environments, there are several major differences, such as: 1) level of experience and knowledge; 2) motivation; 3) preconceived information and the effect that may have on the information being delivered and how the learner chooses to use that information (Russell, 2006). For example, “a change in the ability to perform a

clinical procedure does not always result in that procedure being incorporated into clinical practice, and vice versa” (Fox, R. D., Bennett, N.L., 1998, p. 466). So, a physician may learn a new technique during a CME session, but they choose whether or not that technique is relevant to their further practice.

Not only do adult learning concepts play an important role in a program’s characteristics, but the way in which the program content is being delivered is another variable that we can look at to further evaluate the success of a program. Physicians attending our programs have an opportunity to choose from three main topics: clinically-based/scientific, practice management, and legal management topics. So, is there a correlation between teaching methods and subject matter, and does that correlation mean a participant will be more successful if learning in that environment? Didactic sessions are those sessions which incorporate a lecture-style presentation to a listening audience with minimal interaction and discussion, interactive sessions rely on group interactions and hands-on/simulation activities used to engage the audience in active listening and participation, and a mix of the two includes both types of sessions during any given program. The use of didactic lectures in traditional CME is being revisited in many educational programs (Davis, 1999). In one study, it was found that such learning methods are able to indeed alter the competency and knowledge levels of physicians, and even increase attitudes and skills; however, further research into what elements and variables that are needed to make a program successful are being reviewed (Davis, 1999). However, also noted is that they do not have any direct correlation to immediate physician performance changes. Compared to interactive sessions, which showed promising results in another study that revealed a higher correlation to changing

physician performance. Also noted, was that programs that included a mix of the two, were shown to have better results for physician performance. It is the interactive sessions, when compared to passive CME sessions that have shown increase change. One of the interactive elements discussed was that of simulation interactions; “simulation technology is a power tool for the education of physicians and other healthcare professional of all levels” (McGaghie, 2009, p. 62S). Simulation allows participants to take part in a number of clinical techniques in a safe and comfortable environment, one in which physicians can utilize adult learning concepts to motivate each other and network on ideas and issues that arise in real-time discussion. There are both advantages and disadvantages of these methods. For example, one advantage to a lecture-style presentation is that factual material can be presented outright to the participant, in a direct and logical manner; however, it can depend highly on the speaker’s skillset as a presenter and makes it difficult for the presenter to gauge audience understanding (Instructional Methods, n.d.).

Now that we have discussed several variables that are incorporated within our programs, let’s discuss two learning theories that are also a part of the CME process and have an effect on our findings and interpretations. “CME best practices reside in educational programs that have the following three features: mastery learning, deliberate practice, and recognition and attention to culture barriers within the medical profession that frustrate better CME programs” (McGaghie, 2009, p. 65S). For this evaluation, mastery learning and deliberate practice are two principles that can help to shape programs characteristics. “They also conform to accepted principles of adult education independent of teaching modalities” (McGaghie, 2009, p. 65S). “The goal of mastery

learning is to ensure that all learners accomplish all educational objectives with little or no variation in outcome” (McGaghie, 2009, p. 65S). This initial part of a program helps learners to obtain the information needed to then assimilate their next steps toward change. Once this learning is complete, adult learners then choose to utilize the learned technique in their performance. The amount of time required to master an objective will vary with the learner, and with adult learners, it depends on the knowledge already obtained and the information’s relevance to their personal performance. Mastery learning also requires standardized curriculum, assessments and standards. Because our programs are based on a gap analysis and objectives set forth by individual specialties and groups, this is an aspect that needs more implementation in our programs. Deliberate practice is another variable, that when combined with mastery learning, may show some benefits in physician performance. “Deliberate practice is an educational variable associated with delivery of strong and consistent educational treatments as part of the master learning model” (McGaghie, 2009, p. 66S). Although, this is noted as quite rigorous for learners as it requires a continuous stream of information that is processed and maintained by motivated learners. McGaghie (2010) also mentioned that it does have at least nine requirements that can inform CME, listed here briefly: 1) highlight motivated learners; 2) engagement with well-define objectives; 3) appropriate difficulty level; 4) focused, repetitive practice; 5) precise measurements; 6) informative feedback; 7) correction of errors; 8) evaluation; and 9) advancement. Combining these two variables, mastery learning and deliberate practice, can inform CME to better provide evaluation of knowledge and change in performance.

There are several other variables taking place during an education session that can effect one's success. These may be called environmental variables, such as: layout of the room, comfort-level, size of class, temperature, and location. Plainly said, having a comfortable setting during the activity is an integral part in helping physicians to focus. If the set-up does not allow for collaborative discussion or an open dialogue between teacher and learner, this may also effect on how information is being received.

In a study involving the effects of CME education programs based on varying delivery methods, i.e. didactic, interactive and a mix, it was found that 1) in three educational programs that utilized all didactic lessons, none revealed a positive effect on physician performance, 2) in reviewing programs that solely utilized interactive sessions, 66% revealed a significant impact on physician performance, and 3) 71% of the mixed educational program (including both didactic and interactive sessions) were found to have a positive impact on performance. It was also noted that all three didactic lessons focused on a mix of content, "one study focused on screening for cholesterol, one on family practice topics, and a third attempted to improve screening techniques for breast and cervical cancer" (Davis, 1999, 869). All three of these would fall into a practice management educational content track.

The success of an adult continuing education program may be the result of taking into consideration the type of delivery method utilized when disseminating a particular type of educational content. My study looked further into a variety of learning techniques when delivering clinical and science-based topics versus other health care topics relevant to today's practicing physicians.

METHODOLOGY

This research project sought to determine the effects of a continuing medical education program on science learning and attitudes in adult learners, and to evaluate whether any particular learning environment enhanced that learning or attitude. With sessions taking place only annually, it was important to take into consideration the length of each evaluation, observation protocols and assessment techniques used to evaluate the session as a whole in order to cause the least amount of disruption to our attendees, instructors, and program coordinators. The hope was to produce an evaluation product that can be utilized year after year, helping us collect valuable insight into the success of each program and to determine where, if any changes, need to be initiated.

Fortunately, all took place over a two day period, and so that allowed me to collect data from all CME sessions simultaneously. All programs were evaluated utilizing similar protocol at the 2013 TexMed conference. Using a triangulation matrix, I provided a listing of my research methods (Table 1). The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for working with human subjects was maintained (Appendix A).

Table 1.
Data Triangular Matrix

	Pre-CME Session Programs	2014 Live CME Programs	Post-CME Session Programs
Q1: What are the effects of continuing medical education programs on adult student learning toward science and clinical topics?	Pre-Manager's Journal	Program Observations (Appendix B) Assessment/Engagement Questionnaire (Appendix C)	Post-Manager's Journal

	Pre-CME Session Programs	2014 Live CME Programs	Post-CME Session Programs
Q2: How do various learning techniques and teaching methods affects attitudes and learner engagement?	Past Attendance Records (Appendix D)	Assessment/Engagement Questionnaire Program Observations	Post-Manager's Journal Individual Attendance Records (Appendix E)

The Texas Medical Association annual conference was held May 2-3, 2014, and gathered 1544 physicians/students together for educational programming, networking, and taking part in TMA's House of Delegates legislative arm. Of those 1544 physicians/students, we had 811 attend our educational programming. The educational programming took place on Friday, May 2nd from 7 am – 5 pm, and on Saturday, May 3rd from 8 am-5 pm. Physicians, students, and residents participated in any topics of their choosing, and were open to float among the various sessions being offered either/both days. For example, they were provided the opportunity to take part in a presentation on the *Pros and Cons of Bronchial Thermoplasty* in the Allergy, Asthma, and Immunology session, listen in on a *Thyroid* discussion and its effects on patients in relation to Otolaryngology, watch a lecture on an *Update on Deep Brain Stimulation in Neurodegenerative Disorders in the Physical Medicine and Rehabilitation* session, ask questions during an Ethics in Medicine Forum geared toward *Ethical Dilemmas Faced by Physicians as a Result of Employment or Health Care System Requirements*, or interact with fourteen poster presenters discussing quality improvements in clinical and practice environments.

I have included a complete listing of all program activities throughout the two-day event:

Table 2.
Listing of CME Programs by Day

Friday Program	Time
Allergy, Asthma, Immunology	7:30-11:45 am
Ethics in Medicine Forum	1-3 pm
Learning Labs	10:30-2 pm
Let's Get Active	7-8 am
Ophthalmology	8 am-3:15 pm
Otolaryngology	7:30 am-2:45 pm
Pain Medicine	7:30 am-11:30 am
Physician Health and Wellness (PHW)	12:30-3 pm
Practice Transformation	8:30-3 pm
Psychiatry	8 am-3 pm
Saturday Program	Time
Anesthesiology	9 am-4:30 pm
Choosing Wisely: Quality and Patient Safety	10 am-2 pm
Colon and Rectal Surgery	9 am- Noon
Emergency Medicine	9 am-5 pm
Geriatric Medicine	9 am-Noon
Holistic Medicine from India	2-5 pm
Occupational Medicine	9 am-5 pm
Ophthalmology	9 am-3:10 pm
Otolaryngology	9 am-1 pm
Partners in Public Health	9 am-4 pm
Physical Medicine and Rehabilitation (PMR)	9-11:30 am
Poster Session	8-9 am

For my data collection process and to ensure reliability during the analysis phase, student learning was evaluated using an on-site assessment, program observations, and pre-and-post manager notes. As manager of the educational programs, I kept a journal of daily activities and questions that arose from instructors, program chairs and attendees during the planning process. For the CME live program sessions, I created an observational protocol used by all on-site CME monitors to capture attendance status for

each presentation within each session, presenter and attendee observations (Appendix B). By utilizing a variety of instruments (Table 1), my intent was to assist with reliability and validity of my project. I held a training session that each monitor was mandated to attend prior to utilizing the observation protocol where I discussed the purpose and use of the observations to each. Monitors then recorded observations during each presentation, waiting between 5-10 minutes before entering the room, tallying attendance and gauging any observations. This time span allowed for moderator introductions and speaker(s) to begin their presentation. Each monitor was asked to take observations for an accumulated 10 minutes during the presentation and to return the observation protocol worksheet to me following the program.

The assessment questionnaire was included with other survey information and distributed to learners at the beginning of each session or handed to new attendees as they walked into the session, and was the primary use of gauging student learning toward science as it allowed for me to quantify the quality of answers following each session. In order to continue with the least amount of disruption in our learner environment, note that the assessment is of familiarity to our learners, and was taken from the prior year's assessment forms. The assessment question is developed by our continuing medical education department for quality analysis each year. The questionnaire was built using a scantron format. The assessment section of the scantron asked an open-ended question (Appendix C). A post-manager's journal was kept in order to record my own observations during the two-day event, of the overall attendee, instructor and monitor experience observed.

The data utilized in analyzing various learning and teaching methods was collected using attendance records (past and on-site), program observations, an on-site learner questionnaire, and post-manager journal observations.

Pre-published attendance records from past programs were collected from our TMA database and compared to 2014 attendance numbers (Appendix D). This information is gathered every year and input into our database for further analysis. Program observations, discussed above, were divided into sections, where observations for varying learning methods were grouped and compared.

The learner questionnaire (Appendix C), included survey questions based on preferred learning environments and attitudes towards science. Each survey was handed out, as discussed above, prior to the start of each program or as learners walked into the room. They were asked to complete it at the end of their participation in the program. These questions were not specific to the program's content; instead, they asked general questions on attendee attitude toward continued learning in general. Therefore, analysis by program was not necessary.

I also kept a post journal of observations I noticed of attendees and comments I received from instructors, program chairs and program coordinators.

The total number of physician and student attendance for the conference was at 1544, with 811 reporting CME credits, and of that 811, a total of 553 completing the evaluation forms. With the high number of attendees, sampling of the population was performed randomly utilizing an Excel formula for each individual program. Each evaluation form was numbered and input into an Excel format, and then the formula =RAND() was utilized to obtain a randomized number that was then sorted from smallest

to largest. Those numbers then correlated to the evaluation survey number that was utilized in the random sample. The first 5-6 surveys listed were pulled from each program to create a total sample size of 98. For those programs showing an attendance of over 100, I pulled six randomized surveys to increase their sample size to help with reliability.

The total population consisted of the following characteristics, 1) average age of attendees = 54 years old; 2) total number of physicians = 1395; 3) total number of residents 35; and 4) total number of students 114. The female to male ratio for all categories was 59% male to 41 % female.

DATA ANALYSIS

Student Attitudes

Learners were provided with two survey questions that helped gauge their attitude toward learning scientific and clinical topics in an informal setting, and the importance of learning these concepts for their professional career. Questions 6 asked students: “I believe information presented will be useful in my medical career”, and asked them to rate their response on a Likert scale. The scale ranged along the following: agree, mostly agree, mostly disagree, and disagree. It was shown that 89 learners (91%) agreed that the information learned in the program will be used in their career moving forward (Figure 1). This revealed a very strong belief that information learned in a continuing medical education program is beneficial and a component to the success of their professional careers. Only one learner (1%) disagreed with this statement, while eight learners (8%) mostly agreed with the statement.

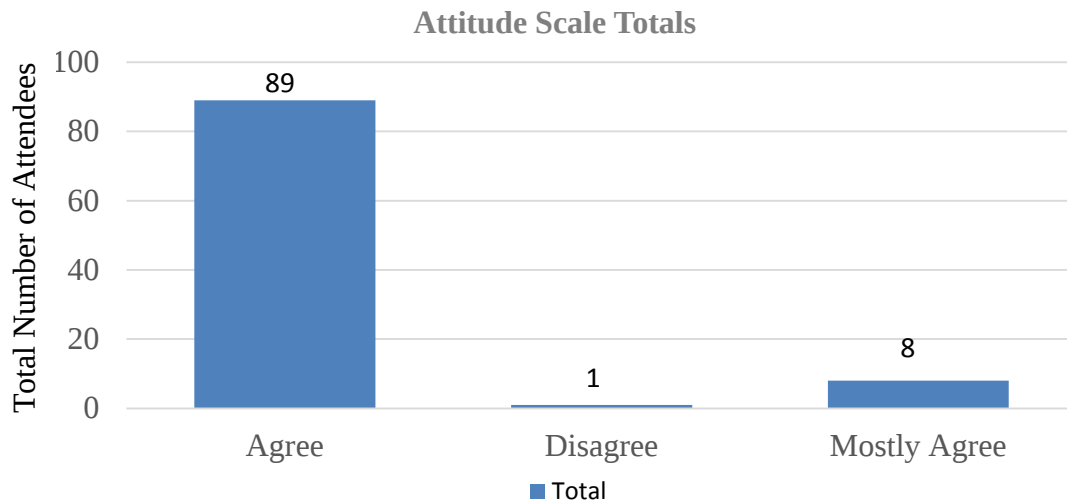


Figure 1. Survey Answers (N=98) to the Question, “*I believe information will be useful in my medical career.*”

The next question I asked informing me of learner attitudes was the following, “I enjoy learning scientific and clinical information in an informal setting.” This survey was also a part of the evaluation with the above question. It was also on a Likert scale and ranged along the following: agree, mostly agree, mostly disagree, and disagree. The total counts are provided below (Figure 2), and is also N=98. Of the 98 learners surveyed, 78 (80%) agreed with that they enjoyed learning scientific and clinical information in an informal setting, 2 (2%) disagreed, and 18 (18%) mostly agreed. This also revealed that a high majority of learners agree that this setting is enjoyable for them. I believe this data reflects that continuing education programs are a great way for learners to continue their pursuit of education in an informal setting. Although, a note that this question also produced a higher rate of mostly agreed responses than the previous question, indicating that a few learners may have a higher preference for a different setting.

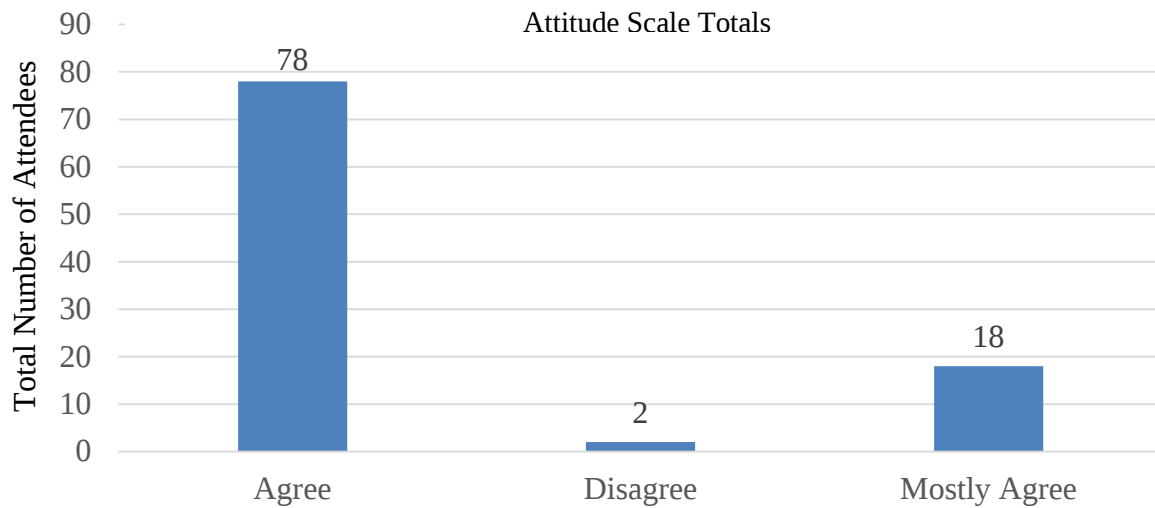


Figure 2. Survey Answers ($N=98$) to the Question, “*I enjoy learning scientific/clinical information in an informal setting.*”

Program Attendance

Program attendance, in the past, has been tallied as a final reconciliation process, where program attendance total is the number of attendees taking part in each program. However, for the purposes of this project, I incorporated attendance totals for each individual presentation. I believe this provided me with a more accurate average of attendance for the program and will help me to look closely at attendance for individual teaching methods (i.e. didactic versus panel discussions). Figure 3 below illustrates average attendance totals for programs that were tallied, and Appendix E includes individual attendance rates for individual presentations. The TexMed Poster Session did not obtain a tally for their attendance as this seemed to be a bit of challenge, as the session was very interactive and attendees came and went at a much quicker pace.

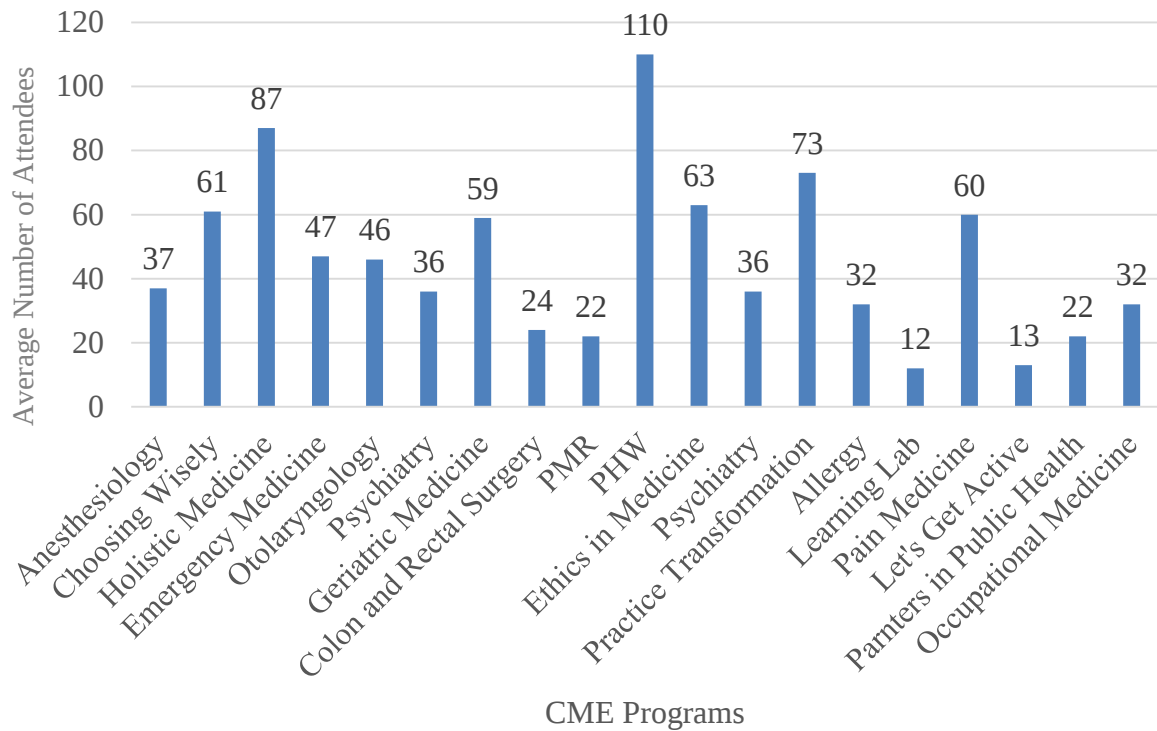


Figure 3. Average Program Attendance (N=1544) for CME Programs

The highest program attendance was that of the Physician Health and Wellness Program, with an average of 110 learners (7 %). Historically, attendance records show a higher interest in this program over others occurring during this time frame. It may also have the highest program attendance because many of the other simultaneously running programs have ended. The top five programs in order of highest is: Physician Health and Wellness, Holistic Medicine, Practice Transformation, Ethics in Medicine Forum, and Choosing Wisely: Quality and Patient Safety. The lowest average attendance was that of the Learning Labs at only an average of 12 (.08%) attendees, and the Let's Get Active program at an average of only 13 (.09%) attendees. The Learning Labs and the Let's Get Active programming both take place in the exhibit hall, away from the general CME program area of the conference, so this may have contributed to their lower attendance

averages as many of our attendees are familiar with educational programming occurring outside of the hall.

The overall average attendance for each program was 46 attendees. When I looked at individual presentation attendance, I found that on average, panel sessions were very close to the average, coming in at an average of 38 attendees for those sessions only.

Teaching Delivery Method

Included on the overall evaluation was a question asking attendees to rate their overall preference for presentation delivery method. For this survey, $N=98$, and participant answers were compared by topic preference and delivery preference to indicate any correlation between the two. I totaled the top preference, listed as the number one in the survey, and calculated the percentage of each. Figure 4 below represented the percentages of each preferred delivery method for scientific and clinical topics. An example of a scientific of clinical topic that was covered in one of our programs is that of a discussion on Allergy, Asthma and Immunology. For scientific and clinical topics, learners prefer to acquire new information through lectures (79%) the most, with a panel session coming in at a far second choice, at 12%, with simulation and question and answer session at a 6% and 3%, respectively.

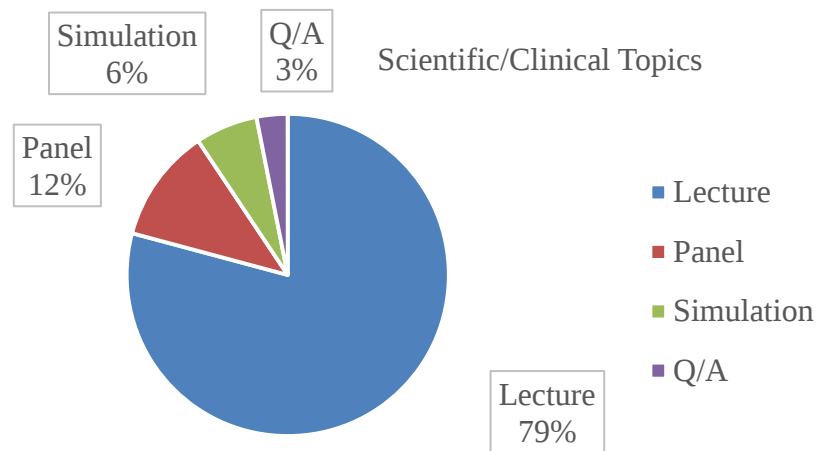


Figure 4. Percentage of each preferred delivery method for scientific and clinical topics, $N=98$.

Figure 5 illustrates that for legislative topics, learners prefer to learn with a much more mixed program, with lecture preferences at 32% and a panel session at 50%. An example of a legislative topic that was covered was that of a discussion on the Affordable Care Act and compliance issues. Again, simulation and question and answer sessions come in as a second and third preference at 4% and 14%, respectively. It is also noted that a panel session has a higher preference than a lecture in this topic as well.

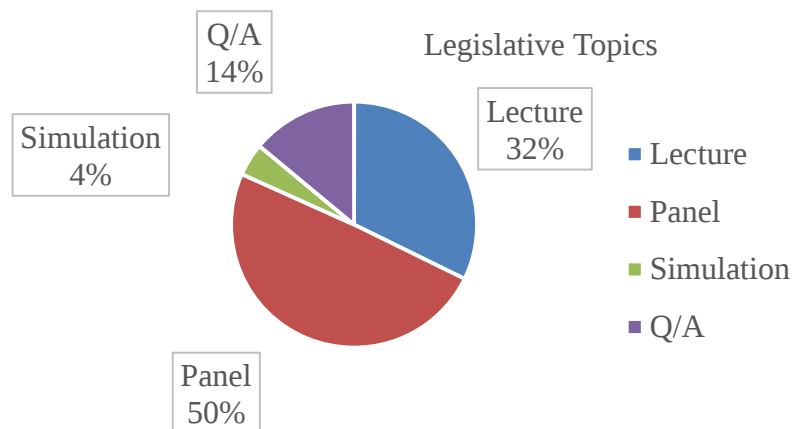


Figure 5. Percentage of Each Preferred Delivery Method for Legislative Topics, $N=98$.

Legislative topics and practice management topics show similar results; practice management topics also prefer a delivery method of a mix of lecture and panel sessions, with lecture sessions at a preference of 45%, and panel at a preference of 31%. An example of a practice management topic that was covered in one of our programs is that of a discussion on transforming practices for new payment models. Simulation also shows a jump in preference for this session, with the highest percentage among all three topics, at 18%.

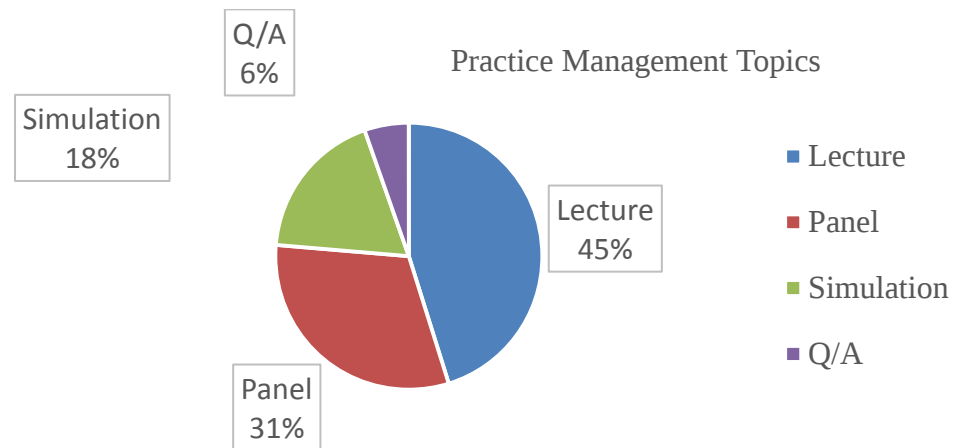


Figure 6. Percentage of Each Preferred Delivery Method for Practice Management Topics, $N=98$.

I also calculated the total method preferences across all topics, see Figure 7 for total preferences for lecture, panel, simulation and question and answer session distribution. It was relevant that lecture was the highest preference at 52%; however, the graphs above do show some variation in preference when compared individually.

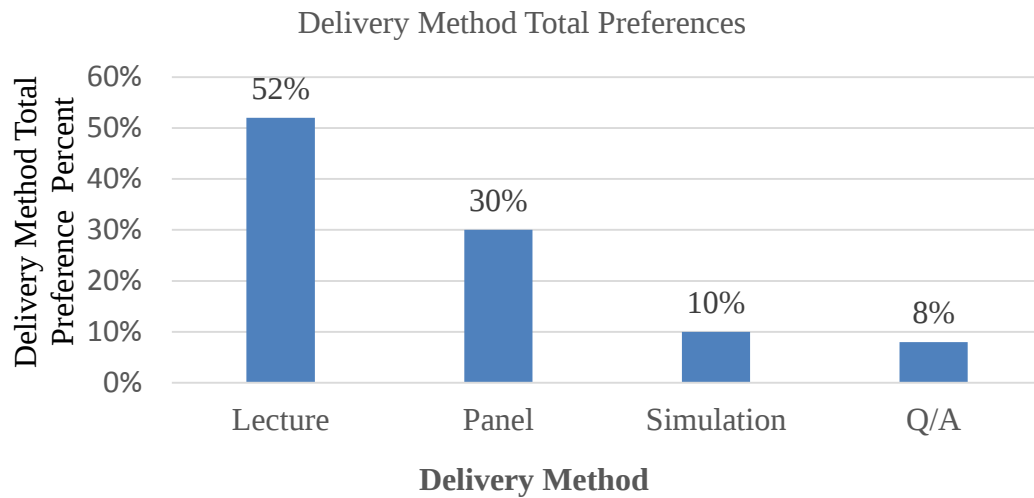


Figure 7. Percentage of Total Delivery Method for All Topics, $N=98$.

Assessment Quality

Each survey also included an assessment question for each program, asking attendees an open-ended question on what changes they plan to implement as a result of participating in the individual CME program. The quality of assessment was calculated using a grading rubric (Appendix F). The grading rubric assigned a number between one and four, with four being of the highest quality, and one lowest. After assigning a grade to each answer, I then calculated the average grade for each program, ranging from 1-4, the grades are listed below by program in Figure 8.

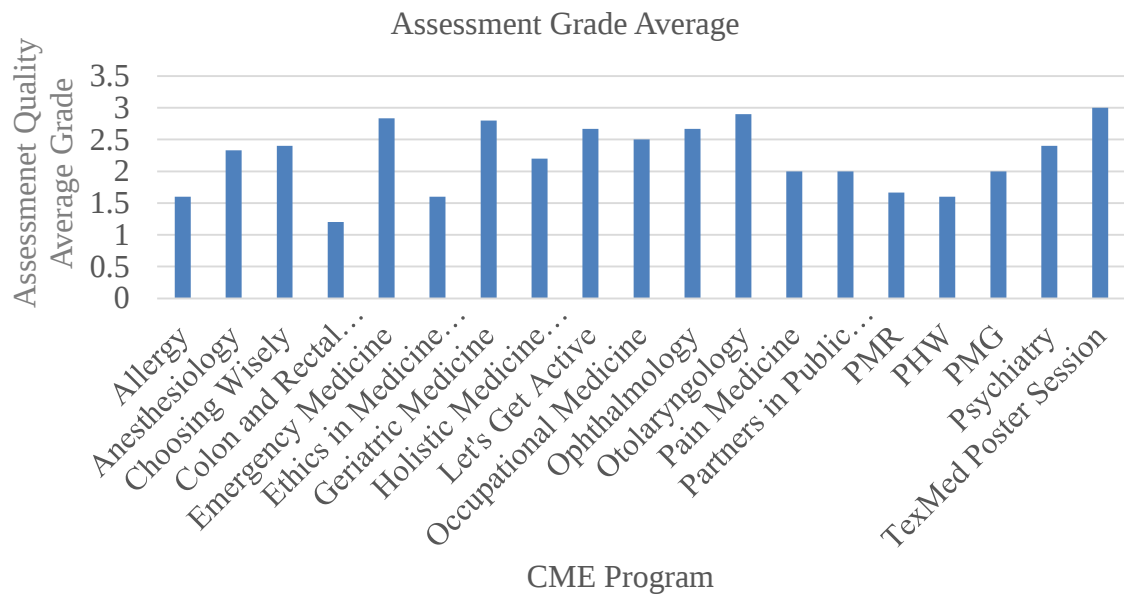


Figure 8. Average Assessment Grade on a Scale from 1-4 by Program, $N=98$.

The five programs which have the highest scores are as follows: TexMed Poster Session, Otolaryngology, Emergency Medicine, Geriatric Medicine, and Occupational Medicine. Three of the five programs, as you will see below, follow the preference for learning method, and therefore, that may have contributed to the above average scoring on the assessment. The overall average grade was 2.2 for all programs. The programs in Table 3. all fall above the overall average.

Table 3.
Listing of CME Programs above Average Assessment Grade

CME Program	Assessment Grade Average
Anesthesiology	2.33
Choosing Wisely	2.40
Emergency Medicine	2.83
Geriatric Medicine	2.80
Holistic Medicine	2.20
Let's Get Active	2.67
Occupational Medicine	2.50

Ophthalmology	2.67
CME Program	Assessment Grade Average
Otolaryngology	2.90
Psychiatry	2.40
TexMed Poster Session	3.00

Program Characteristics

Utilizing the observations worksheet (Appendix B), I compiled a character profile for each program using the percentage of the different types of delivery methods and observations noted by each on-site monitor for those programs that aligned with one of the three topics in our preference scale; scientific, legislative or practice management. The observations were quantified by assigning a positive or negative observation marker that was dependent on the observation itself. For example, an observation noting that learners seemed uninterested and reading other material not associated with the program was given a negative observation marker. For a positive observation marker, for example, a monitor noticed good interaction between the presenter and audience during a question and answer session. When compared to preferred learning styles, characteristics and observations of programs coincide with what learners prefer and their overall engagement in the session itself. Although attendance rates do not coincide with this, it should be noted that the highest assessment grade received by the TexMed Poster Session also incorporated a completely interactive session and would fall under a mix of content.

In Figures 9-16, we see program characteristics with all lecture-style programming. All programs listed below fall into the scientific and clinical topic category and all have 50% or higher positive observations associated with them. The preference in learning method survey question coincides with this as we see that learners

prefer a lecture-style environment, and the below characteristics reflect that they are also engaged in a mostly positive manner with that style of learning.

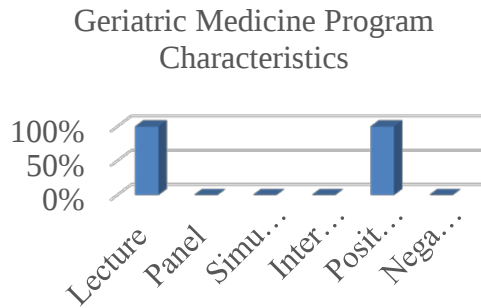


Figure 9. Geriatric Program Characteristics

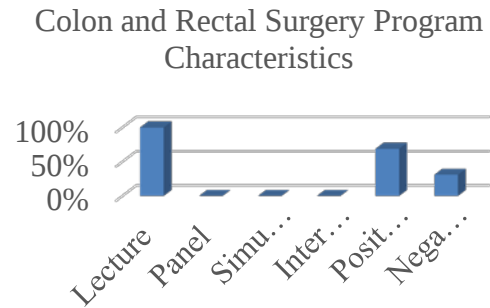


Figure 10. CRS Program Characteristics

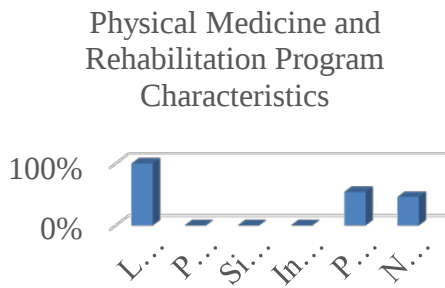


Figure 11. PMR Program Characteristics

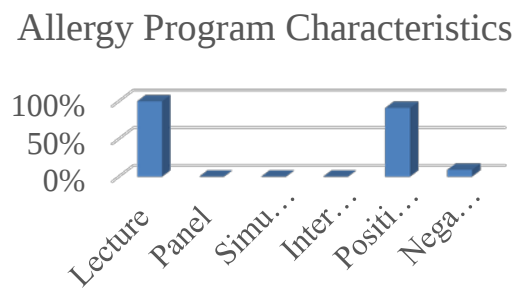


Figure 12. Allergy Program Characteristics

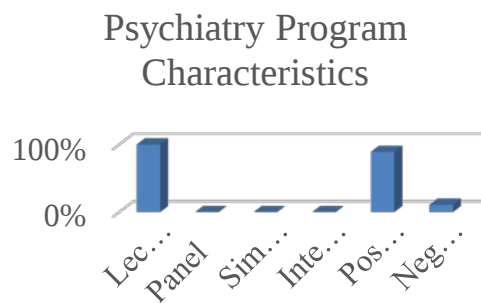


Figure 13. Psych. Program Characteristics

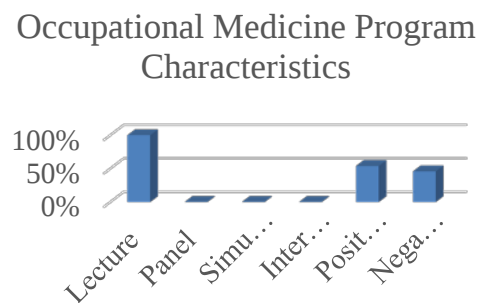


Figure 14. OCM Program Characteristics

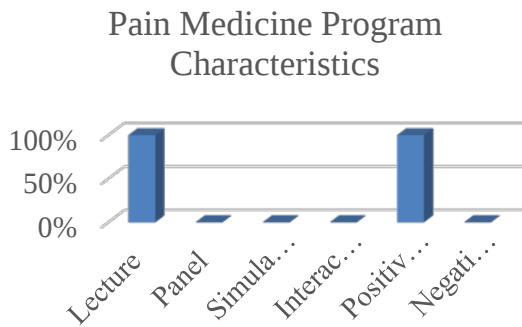


Figure 15. Pain Program Characteristics

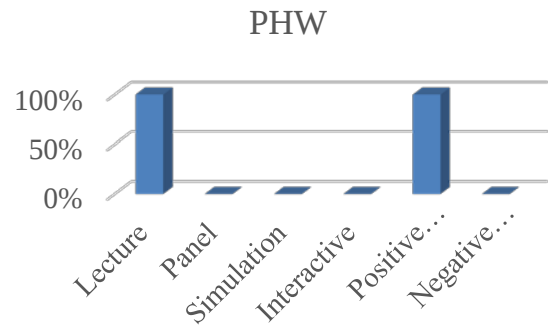


Figure 16. PHW Program Characteristics

In Figure 17-21, we see a mixed variety of delivery methods in each program. Also note that three of the five programs would fall into a practice management topic listing, and in accordance to our learner preferred survey results, a mix of methods is what our learners prefer. Of those three programs, Choosing Wisely, Partners in Public Health, and Practice Transformation, positive observations are higher in percentage than negative observations. This indicates that a learners preferred learning method (a broader mix), as seen below, does indicate higher engagement and positive observations. Also notice that when the two scientific and clinical topics, Emergency Medicine and Anesthesiology included a mix of delivery methods, we saw a higher negative observation rate, and closer rates of positive and negative observations in those, respectively.

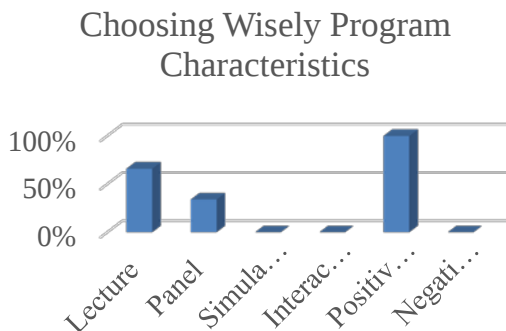


Figure 17. CW Program Characteristics

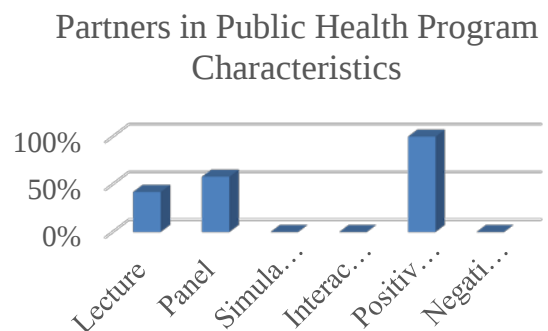


Figure 18. PH Program Characteristics

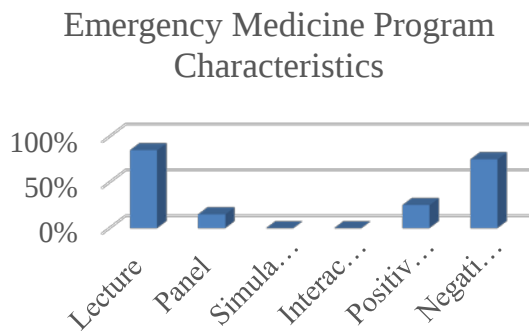


Figure 19. EM Program Characteristics

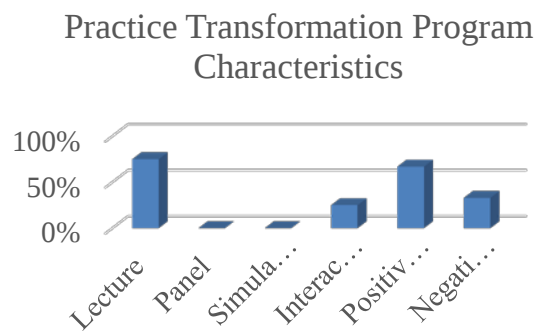


Figure 20. Practice Program Characteristics

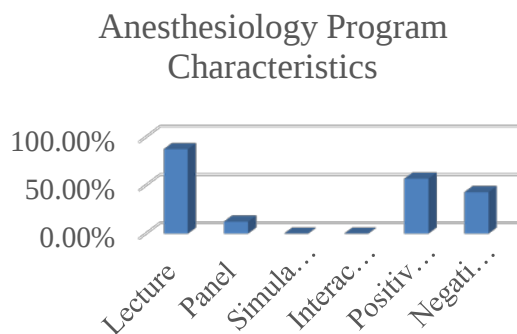


Figure 21. Anesthesiology Program Characteristics

Our final two programs, Let's Get Active and Ethics in Medicine Forum, both had an all-panel or an all-interactive program characteristic. Our Let's Get Active session was a complete interactive session, and gained a completely positive observation rate. Our Ethics in Medicine program would be characterized as a mixed content as it incorporated practice management and some legislative insight, and so according to our preference survey, learners prefer a broader mix, including higher panel participation for both topics.

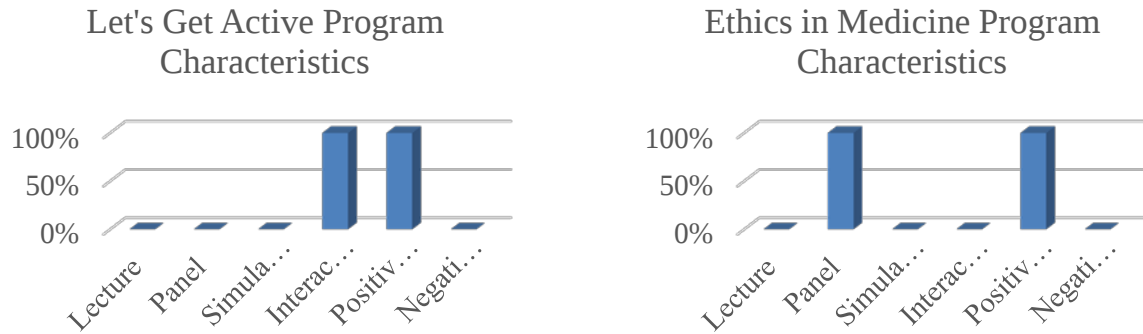


Figure 22. Active Program Characteristics Figure 23. Ethics Program Characteristics

You will notice that there were four programs that were not listed in the above character profiles. The data collected for those programs was not substantial and did not provide enough information to warrant a character profile. This may have been a collector's error, and I will be sure to address that as I move to next year's data collection training.

A Brief Cross Comparison

When looking at the top five attended programs, Physician Health and Wellness, Holistic Medicine, Practice Transformation, Ethics in Medicine Forum, and Choosing Wisely, some correlations evolved. Four of the five programs followed the learners preference rule, therefore, did well in one of more categories (above average assessment quality and/or higher positive engagement observations). Programs, such as Emergency Medicine and Anesthesiology, had a higher negative engagement observation rate or a very close negative to positive ratio, and they did not follow the preference rule, indicating that preferred learning style does indeed change with the topic learners are learning.

Other Notable Variables

As with many conferences, location and schedules plays an important role when attendees are choosing which program session they would like to attend. This may account for the low attendance rates for both the Active CME session and the Learning Lab session. The Active CME program took place in the exhibit hall and at an earlier time. The Learning Lab also took place in the exhibit hall, and because many of the programs all took place in a separate hall, this could account for the low attendance in those programs. However, those attendees that did attend each session were noted as having a high engagement/observation rate, and the Active program did have an above average assessment average as well. Engagement levels can also be compromised with a number of technical issues out of our control, for example, during some programs, it was noted that “light issues” were distracting, and attendees “entering and leaving the rooms” was also a distraction which could have played a role in lower engagement levels/negative observations.

INTERPRETATION AND CONCLUSION

The results of the study illustrated that the continuing medical education program provided learners with many ways in which to implement change in their practice and future professional careers. With 24 programs in which to choose from, there were a number of topics that would be of interest to anyone attending this conference. It revealed that learner preferences and program characteristics, based on those preferences, is an integral piece to consider when planning a program. Because successful programs included what our attendees preferred, it made the learning experience all that more engaging. For scientific and clinical topics, learners prefer a learning environment with

didactic presentations over panels and simulations; for practice management topics and legislative topics, learners prefer a mix of the two. I wonder if it is because, as formal students, we are taught science in a formal setting, and learning through didactic sessions has become the approach we are both comfortable and accustomed to when processing scientific information.

In response to my AR question on how various learning techniques and environments affect attitudes about science, this study revealed that attitude towards learning in this informal environment was enjoyable for learners and provided relevant information they are able to use in their future endeavors. It was also revealed that learner engagement does change depending on the technique being utilized to teach a particular topic. For example, when we look at the observation data for *Emergency Medicine* and note that the program did not follow the preference characteristic for a scientific-based topic, we see negative observations. Negative observations ranged from learners reading a newspaper to walking in and out of the room during the talk. However, when a scientific-based program followed that learning preference, we see positive observations, where learners are focused on the presentation and interacting with the presenter through questions following the session or are intently listening to the presenter during their lecture. In response to my main AR question on the effects of a continuing medical education program on adult student learning in science and clinical topics, the study revealed:

- Learners had a very strong belief (91%) that information learned in a continuing medical education program is beneficial and a component to the success of their professional careers.

- A high majority of learners (80%) agree that this setting is enjoyable for them and it reflects that continuing education programs are a great way for learners to continue their pursuit of education in an informal setting.
- A high learner engagement and positive observations are dependent on delivery method strategy of particular content topics.
- A successful continuing education program adheres to preferences of those delivery methods.

And finally, this informal environment success correlates to understanding adult learning concepts as well.

- Adults are internally motivated and self-directed [adult learners will invest time and energy in their own learning if they feel that it will ultimately help them meet their professional and personal goals]

Study Revealed: As a conference, with a variety of topics and information, this concept feeds well into the format in which our programs are delivered. Because attendees are able to choose and come in and of programs of their choosing, they are able to self-direct their learning where needed.

- Adults bring life experiences and knowledge to learning experiences [physicians are able to network, teach and learn from other's experiences in the right learning environment]
 - Study Revealed: During the planning process for our programs, our planning committee was asked on their advice for implementing certain hot topic sessions, allowing us to gather feedback on which topics were of

interest to our attendees. I feel that because we are able to assess our committee's interests, we are able to delve into what others might also be interested in learning from others.

- Adults are goal oriented [this correlates with the first statement and enhances motivation to learn a certain topic]
 - Study Revealed: Because the final goal of any CME program is to implement change and provide current information, physicians are able to identify, on their own, which topics would be the most beneficial in helping them reach their personal and professional goals.
- Adults are relevancy oriented [given choices on which programs they would like to attend, physicians are able to attend those topics and presentations that are most relevant to their current professional endeavors]
 - Study Revealed: Once again, the relevance of which programs they attend are at the attendees' disposal. This is relevant with the attendance numbers varying among all programs throughout the two day event.
- Adults are practical [simulation and case study techniques are beneficial to these learners]
 - Study Revealed: As shown in the results of positive versus negative observations, we see that attendees have positive engagement with a program if the characteristics of that program are aligned with what they want to learn. A positive observation was shown in the Active CME, revealing that attendees chose to learn techniques in an interactive environment.

- Adult learners like to be respected [an appropriate level of difficulty is important for this characteristic]” (QOTC, n.d.).
 - o Study Revealed: Because many of our programs followed the preferences of our, I feel that we are respecting how they would like to be taught those particular topics. This respect leads to a positive observation among attendees.

The study revealed that assessment is a difficult part of the process for continuing medical education programming. Although I was able to quantify the quality of the answer for the question, it did not necessarily indicate the level at which the learner interpreted the information. I also believe that because adult learners choose which information is relevant and which is useful to them, it is likely they were able to comprehend what was discussed, but I would have no real way of knowing that with how the question is phrased. Because I was trying to impact our programs as little as possible, utilizing the question previously utilized was the only option I had for an assessment question. In the future, I would like to implement a pre-and-post test for at least one program where attendee participation is consistent. It is difficult to do so with attendees coming in and out of the session at their convenience, as it makes it difficult to capture every single attendee as they walk into the room.

I like the added use of our on-site monitor’s time as observational note-takers. I feel like this will help with not only, keeping them busy while on-site, but will help us to gauge audience reaction and interactions. It will also assist with logistics of our room set-ups. Because we were able to obtain average attendee counts per individual presentation, this will help to set-up a more intimate setting for learner engagement.

This, I believe, may also have an effect on positive versus negative observations. In a smaller room set-up, I feel attendees are able to interact a bit more with the presenters, or at least, feel like they are able to and more comfortable in doing so.

VALUE

The action research process was valuable to me because it allowed me to delve further into our planning and on-site processes a bit more than I was able to last year. It allowed me to manipulate our survey questions, taking out past questions that are no longer relevant, and add questions that we are able to then use for analysis later on. It gave me data to also support changes I hope to implement, for instance, by using the preferred learning survey and the positive observations within those program characteristics that observed those preferences, I feel that I will have more confidence to insist we implement a program characteristic profile guide for individual programs based on their topic of discussion. I feel that because our data reveals that attendance and observations were high and positive, respectively, my supervisor may allow a discussion around doing so in future years.

This was also valuable for me, as it allowed me to explore adult learning concepts around science, specifically, and look to how others are implementing their continuing education programming successfully.

And finally, it was terrific to see how much support I have from the organization I work for, my colleagues and my supervisor on this project. Not only did they allow me to implement changes in our planning and on-site procedures, but they allowed me to really look at how we can improve our education programming overall. It is with much appreciation and gratitude that I look forward to helping do just that. I feel that our

programs need to not only provide a variety of information for our members, but we need to listen and work toward what they prefer in the learning environment that will provide them with the tools they need to succeed as learners, as physicians, and as our members.

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APPENDICES

APPENDIX A

EXEMPT STATUS MONTANA STATE UNIVERSITY



INSTITUTIONAL REVIEW BOARD
For the Protection of Human Subjects
FWA 00000165

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 c/o Immunology & Infectious Diseases
 Montana State University
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 Telephone: 406-994-6783
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 406-994-5721
 mquinn@montana.edu
Administrator:
 Cheryl Johnson
 406-994-6783
 cherylj@montana.edu

MEMORANDUM

TO: Liliana Guajardo and Walt Woolbaugh
FROM: Mark Quinn, Chair *Mark Quinn*
DATE: March 11, 2014
RE: "The Informal Classroom: Evaluating the Effects of a Continuing Education Program on Science Learning and Attitudes in Medical Students, Residents and Physicians" [LG031114-EX]

The above research, described in your submission of March 10, 2014, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

- ☒ (b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
- ☒ (b) (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.
- ☐ (b) (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
- ☐ (b) (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.
- ☐ (b) (5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.
- ☐ (b) (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.

APPENDIX B

INDIVIDUAL PROGRAM OBSERVATION WORKSHEET

Anesthesiology Program Observation Worksheet

Please complete the below observations for each individual session in your program.

CME Program Name: _____

Speaker Name: _____

Presentation Title: _____

Delivery Format: (choose one)

Lecture _____ Panel _____ Interactive _____ Simulation _____

Total Attendee Count: _____

Observations:

--

Speaker Name: _____

Presentation Title: _____

Delivery Format: (choose one)

Lecture _____ Panel _____ Interactive _____ Simulation _____

Total Attendee Count: _____

Observations:

--

APPENDIX C

ASSESSMENT, ATTITUDE, AND PREFERRED LEARNER SURVEY SAMPLE

Attitude, Assessment, and Learning Method Preference Survey Questions

The TexMed Executive Planning Team, program chairs, and education manager will use this evaluation in developing programs for future conferences. In addition, results will be used in a research study looking at the effects of continuing medical education programs on scientific learning and attitudes. Participation in this research is voluntary and participation or non-participation will not affect credits issued.

Title of Activity:

Date of Activity:

Program Objectives:

Attitude Questions:

Please rate each of the following aspect of the overall program by bubbling in your response to the right.

1. I believe information presented will be useful in my medical career:

Agree Mostly Agree Mostly Disagree Disagree

2. I enjoy learning scientific/clinical information in an informal setting

Agree Mostly Agree Mostly Disagree Disagree

Assessment Question:

What changes will you implement in your practice as a result of this activity?

Learning Preference Question:

Please rank your preference for method of learning (1-4) for the below content area:
(1 is more preferred method)

Topic	Lecture	Panel	Simulation	Questions/Answers
Scientific/Clinical Topics				
Practice Management Topics				
Legislative Topics				

Please deposit evaluation form in one of the CME reporting boxes located in the meeting room corridors.

APPENDIX D
PAST ATTENDANCE RECORDS

CME Program Attendance Records

Program Attendance

Program Name	Attendance					
	2013	2012	2011	2010	2009	2008
General Session*	435	389	382	356	229	193
Allergy	111	89	65	71	72	80
Anesthesiology	49	78	55	87	62	91
Anticoagulants*	42	NA	NA	NA	NA	NA
Cancer*	100	114	162	102	127	111
Colon/Rectal Surgery	21	42	32	31	18	43
Coordination of Care*	84	NA	NA	NA	NA	NA
Diabetes/Endocrinology	NA	143	96	101	144	182
Emergency Medicine	142	122	134	107	29	53
Geriatrics	68	46	78	108	141	58
Leaning Labs Day 1*	42	NA	NA	NA	NA	NA
Leaning Labs Day 2*	12	NA	NA	NA	NA	NA
Medicine and Ethics	NA	187	NA	NA	NA	NA
Occupational Medicine	74	82	73	NA	92	93
Ophthalmology Day 1	127	87	112	141	129	107
Ophthalmology Day 2	100	75	108	112	119	142
Otolaryngology Day 1	95	107	88	75	83	90
Otolaryngology Day 2	55	70	48	74	72	73
Pain Medicine	115	112	104	69	74	106
Physical Med/Rehab	36	27	34	30	35	38
Physician Health*	125	69	99	NA	71	155
Practice Management*	106	139	107	85	58	NA
Preparing for Value Based Care*	87	NA	NA	NA	NA	NA
Psychiatry	101	67	69	85	65	60
Quality*	52	171	143	NA	62	NA
Quality Poster Session*	89	NA	NA	NA	NA	NA

APPENDIX E
ATTENDANCE BY SESSION

Program	Delivery	Attendee Count
Anesthesiology	Lecture	42
Anesthesiology	Lecture	56
Anesthesiology	Lecture	31
Anesthesiology	Lecture	41
Anesthesiology	Lecture	38
Anesthesiology	Lecture	37
Anesthesiology	Lecture	25
Anesthesiology	Panel	26
Choosing Wisely	Lecture	70
Choosing Wisely	Lecture	68
Choosing Wisely	Lecture	64
Choosing Wisely	Panel	60
Choosing Wisely	Panel	55
Choosing Wisely	Lecture	53
Holistic Medicine	Lecture	100
Holistic Medicine	Lecture	100
Holistic Medicine	Lecture	75
Holistic Medicine	Lecture	80
Holistic Medicine	Lecture	80
Emergency Medicine	Lecture	49
Emergency Medicine	Lecture	57
Emergency Medicine	Panel	42
Emergency Medicine	Lecture	38
Emergency Medicine	Lecture	48
Emergency Medicine	Lecture	52
Emergency Medicine	Lecture	43
Otolaryngology	Lecture	42
Otolaryngology	Lecture	45
Otolaryngology	Lecture	42
Otolaryngology	Panel	60
Otolaryngology	Lecture	60
Otolaryngology	Lecture	70
Otolaryngology	Lecture	42
Otolaryngology	Lecture	36
Otolaryngology	Lecture	49
Otolaryngology	Lecture	46
Otolaryngology	Panel	39
Otolaryngology	Lecture	35

Otolaryngology	Lecture	40
Program	Delivery	Attendee Count
Geriatric Medicine	Lecture	70
Geriatric Medicine	Lecture	58
Geriatric Medicine	Lecture	50
Colon and Rectal Surgery	Lecture	24
Colon and Rectal Surgery	Lecture	27
Colon and Rectal Surgery	Lecture	28
Colon and Rectal Surgery	Lecture	30
Colon and Rectal Surgery	Lecture	29
Colon and Rectal Surgery	Lecture	17
Colon and Rectal Surgery	Lecture	22
Colon and Rectal Surgery	Lecture	22
PMR	Lecture	15
PMR	Lecture	21
PMR	Lecture	33
PHW	Lecture	110
PHW	Lecture	110
Ethics in Medicine	Panel	63
Ethics in Medicine	Panel	63
Ethics in Medicine	Panel	63
Psychiatry	Lecture	28
Psychiatry	Lecture	28
Psychiatry	Lecture	42
Psychiatry	Lecture	32
Psychiatry	Lecture	50
Practice Transformation	Lecture	102
Practice Transformation	Lecture	50
Practice Transformation	Lecture	67
Allergy	Lecture	35
Allergy	Lecture	40
Allergy	Lecture	35
Allergy	Lecture	25
Allergy	Lecture	25
Learning Lab	Lecture	15
Learning Lab	Lecture	9
Pain Medicine	Lecture	83
Pain Medicine	Lecture	40
Pain Medicine	Lecture	38
Pain Medicine	Lecture	80
Let's Get Active	Interactive	13

Partners in Public Health	Panel	14
Partners in Public Health	Panel	14
Partners in Public Health	Lecture	18
Program	Delivery	Attendee Count
Partners in Public Health	Panel	35
Partners in Public Health	Panel	35
Partners in Public Health	Lecture	22
Partners in Public Health	Lecture	19
Occupational Medicine	Lecture	32
Occupational Medicine	Lecture	39
Occupational Medicine	Lecture	32
Occupational Medicine	Lecture	40
Occupational Medicine	Lecture	35
Occupational Medicine	Lecture	28
Occupational Medicine	Lecture	27
Occupational Medicine	Lecture	27

APPENDIX F
ASSESSMENT QUALITY GRADING RUBRIC

CME Assessment Grading Rubric

4	Answer includes clearly stated concepts learned from the program's objectives Answer includes details on how change will be implemented Answer includes practical and future use
3	Answer includes concepts learned from the program's objectives Answer includes idea of change to be implemented without details Answer includes idea of practical and future use
2	Answer includes concept learned from the program's objectives Answer includes idea of change to be implemented without details, but no idea of practical and future use
1	Answer does not include any clear concepts, details or practical use of learned objectives.