

# PETTT TECHNICAL REPORT

## PETTT-01-PT-01



### Continuing Medical Education: Observations of CME Course on Feb. 8 and 9, 2001

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## **Executive Summary:**

The development of quality educational objects (e.g., presentations) is time and resource intensive. Depending on the type of object, time may be needed to design the object, decide what to include and exclude, implement it, revise it, and submit it to quality checking. Thus, it is important to understand how to effectively **design** and **use** such resources in a variety of learning situations. What are possible scenarios of use? How should their use be facilitated? Further, given the goals of use and facilitation, what are the implications for the initial design of the objects?

This report explores these issues in one educational context, Continuing Medical Education, and with one type of object, PowerPoint presentations. At the University of Washington, the CME designers are exploring the possibility of using one version of PowerPoint presentations as the central instructional resource in each of three CME contexts – standard 2-day CME short courses, traveling road show presentations, and independent CME student access to the website. Specifically, the opportunity to conduct a formative evaluation of a traditional short course using an initial version of these PowerPoint presentations provided a first step in investigating these overarching issues. In particular, this situation provided an opportunity to explore connections between the design of the PowerPoint presentation objects, contexts of use, and facilitation in these contexts.

This report focuses on the results of a formative evaluation of a CME 2 \_ day short course taught in February of 2001. The data for this analysis consisted primarily of observations. Both authors of the report observed one half-day session of the short course while one author observed a second half-day session. In addition, both authors reviewed the PowerPoint presentations given to participants in book form. These observations were then synthesized into a broad description of the CME course including a description of the learners, the learning domain, the teaching resources (i.e., the PowerPoint objects), the educational environment, the educators, and the learning experience. This synthesis is provided in Appendix I of this report. This synthesis, in addition to the original observations, were then used to identify (1) recommendations directly for the CME course and (2) recommendations for use of the Powerpoint presentations on the website and in the traveling road shows.

Concerning recommendations to the CME short course, the following specific question drove this analysis: What recommendations can be made improving the CME course that uses the PowerPoint presentations as a key element? Findings in this area were grouped into three categories – minor changes, thinking deeper, and getting ambitious. These recommendations are listed below (and described more fully in the body of the report).

### **Minor Changes**

- Address usability of PowerPoint slides
- Address usability of reference book

### **Thinking Deeper**

- Enhance “book” to represent an improved resource for course and reference functions.
- Add information to images to direct users’ attention to important features of images
- Use video to capture action-oriented and “live” course elements
- Engage learners by creating opportunities for more participation
- Provide stronger ties to issues of physician practice

### **Getting Ambitious**

- Provide stronger ties to incoming/developing issues of learners
- Consider different instructional models, such as a problem-based approach

Concerning the recommendations for the website and the traveling road shows, the following specific question drove the analysis: What are the recommendations concerning the use of the PowerPoint presentations as part of the two other CME educational strategies – as part of a “traveling road show” and

as a web-based resource for individual physicians? The recommendations were grouped into recommendations for the website and recommendations for the road shows. These recommendations are listed below (and described in more detail in the body of the report).

*Recommendations for Website:*

- Support recap of the whole course
- Support recovery of individual points made in a presentation
- Support learners investigating specific topics further
- Support learners who want a follow up from course experience

*Recommendations for Road shows*

- Consider “Educator” Variations:
- Consider “Learning Domain” Variations
- Consider “Instructional Approach” Variations

Overall, it was observed that course was quite successful. The bulk of this report focuses on strategies for making the course better. A key contribution of this work is clearly the recommendations that have been provided. Another key contribution of this work concerns the underlying process used to develop the recommendations. Our efforts to develop recommendations began with something more basic – an effort to describe the learning experiences along six important dimensions -- learners, learning domain, instructional approach, educators, resources, and environment. In developing the recommendations, we repeatedly turned to this description. At times, we were identifying possible changes to one of the dimensions (i.e., how could the slides, one of the resources, be enhanced). At other times, we were considering the implications of some dimension (i.e., what is implied because the learners are “mature”). The systematic nature of this approach helps us to feel confident in our recommendations.

We believe that the ideas contained in this report will be valuable to a number of different audiences. Anyone interested in systematic approaches to the development of recommendations might be interested in this work. More specifically, educators may be interested if they are curious concerning the development of a course given existing PowerPoint presentations. Most basically, we believe that the information in this report will be useful to the educators who did such a good job of creating the first version of the CME Orthopedics Course.

# Table of Contents

Executive Summary: ..... i

Table of Contents ..... iii

Introduction: ..... 1

Method: ..... 1

Results ..... 2

Recommendations I – CME Course ..... 2

Minor Changes ..... 3

Address usability of PowerPoint slides ..... 3

Address usability of reference book. ..... 4

Thinking Deeper ..... 4

Enhance “book” to represent an improved resource for course and reference functions. ..... 4

Add information to images to direct users’ attention to important features of images ..... 5

Use video to capture action-oriented and “live” course elements ..... 6

Engage learners by creating opportunities for more participation ..... 8

Provide stronger ties to issues of physician practice ..... 8

Getting Ambitious ..... 9

Provide stronger ties to incoming/developing issues of learners ..... 9

Consider different instructional models, such as a problem-based approach ..... 10

Recommendations II – Beyond CME Course ..... 12

Recommendations for Website: ..... 12

Support recap of the whole course ..... 12

Support recovery of individual points made in a presentation ..... 12

Support learners investigating specific topics further ..... 12

Support learners who want a follow up from course experience ..... 12

Recommendations for Road shows ..... 13

Consider “Educator” Variations: ..... 13

Consider “Learning Domain” Variations ..... 14

Consider “Instructional Approach” Variations ..... 14

Conclusion ..... 14

Bibliography ..... 15

Appendix 1. Detailed Description of the Learning Experience ..... 16

Learning Domain (and Learning Objectives) ..... 16

Learners ..... 16

Environment ..... 17

Resources - Characteristics of the Learning Technology ..... 17

Educators..... 17  
Instructional Approach..... 17  
Appendix 2: Field Observation Guide..... 19

## Introduction:

The development of quality educational objects (e.g., presentations) is time and resource intensive. Depending on the type of object, time may be needed to design the object, decide what to include and exclude, implement it, revise it, and submit it to quality checking. Thus, it is important to understand how to effectively use such resources in a variety of learning situations. These observations suggest several important questions: What are possible scenarios of use? How should their use be facilitated? Further, given the goals of use and facilitation, what are the implications for the initial design of the objects?

This report explores these issues in one educational context, Continuing Medical Education, and with one type of object, PowerPoint presentations. Continuing Medical Education is an important and challenging issue for the medical profession and one of continued relevance (Mayhew, 1971; Houle, 1980; Stern, 1983; Merriam and Cunningham, 1989; Baskett and Marsick, 1992; OECD, 1995; Moon, 1999; Mott and Daley, 2000). Universities are a source of much of continuing education, and are interested in various models for supporting continuing education. Since a key attribute of any professional is the knowledge base that they possess, it is clearly important that a professional maintain up-to-date information in order to continue to operate as a professional. By its nature, continuing medical education occurs in conjunction with practice (unlike degree oriented education, in which, for a time, education is the sole focus). Usually this implies that time for CME is constrained (i.e., short courses are common). Additionally, since a purpose of continuing medical education is to help a professional maintain their ability to practice, an important dimension of CME is that medical professional needs to link the new knowledge to implications for practice. Current emphases in continuing medical education include an emphasis on creating a broader and more systematic approach to CME, by permitting a wider variety of learning experiences to fulfill CME requirements for continued professional licensing and by encouraging medical professionals develop CME plans.

At the University of Washington, three models of CME are being explored – standard 2-day CME short courses, traveling road show presentations, and independent CME student access to the website. Specifically, the CME designers are exploring the possibility of using one version of PowerPoint presentations as the central instructional resource in each context. The opportunity to conduct a formative evaluation of a traditional short course using an initial version of these PowerPoint presentations provided a first step in investigating these overarching issues.

This report focuses on the results of a formative evaluation of a CME 2 \_ day short course taught in February of 2001. The overall challenge is to better understand interactions between the design of the PowerPoint presentation objects, contexts of use, and facilitation in these contexts. The results of the evaluation are used to address the following questions:

1. What recommendations can be made improving the CME course that uses the PowerPoint presentations as a key element?
2. What are the recommendations concerning the use of the PowerPoint presentations as part of the two other CME educational strategies – as part of a “traveling road show” and as a web-based resource for individual physicians?

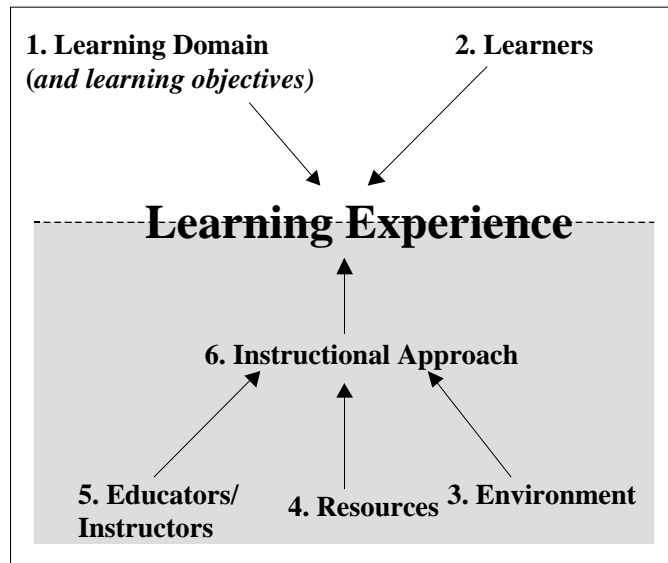
The outcomes of this investigation include recommendations for the specific CME course, recommendations for the other CME contexts, and general observations about the use of PowerPoint objects in instruction. These results will benefit the course developers when the CME course is next taught, and also the developers of similar courses.

## Method:

The goals of this investigation – to identify recommendations of immediate and future use – represent formative goals. The purpose is not to make judgments about whether something “worked” in an absolute sense, but to identify elements of a practice that *may* not have worked and opportunities for improvement. In such cases, it is useful to develop a broad, rich description of an event, and then to analyze the description in order to identify the opportunities for changes. In this case, we sought to gain a broad understanding of the offering of the CME course.

To gain this broad understanding, two members of the PETTT team (Jennifer Turns and Tracey Wagner) observed the CME course “Practical Approaches to Common Orthopaedic Problems” for two of five half-day sessions on February 8 and 9, 2001. Both observers took field notes, and typed the field notes upon return to the office. The observers relied on a “field observation guide” prepared specifically for this event (see Appendix 2).

The processing of these observations involved two separable activities. First, these observations were synthesized into a detailed characterization of the learning experience. Specifically, observations were based on (and ultimately organized into) the PETTT framework for describing an educational event: (1) Learners, (2) Learning Domain, (3) Structure of Learning Environment, (4) Characteristics of the Educators, (5) Characteristics of Learning Technology, and (6) Instructional Approach. Second, this characterization was used as a guide for identifying possible recommendations as well as explaining the significance of the recommendation.



**Figure 1. Factors Associated with Describing a Learning Experience**

## Results

Approximately 200 people attended the course, which was carried out in the auditorium at the Seattle Museum of History and Industry. The course spanned five half-day periods, with each period devoted to common orthopedic conditions associated with a specific body part (shoulder, wrist, etc). Each half-day period consisted primarily of a series of short “common condition” lectures (15-20 minutes), separated by question/answer period (typically 1-5 questions). Additionally, there were live “how-to” demonstrations of conducting a physical exam for these body regions (e.g., the shoulder). Physicians from the UW Medical Center gave all presentations and demonstrations.

Overall the course seemed very appropriately designed for the participants. The participants received a great deal of material that was organized in a meaningful manner. Because the material was presented using a consistent underlying format, it was most likely easy for participants to follow. In addition, the emphasis on physician practices (rather than the latest surgical techniques and/or the latest research results) showed respect for information needs of the attendees. From our observations, the participants seemed to be responding well to this information – they were attentive, taking notes, and asking questions.

A more detailed description of the learning experience is included in Appendix 1. In particular, we describe the learning experience along six factors, shown in Figure 1. The information characterizing the CME course is based on our observations and knowledge we gained from talking with various designers of the course. This characterization serves as a backdrop for recommendations for enhancing the learning experience contained in the next two sections. In those sections, we focus on opportunities for changes to the environment, resources, and overall instructional approach (factors below dotted line in figure) that might better serve to help learners acquire specific course learning objectives.

## Recommendations I – CME Course

These recommendations in this section are offered in a general order of increasing complexity, increasing difficulty in implementation, and increasing potential impact. The recommendations are offered in three areas: minor changes, thinking deeper, and getting ambitious.

- **Minor Changes:** The minor changes assume that the course and materials stay essentially the same. The minor changes are those that will improve the existing materials.
- **Thinking Deeper:** The recommendations in the second section, “thinking deeper,” are those that require some substantive change to the course, but do not necessitate a major change. The majority of the suggested recommendations are included in this section.
- **Getting Ambitious:** The recommendations in the final section, “getting ambitious,” are those that could involve substantive changes to the course. We have included these recommendations because of the possibility that such changes could lead to dramatic changes in the outcomes of the course.

Because of this hierarchy in the recommendations, it is possible that different recommendations could contradict one another, or render each other irrelevant. For example, the minor changes section includes recommendations on improving the usability of the “book.” However, the next section includes suggestions about the book that could result in a different format, thus rendering the usability suggestions not of direct importance.

## **Minor Changes**

The minor changes assume that the course and materials stay essentially the same. The minor changes are those that will improve the existing materials.

### **Address usability of PowerPoint slides**

1. Restrict backgrounds to limited set.
2. Use backgrounds with no distracters (i.e., moving elements, brightly colored design elements, etc.)
3. Ensure that arrows used to annotate images point clearly and unambiguously to intended element of the image.

These recommendations represent simple changes to the presentations that can serve to enhance the usability of the presentation. While some of these recommendations essentially represent a combination of general presentation suggestions, the reason to focus on these changes stems a feature of the course – the number of different presentations to which participants were exposed. What represents a small distracter when on an individual presentation becomes more of an issue when there are 50 presentations that the participants are viewing (and when the presentations are moving quickly, as they were in the course). The result of being distracted unnecessarily is poor comprehension and thus retention.

4. Ensure each presentation has author slide
5. Add speaker name and presentation topic to footer on each slide of each presentation.

The recommendation concerning the footer stems from a different but similar issue. Given the pace at which the material was covered, it was quite easy to miss the initial slide that named the content and the author. If someone in the audience missed this initial slide, they would have difficulty finding the materials in the book (and spend valuable listening time looking for materials). By putting the speaker name and topic on each slide, participants could more easily recover from missing the initial slide.

6. Modify slide headers to use 2 levels of heading – a first level that is consistent across as presenters (i.e., condition, symptoms, differential diagnosis, treatment, etc.) and a second level that each speaker/presenter determines.

We suggest this recommendation for a number of reasons. First, although this change may make the slides less aesthetically pleasing, it may help participants who may be coming in and out of the presentation (either physically or mentally). In other words, these formal first level titles will unambiguously indicate where the speaker is in the lecture. Beyond this usability issue, these structured first level headings would help in a number of other ways:

- The headings would act as an explicit advance organizer, something which has been shown to enhance learning and retention.

- They could help participants know how to allocate their attention (e.g., if each presentation had a slide entitled, “When to refer,” many participants might want to be certain to pay attention then).
- The headings would make the underlying structure of the presentation more explicit, and thus may help participants relate materials more explicitly *across* presentations (e.g., what are the difference in treatments for condition a and condition b?).

### **Address usability of reference book.**

In the CME course, participants were given a reference book containing copies of all slides used in the lectures. In this section, we focus only on changes that affect the way the printouts of the PowerPoint slides are aggregated into the book. Suggested changes to the PowerPoint slides themselves are addressed in the previous section (and some in later sections).

1. Add page numbers
2. Add header (or footer) with speaker and topic to each printed page of book (regardless of whether a similar change is made to the slides).
3. Organize the book so presentations are included in the book in the same order as they are given in the course.
4. Remove note pages at end of presentations, because rarely used.
5. Print the presentations for the book using PowerPoint’s 4 per page handout format (rather than the 6 per page).
6. Color edges of the first page for each presentation (and then remove blue sheets).

These changes represent those we believe will enhance the usability of the book. These suggestions represent a compromise between a number of considerations including: making it easy for participants to find information in the book (i.e., page numbers, headers, organization), keeping the book a reasonable length, and providing participants with an easy and appropriate place to record notes. For example, we suggest that the PowerPoint 4/page handout format be used so that participants will have more room *on the page with the slides* in which to take notes. We observed many people taking notes directly on the pages with slides (where there was little room) but few people taking notes on the provide note pages. Furthermore, it would have been difficult to use the note page (if it had been found) because of the pace of the presentation and the need, then, to move between the printouts of the slides and the note page. However, because this suggested change would increase the length of the book, we sought ways to shorten the book somewhat. This led to the suggestions to remove the blue pages and the intervening colored pages.

### **Thinking Deeper**

The recommendations in the second section, “thinking deeper,” are those that require some substantive change to the course, but do not necessitate a major change. The majority of the suggested recommendations are included in this section.

### **Enhance “book” to represent an improved resource for course and reference functions.**

1. Modify the book so that the content of each presentation is given in outline format, with all images at the end of the outline (clearly marked and referenced with Figure numbers).
2. Add a bibliography

The book (or “syllabus” as several presenters called it) represented a key element of the CME short course learning experience we observed. This book appeared to serve two functions. First, it represented a resource that participants could use **during** the course – a context for taking notes and a tool for following along with the presentations. Second, it represented a resource that participants could use **following** the course, back in the office practice. As a repository of the content covered in the CME course and the participants’ own annotations to that content, this could be something to which physicians refer back in their own context. Furthermore, these functions were being served almost as a by-product of using PowerPoint – the book contained printouts of the slides using the “handout” function of PowerPoint. With this functionality, the assembly of the book required minimal effort.

In this recommendation, we focused on how the book could be enhanced as a during-course resource and a post-course resource, while still requiring minimal assembly effort. To explore this, we considered the strengths and shortcomings that the book had relative to each function.

As a resource **during** the course, the book relieved students of the burden of writing down all of the content and permitting students to make annotations directly on the content. At the same time, there was little space for notes. Furthermore, the book may have helped students to follow along with the course, but did not really help students to take the next step – of thinking critically about the material or synthesizing the material across presentations.

As a resource **following** the course, the book makes it possible for participants to return to their practice armed with the information in the presentations. At the same time, we are left wondering if the participants of the course *will* use this book as a reference. The book is large and bulky. The information contained may not be sufficient for reference in practice. What types of information resources do physicians use in practice?

In the context of these issues, the suggested solution addresses both of these functions, and yet still is relatively easy to create. The suggested solution would have significantly fewer pages, and yet still have more room for notes. The format of the new book would emphasize similarities in presentations (through the headings) and would make the information more accessible to participants (they could more easily see the information “at-a-glance”). Additionally, because the material in different presentations could be more easily compared, the format might promote synthesis. While the proposed book format would require slightly more time to create (someone would need to transform the PowerPoint presentations in the outlines with figures at the end), this transformation would be simple. To us, it appears that the drawbacks of this format (i.e., losing the images of the PowerPoint slides that may help some people’s memory, losing the juxtaposition of image and text, and losing the positioning of the images in the story) would be offset by benefits on other dimensions.

### **Add information to images to direct users’ attention to important features of images**

Images played a large role in the PowerPoint presentations: over half the slides included a prominent image, including x-rays, photographs, diagrams, and cartoons. These images were used during the presentations in ways that contributed additional content to the messages. As is common during spoken presentations, the instructors verbally added important details that permitted participants to fully understand the images and incorporate them into the presentation content. Instructors commonly explained the images, elaborated upon their meanings, described cases relating to the images, and/or related the images to other presentation content. The recommendations below are concerned with

- improving the usability of the images during the presentation, and
- ensuring that the images can be interpreted outside of a verbal presentation as easily as during.

1. For images showing a condition, show a healthy example adjacent.
2. Label healthy and unhealthy images.

*Explanation:* By providing a healthy image in contrast to a condition example, presenters will help audience members to identify and perceive the characteristic features of the condition image. The condition example contains both important information and irrelevant information; a direct comparison with a healthy image simplifies the task of distinguishing the defining condition information. Some uses of the healthy/unhealthy contrast were used; for example, the “Soft Tissue Problems of the Elbow” session contained a contrasting pair of images of a biceps

rupture. Additional opportunities for providing contrast also exist, as in one session when a presenter commented “I know you need to see a good one here,” in reference to a photo representing a condition. (The concept of providing a contrast can be expanded to showing both “right way” and “wrong way” for exercises, as well as other times when the image is being used to define a concept or action.)

3. Where possible, annotate x-rays (using graphic additions such as arrows, circles, or shading) to highlight condition indicators (i.e., rupture, break, joint narrowing, etc.).

*Explanation:* These explicit indicators focus attention on the critical elements and reduce distracting emphasis on uninformative areas of the image. Although many audience members are expert in interpreting x-ray images, in the context of a dense learning environment like the CME course, the reduction of unnecessary cognitive effort allows the participants to focus their mental energy on new material to be learned. Rather than examining the image to determine its overall nature, participants can concentrate on noting the specific indicators of relevance to the presentation. Quite a number of images were annotated, such as the wrist fracture session, which was filled with x-rays, many of them annotated with arrows or numerals. Other opportunities for annotations exist, as in the elbow arthritis and elbow soft tissue sessions, where large numbers of x-rays with no annotations are used.

4. Include explanatory text with all images. Avoid using images without accompanying text.

*Explanation:* If the PowerPoint slides were used only during presentation, then many images may remain unlabeled. A full-screen image might well be the most effective use of graphics to support the spoken points. However, it is important to provide textual explanations for every image in the CME book because of the expectation that users will refer to materials outside of course. Like giving a caption to a figure, the textual additions provide an explanation of the meaning of an image, highlighting its relevance to the presentation topic. Bare images in the book may be very difficult for participants to interpret apart from the explanatory verbal portion of the presentation.

## **Use video to capture action-oriented and “live” course elements**

1. Help participants to access videos of exercises. This could be done by embedding more exercise videos in the presentations. It could also be done by providing participants with URLs point to exercise videos (either in a presentation slide or in a separate reference list).

*Explanation:* The exercise videos are important because exercises are dynamic and can be more easily understood in video. We note that videos take time to show, so we are not advocating showing all exercises and video in presentations. One or two videos, of particular relevance to the embedding presentation, could be played for the audience, emphasizing their availability and encouraging audience members to play others at another time.

2. Capture the “live” course elements (i.e, demonstrations of physical exams, question answer periods, and even the presentations themselves) on video and make the videos available to participants later through the website.

*Explanation:* The CME course contained several activities providing fleeting moments of valuable information, but which are not retrievable after the course.

- During demonstrations, participants in the course were taking only limited notes. Many participants were physically trying out the exam. These exams were not covered in the

PowerPoint objects or course book, and are now impossible to consult. Ironically, the portion of the course that participants are most likely to take back to their practice is the one portion of the course not captured for future reference.

- During Q/A, few participants were taking notes. By its nature, the Q/A sessions were not covered by the PowerPoint objects or in any pre-prepared material. However, the questions and answers are certainly of value to at least a portion of the participants. Again, the information has been lost once the session ends.
- Lectures. The presenters provided information beyond that contained in their PowerPoint presentations. This information include explanations, elaborations, examples, and the occasional demonstration. While some of this was likely captured by participants' personal notes and speakers' notes available online, much of the additions are likely not captured in either place. Videos available online could allow participants to refer back to this rich content or extend the reach of the presentations entirely.

#### Apply defined Learning Objectives to the course.

1. Adopt a set of publicly available learning objectives for the course.
2. Make learning objectives work for you – Use them.

*Explanation:* Learning objectives are the goals for the course. In developing a plan for the course content and activity, instructors can rely on specific learning objective to maintain coherence and build connections across different pieces of the course. Any question about what to do in the course can be approached by asking “What are the learning objectives?”

We inferred the following learning objectives from our observations and the documentation provided. These objectives could be adopted as is, or with minor or major changes.

- Theory: Participants will develop knowledge about conditions. This includes (a) all points on the presentation template (topic, recognition, workup, ambulatory management, referral conditions, how an orthopedist will treat it), (b) differentiating condition from other conditions, and (c) using exams as evidence for multiple conditions.
- Theory into Practice: Participants will return to their practice with the ability to use the new information in their treatment of their patients.

Possible strategies for using learning objectives include:

- (a) Update the presentation template to directly state learning objectives (perhaps as discussed under MINOR CHANGES: Address usability of PowerPoint Slides: Recommendation #6)
- (b) Make learning objectives available to course participants before the course as an advance organizer
- (c) Seed the Question/Answer period with references to learning objectives (e.g., open Q/A period with the prompt, “We’ve tried to emphasize information that will help you with recognizing, working up, and deciding when to refer patients with condition x – does anyone have any questions about these topics or any others?”)
- (d) Somewhere in the presentation, provide questions or cases that focus attention on the learning objectives and/or that provide participants with opportunities to test their understanding relative to learning objectives. (E.g., present a case history and allow time for audience members to think about how they would handle such a case.)

At least one presentation followed this model, describing a case in the beginning of his presentation, allowing the audience to consider the content in light of the case, and returning to the case at the end of the presentation. This approach gives the participants an immediate application for the content of the talk, helping both in retention and mental organization.

*Caveat:* Objectives held by the learners may be different from the learning objectives articulated by the course developers. This is a serious concern for a course aimed at improving doctors' practice, as these doctors very likely do have particular needs and interests. First, the developers of the course should have a good sense to begin with about such learner objectives, and a successful course will have been built to these to at least some degree. To reach the learners' objectives more surely, we have elaborated several possibilities.

- (a) The Q/A period provides an opportunity for participants to focus on their own issues. This opportunity already exists and can be further improved by linking the Q/A period directly to developers' learning objectives.
- (b) The course will be complex and broad and can address both developers' objectives and learners' objectives.
- (c) One of the "GETTING AMBITIOUS" points discusses getting learner questions prior to course. Such information could be used to identify/refine learning objectives.

## Engage learners by creating opportunities for more participation

In general, we recommend that learners have more opportunity to engage with the material and thus to be at the center of the learning experience. The following are examples of how engagement could be increased. Many of these examples stem from our observation of what participants were already doing informally.

- a) Physical engagement → Provide time for participants to try exercises
- b) Verbal engagement → Provide time for participants to talk to their neighbor about the material
- c) Cognitive engagement → Provide participants with a short period (2 minutes) of quiet time as an opportunity for them to look back at their notes, to formulate questions, to draw patterns
- d) Application engagement → Provide time to work on problems or cases
- e) Directed engagement with materials → Provide participants with time to interpret images before explanation of the image is provided. In general, provide participants with a few seconds to interpret materials.

*Explanation:* Additional participation opportunities are generally about giving the participants time to process the wealth of material being presented and to involve them actively in their learning. Such involvement is a great help to deep learning and retention, as well as being more enjoyable and stimulating than passive listening. The challenge of returning to a mentally engaging environment may be especially welcome to participants whose practices are less stimulating.

## Provide stronger ties to issues of physician practice

Because one of the strongest needs of the participants is to improve the way they approach orthopedic problems in their practice, the presentations should emphasize physician practice as much as possible. This can be done in several ways:

- Rhetorical: The speaker verbally acknowledges the participants' probable use and/or experience of the content in each session. Statements like "You will see a lot of this...", "If you see this, then you should...", "This will be less common in your offices..." put the content into the context of practice and give the participants responsibility for comparing the content to their own experience.
- Audience-based: The speaker may ask for information from the audience with prompts like "Has anyone seen cases of...?" or "Has anyone ever tried...?" These questions help the speaker keep the content focused on the experiences of the audience; they also allow the audience to see that the content is relevant to their peers, even if not to themselves at times.
- Participatory: Provide the audience with opportunities to work applied cases, starting with case histories and developing diagnoses of conditions. This is the most like physician practice, and so emphasizes the very elements and thought processes most important to the participants. Anything unclear will be highlighted when audience members try to apply the information in their own contexts.

*Explanation:* Each of these suggestions is focused on tying the presentation material to the eventual context of use. The information provided in the short course (and in much of medical science) is organized by conditions with symptoms within conditions. However, the job of the physician is the inverse problem—that of reasoning from symptoms to conditions. Thus, it may be important for the physicians to practice using the information on conditions in the context of physician reasoning. At the same time, unlike med school, the learners are practitioners, and therefore can be assumed to be familiar with medical reasoning (from symptoms to conditions).

## Getting Ambitious

The recommendations in the final section, “getting ambitious,” are those that could involve substantive changes to the course. We have included these recommendations because of the possibility that such changes could lead to dramatic changes in the outcomes of the course.

## Provide stronger ties to incoming/developing issues of learners

As we watched the course, we became interested in the questioning behavior we observed. The number and content of the post-presentation questions differed across the presentations. Some presentations stimulated more questions than could be handled in the amount of time possible, while other presentations stimulated no explicit question asking behavior. When questions were asked, some questions seemed to stem directly from the content presented while other questions seemed unrelated to the content just presented (although definitely related to the overall theme). Our reflection on the meaning of this led to the following recommendations.

1. Gather information about participants’ questions before the course. This could be done using the Catalyst tool WebQ, (<http://depts.washington.edu/catalyst/tools/#tools>), that is available to UW educators.
2. Use this information to inform the design of the course. This might include using the questions to guide selection of material (what do participants have the most questions about), emphases in the material (are participants more interested in differential diagnosis or referral conditions), and specific points to make (i.e., questions such as “how many injections are acceptable” indicate a need to point out that no injections are considered good at this time).
3. Provide an aggregated list of these questions to participants at the beginning of the course. This could be framed as an advance organizer of what you might take out of the course. It could also be used as the basis of a discussion about expectations – what types of questions the course will address and what types it will not address.

*Explanation:* From our observations, it seems clear that some participants came into the course with very specific questions. It is quite likely that many other participants had similar questions. If information about these questions existed, the designers of the course could be certain that the course was addressed the needs of the participants (i.e., solving the right problem).

4. Find ways to encourage participants to articulate questions during the presentations. For example, presenters could allocate one minute at the end of each presentation for participants to write down their own questions in their book. This could be in addition to the time allocated for open questions.

*Explanation.* There are two primary reasons that we make this recommendation. First, this process may support the goals of continuing medical education, specifically enhancing the possibility of learners **continuing their learning** beyond the formal continuing education experience. Much of self directed learning is a process of articulating questions to oneself and then finding strategies for answering the question. Furthermore, articulating the question is often a significant portion of the effort. It is suggested that providing participants with the time to articulate a question will promote those participants to then later seek out an answer to that question and thus continuing their continuing medical education experience.

Second, the act of writing questions is a good learning strategy. Question formulation is a **synthesis** activity – requiring a learner to critically consider what has been discussed and then think beyond what has been presented to what has not been presented. Thus, providing participants time to formulate questions is essentially giving them an opportunity to reflect on the material.

5. Find ways to support participants in answering their questions. Possible strategies for accomplishing this include:
  - a. Adding reference materials to the book (i.e., pointers to useful books, articles, and websites),
  - b. Providing participants with an opportunities to talk to their neighbor during the course (e.g., a couple minutes between every third presentation),

- c. Setting up tables during lunch and breaks that are devoted to specific issues of interest to participants, and
- d. Setting up a bulletin board in which participants of the course could talk with each other after the course.

*Explanation:* As in the previous case, this recommendation is mainly about helping participants continue the continuing education experience. In this case, the goal is to provide participants with opportunities to find additional information. This recommendation is important, whether or not it is coupled with the previous recommendation.

## Consider different instructional models, such as a problem-based approach

The UW CME course now has both a set of known goals and a set of prepared PowerPoint presentations. (The goals, as we inferred from the course and supporting material: Participants will develop knowledge about conditions including factual content, differentiation of conditions, and diagnosing via exams; Participants will return to their practice with the ability to use the new information in their treatment of their patients.) With this preparation, consider the following elements of this educational experience:

- Mature learners – they have process knowledge, relevant content knowledge, are able to ask questions, etc.
- Confident learners – learners come in moderately confident in their understanding of the course content (as measured by Greg Gardner’s survey).
- Advanced learners – they have extensive prior knowledge. This could mean that there are possibilities for misconceptions, confusions. They might need clarifications.
- Instructional materials exist – the PowerPoint slides represent an important resource
- Educators have a variety of expertise – the presenting doctors have a variety of different expertise. This expertise should be used effectively.

Given these observations, it seems that a lecture model may not be the most effective approach. We suggest considering another model – the problem-based learning model. Specifically, we suggest incorporating problem-based learning elements.

Problem-based learning is a popular educational approach in many fields, including medicine. In PBL, learners spend much of their formal “learning” time focused on solving a problem by using the theory and concepts that are the learning objectives of the course. The learner is responsible for identifying the relevant information, locating the information, and learning the materials, all in context of solving concrete problems.

Problem-based learning sessions can be incorporated into an instructional approach via a number of different variations. These variations stem from different decisions on

- (a) how much time to devote to solving problems
- (b) the size and scope of the problems
- (c) who facilitates a groups’ problem solving activity
- (d) the extent to which formal lecturing is integrated with the PBL sessions
- (e) how the PBL is integrated with other instructional activities.

We outline several possible PBL variations on the traditional CME approach.

1. **All PBL:** All formal learning time is spent with learners in small groups “solving.” The learners would be responsible for identifying, finding, and covering materials necessary to solve the problem.
  - o Rather than speakers presenting the various talks, participants would be given the PowerPoint objects as a starting point from which to address application problems.
  - o Selected problems (cases) require participants to explore the range of the material, thinking deeply about a variety of aspects.
2. **PBL + Lecture:** Some formal learning time is spent with learners in small groups “solving.” Other time could be devoted to quick presentations of content material by the expert educators.

- Speakers present their material quickly, with an emphasis on enabling participants to approach problems.
- 3. **PBL + Expert Panel:** Another viable approach would be to have learners spent some time solving PBL problems. At the end of each section of the course (i.e., hand session), there could be an expert panel to which the learners could ask questions that arose during the problem-based learning scenarios.
  - This approach makes good use both of the PowerPoint objects, by allowing participants to study the material as appropriate to the cases, and the expertise of the UW faculty doctors, by focusing their efforts on the more challenging aspects the participants find in each session.

Adding PBL into the CME instructional approach could have the following benefits:

- Different people could serve the “educator” function, specifically letting different people’s knowledge and time be used appropriately. The Expert Panel is a particularly good example of this benefit.
- PBL would help learners to go deeper and possibly get to misconceptions. The time spent in deep exploration of specific ideas could surpass the depth of study allowed by straight presentations; such deep study could help participants become aware of their own misunderstandings and provide an opportunity for correction.
- PBL structure would permit learners to cover material *and* have a chance at applying the material. The applied learning situation would be closer to practice.
- PBL could be more challenging for the educators who participate – they might have more fun.

Such an approach would not be without challenges. The following list identifies some of the issues that might be associated with adopting such an approach, and strategies for mitigating these issues:

- There might be less instructor control over the directions the course could take and questions that could arise. While in some senses a weakness (the instructor is an expert and has a great deal of both content and pedagogical knowledge), it is also a strength. Because the instructor has less control over the course, therefore the participants have greater control. This means that the participants are more likely to have their own needs and interests addressed. Because the participants are also experts in terms of their own practices and specialties, participant-control is still likely to lead to good learning outcomes.
- Less depth on certain topics. This could be mitigated by choice of cases to require use of all the material and a facilitation approach that prevents physician participants from oversimplifying cases and thereby avoiding much of the important content.
- Additional preparation time for instructors. The increased preparation would be (1) case selection; (2) facilitation; (3) panel discussion or question/answer. The additional workload could be mitigated by distributing the preparation over a variety of people, including residents who would benefit from participation in such a teaching experience.
- The educators would need different skills: Facilitation is a skill and whoever acts as a facilitator might need training. Having different roles for educators could mitigate this.
- Audience expectations – participants may not anticipate this kind of active involvement in their learning. Depending on the strength of the participants’ expectations, the approach can be selected to offer more or less activity. Also, if the course is advertised as a case-based educational activity, positive expectations are developed, and no mismatch is likely.

In order to accomplish PBL approach, the following action items would need to be carried out. Each is described below along with possible strategies for accomplishing the action item:

- Environment selection – It might be useful to have an open space where small groups can work comfortably. However, group work could be done in a large lecture hall/auditorium.
- Selection of /Creation of Problems – The use of a PBL approach hinges on the existence of problems. Furthermore, the selection and writing of these problems can serve to ensure that the material is covered and that learners think through their activities. While this activity can be time consuming, it can also be fun. UW Physicians see many cases, and thus can use their own experience to develop cases. The development of a template for describing the cases would aid in their preparation.

- Identifying/Training Facilitators. During a PBL session, the role of the educator is not to dispense information but rather to facilitate the knowledge development of the learners. Facilitation is a skill; it might be useful to train the facilitators who might participate in this course. Because a facilitator does not need to be a true expert, orthopedics residents could be trained to serve as facilitators during the CME course.

## **Recommendations II – Beyond CME Course**

While the study of the CME course clearly provided opportunities to make recommendations about the CME course, it also made it possible to better understand the PowerPoint presentations and opportunities for their use in other contexts. These insights are presented in the following sections.

### ***Recommendations for Website:***

The CME course provides a large amount of information, but also anticipates that participants will want to refer back to the material covered. The books provides one resource for reference; a website is another resource provided for participants. The discussion of the website here makes the assumption that the site users were CME course participants and this is not their first time seeing the slides.

This section will take a simple approach to suggesting some initial ideas for facilitating users' needs, acknowledging that web design as a whole is too large a topic for this analysis. The first step in analyzing the design of a website is understanding the needs of its users. For the CME site, the users are course participants, so there are three likely categories of use, each of which can be supported by specific measures.

### **Support recap of the whole course**

One strategy is to make all information available. The website already provides all of the PowerPoint presentations, including various animations and videos. In addition to the slides, other elements of the course could be made available via streaming video (e.g., exam demonstrations, question/answer sessions, spoken portion of presentations). These other elements are of instructional value, and the added effort of video-taping and web-enabling is much smaller than the effort in creating those elements originally.

### **Support recovery of individual points made in a presentation**

One strategy for accomplishing this is to ensure navigation is good. Currently, the PowerPoint objects are organized by presenter and labeled by topic and title. This works well for a user who wants to review an entire presentation. For a user who wants to locate specific content within one or more presentations, the website needs to provide access to content at a deeper level. One possibility would be to link the slides individually, using titles or even thumbnails as predictors.

### **Support learners investigating specific topics further**

One strategy for accomplishing this is to provide additional/supplemental information. As well as the access to deep-level content, users interested in specific topics could be provided with information in addition to what was available from the presentation. This could be in the form of slide notes, recommended reading lists, links to relevant sites or discussion groups, or simple connections to other presentations.

### **Support learners who want a follow up from course experience**

One strategy for accomplishing this is to provide additional tools or connections to group members. If course participants are engaged with the experience, they may be motivated to continue parts of it afterward. One way to support this continuation of learning could be to provide a bulletin board for participants to discuss related issues with one another. While clearly beyond the current level of effort, a discussion board would have benefits for the participants, including encouragement to continue their educational interests and to engage professionally with other physicians out of their areas.

## **Recommendations for Road shows**

So far, this analysis has focused on the 2\_-day CME course offered in Seattle, WA. This traditional lecture-hall based CME approach has challenges. The course

- (a) occurs away from the physicians' normal work environment
- (b) provides physicians with extensive information over a brief time
- (c) may be difficult for many physicians to integrate into their experiences (because of the time demand).

A better model might be one that

- (a) is carried out in the physicians' context
- (b) covers small elements of the domain at a time
- (c) permits physicians to control materials covered.

It is unsurprising, however, that such a model is uncommon. The overhead for such a "localized" course is higher than for the one-time lecture-hall course. Few medical educators have sufficient time to prepare and execute such educational events (i.e., develop the educational materials, give the presentations, answer the questions, etc.).

The PowerPoint presentations used during the observed CME experience may serve to make the localized CME model possible. This is because the PowerPoint presentations represent a *distributed intelligence* artifact. Much of the work involved in giving a presentation have been "hardwired" into the presentations. The following features are all decisions that someone must make in developing a presentation and which have been built into the presentation:

1. Meaningfully organized content
2. Intentionally selected content
3. Pacing through the included material (20-30 minutes)
4. Topics cross-related in useful ways
5. Audience appropriate (created for physicians)

An educator other than the developer who uses these slides has a reduced responsibility for delivering the information – part of the work is done by the slides. This distributed intelligence characteristic means that it takes much less expertise and/or effort to deliver the presentation than it would to originally create it. The overhead for a localized course is lowered and the course can be taken "on the road" more easily.

The basic road show has a UW medical expert who volunteers to serve as an educator by giving a presentation to a group of physicians in their local context. In the basic model, the expert selects the topic (to ensure that he/she are confident about knowing the content). The expert then uses an existing slide set to give the presentation. The benefit to the expert is that he/she can serve as an educator without having to develop the educational materials (or even decide how to present the material) due to the embedded intelligence in the slide set. The benefit to the learner/physicians is more obvious. They get an individualized presentation.

The basic road show model is supported by the PowerPoint slides in their current format, or as improved by the recommendations in the first section of this analysis. Several variations on the road show model are also possible. The variations can be arrived at by considering variations in the educator/presenter, the instructional approach, and the learning domain covered during the presentation. These variations and their implications on preparation are discussed below. Because these variations all involve the giving of presentations, all of the recommendations provided earlier in this document apply to the road show events (i.e., the recommendations for the "book", etc.).

### **Consider "Educator" Variations:**

For all the Educator variations, the presenter can be someone other than the content creator—part of the advantage of using the existing slide sets is the flexibility in educator choice it allows.

- Expert Speaker (Basic model): An expert in orthopedics (but not necessarily an expert in the specific content presented) gives the presentation.
  - This version is the closest to the traditional CME lecture-hall model. The speaker gives a pre-made presentation, reducing his/her preparation time, but the content and instructional approach remains very similar to those of the CME course.
- Brown Bag Speaker: A local physician volunteers to study the slides and then to give the presentation (thus leading a group of physicians through the materials).

- This version gives control to the local physicians. The local group could establish a regular brown bag meeting, each time giving a new physician responsibility for researching and presenting one slide set, using the existing slides. The slides would support that physician's work in their current form.
- The physician-speaker could be better supported if the slides offered extensive speaker notes. Additional resources (reading lists, common problems) could be added to the slides to further support this usage.
- Facilitated Brown Bag: A resident from UW facilitates the brown bag meeting.
  - The resident may have more specialized orthopedic knowledge than the local physicians and can offer both content knowledge and direction for the follow-up discussion.

## Consider “Learning Domain” Variations

- Content choice: The learners/physicians select, in advance, the materials to be presented.
  - When the local physicians select which content they want to study, the educator may be affected (if a UW doctor is expected to present the material).
  - Local control of the content could be beneficial by ensuring that only material of use and interest to the physicians will be presented—time will not be wasted on special-needs information of no use to the audience.
- On-demand content: The learners/physicians select the materials to be presented at the time of the presentation.
  - Very demanding on educators. On-demand might be a good option for a round-table type discussion with no leader and no advance preparation required. Physicians could interact with presentation material and discuss the content with one another or with a UW facilitator. This informal learning has the advantage of minimizing the preparation time for anyone involved.
  - A second advantage of on-demand content is the potential for highly relevant material to be covered. Content can be selected based on the current needs of physicians.

## Consider “Instructional Approach” Variations

- The small group environment allows may promote discussion during the presentation. Such discussion could improve participants' understanding and retention of the content.
  - Discussion could be supported by providing embedded questions/cases in the presentation and/or in the notes section of the slides.
  - Capturing the question/answer sections of the formal CME experience and providing these questions for discussion in the road show experiences could also support discussion.

## Conclusion

The development of quality educational objects (e.g., presentations) is time and resource intensive. Thus, it is important to understand how to effectively use such resources in a variety of learning situations. At the University of Washington, CME (Continuing Medical Education) educators are interested in how to use PowerPoint presentations as the central instructional resource in each of three different models of CME: – standard 2-day CME short courses, traveling road show presentations, and independent CME student access to the website.

The opportunity to conduct a formative evaluation of a traditional short course using an initial version of these PowerPoint presentations provided a first step in investigating these overarching issues. In general, the course was quite successful. The bulk of this report focuses on strategies for making the course better.

A key contribution of this work is clearly the recommendations that have been provided. The bulk of the recommendations focused on the course itself, and particularly on using the PowerPoint presentations effectively in the course. These course-based recommendations were grouped into three categories: minor changes, thinker deeper, and getting ambitious. Additionally, recommendations were made for using the PowerPoint presentations during the road shows and on the website.

Another key contribution of this work concerns the underlying process used to develop the recommendations. Our efforts to develop recommendations began with something more basic – an effort to describe the learning experiences along six important dimensions -- learners, learning domain, instructional approach, educators, resources, and environment. In developing the recommendations, we repeatedly turned to this description. At times, we were identifying possible changes to one of the dimensions (i.e., how could the slides, one of the resources, be enhanced). At other times, we were considering the implications of some dimension (i.e., what is implied because the learners are “mature”). The systematic nature of this approach helps us to feel confident in our recommendations.

We hope that the ideas contained in this report will be valuable to a number of different audiences. For example, anyone interested in systematic approaches to formative evaluation (and the development of recommendations) might be interested in this work. More specifically, educators may be interested if they are curious concerning the development of a course given existing PowerPoint presentations. Most basically, we hope that the information in this report will be useful to the educators who did such a good job of creating the first version of the CME Orthopedics Course.

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## Appendix 1. Detailed Description of the Learning Experience

This appendix provides a detailed description of the observed CME learning experience. The description follows along the six factors associated with the PETTT framework for describing a learning experience: (1) Learners, (2) Learning Domain, (3) Structure of Learning Environment, (4) Characteristics of the Educators, (5) Characteristics of Learning Technology, and (6) Instructional Approach. These factors are shown pictorially in Figure 1.

### Learning Domain (and Learning Objectives)

The learning domain refers the set of knowledge, skills, and attitudes that are the subject of the course. The learning objectives (specific goals for participants of the course) highlight a subset of knowledge, skills, and attitudes within the learning domain.

For the CME course, the learning domain consisted primarily of information associated with medical conditions. The associated information includes symptoms, causes, differential diagnosis, tests, referral conditions, treatments, physiological appearance, and workup practices. In addition to this more factual perspective, we noticed several additional issues concerning this information:

- This information appears to be somewhat dynamic (i.e., what is considered “right” today, can change). For example, exercises that were once recommended can be found to cause harm and then be no longer recommended.
- There appear to be “local preferences” – one group having ideas that are different from another group about how best to accomplish goals. According to one of the UW physician presenters, “We have views that may be a little different from what you have heard.” The use of steroid injections represented a specific example of this. From the UW physicians, we heard, “We are not doing injections.”
- The UW physicians expertise included having suggestions about how to implement specific activities. For example, one UW physician suggested (about a test), “It is so much better for the patient to do this himself.” The physician’s argument was that the patient would know when there was a problem, such as pain and grinding.

In addition to information about conditions, the domain include skills such as the skill of conducting various types of physical exams.

### Learners

The participants in the course appeared to be health professionals of varying types. Although there was probably a majority of practicing physicians, there may have been lab technicians, hospital practitioners, nurses, and other medical professionals in attendance. We do not know the exact proportions.

Because the course is a CME course, we assumed that the participants are already practicing professionals. As a result, we can make the following inferences about the participants:

- The participants already have experience with medical reasoning (from symptoms to conditions). In fact, the participants may have developed personal, idiosyncratic strategies by this point in their careers.
- The participants know what types of symptoms and conditions they frequently see.
- The participants are more mature learners (i.e., they successfully navigated a great deal of schooling to get where they are).

A particularly important inference about participants is that they have incomplete knowledge. Because the participants are practicing medical professionals (not researchers), they cannot be expected to keep completely up to date on all new findings in all medical domains. An important implication is that an important job of a medical professional in these situations is to know when to refer patients to others. An additional implication is that it is possible for participants to have misconceptions or wrong ideas (e.g., outdated, inappropriate inference, etc.).

Finally, because the course is a continuing education course and the participants are practicing professionals, the time available is limited. Unlike other forms of education, where work activity is suspended while the learner focuses on learning, CME experiences are brief interludes from practice. There, it is important to use the time effectively.

## Environment

The course took place at a local museum. The bulk of the course, the presentations, took place in the auditorium. Like any auditorium, the room consisted of long rows of seats, all facing toward a main stage. The capacity of the auditorium exceeded the attendance, so participants were rather spread out (except for a core of people in the middle toward the front). The room contained no clock.

The auditorium stage contained a podium at the right with a connection for a laptop computer. The stage also contained a large projection screen in the center of the stage. Thus, each speaker spoke from the podium and controlled his/her presentation, which appeared on the screen. The auditorium was additionally equipped with other project equipment (as was used to project large images of a hand exam).

Between sessions, participants moved to other spaces in the museum. A check-in desk was set up outside the auditorium, next to an entrance to the museum. Lunch took place in a conference room upstairs. In that space (a large open rectangular room with round tables set up), vendors had set up booths to display/discuss new products.

## Resources - Characteristics of the Learning Technology

Although the course made use of multiple technologies (e.g., all participants used laser pointers to interact with their presentations), this section focuses primarily on the PowerPoint presentations.

The PowerPoint presentations represented a core of the course. The different faculty who participated in the course created these presentations. Each presentation focused on a specific condition and covered a common set of issues. According to the CME website, this basic information included: topic, recognition, work-up, appropriate ambulatory management, referral conditions, and how an orthopedist will treat it.

The presentations included primarily images and text, with some use of video and animation. A wide variety of images were used. These image types included:

- photographs of actual body parts,
- x-rays, and
- schematics of physiology.

Typically, images were shown individually (rather than in conjunction with other images). A significant portion of the images were annotated in some fashion.

With respect to the text, the amount of text on the slides differed greatly across speakers. For example, a presentation on shoulder and elbow contained slides with single terms as points (i.e., exercise, treatment). At the other extreme, the presentations on fingertip injuries and wrist fractures contained slides with several almost-complete sentences. Additionally, the headings differed across the presentations, even though the presentations were designed to follow a consistent format.

## Educators

The educators (or instructors) of the CME course were primarily faculty from the UW Medical Center Orthopedics group. These faculty are recognized as experts in their fields. In addition, because the faculty are at a teaching institution, it is assumed that most have significant teaching experience. Further, while not all of the educators were faculty, all were medical professionals who had been through formal medical education. Therefore, they are all familiar with traditional approaches to medical education.

## Instructional Approach

The course used a lecture + demonstration instructional approach. In addition, participants were able to follow along, and make notes, in a bound volume containing the slides from the lectures.

The primary instructional activities were the short lectures (15-20 minutes each) with subsequent question/answer periods (typically 1-5 questions). Experts from the UW Medical Center served as instructors by giving each of these lectures. In each case, the instructor used the PowerPoint presentations they had created for this purpose (see previous section). Each instructor projected his presentation on the large screen, worked through the presentation sequentially, and used a laser point to interact with the image on the screen. In giving the lectures, the instructors varied in terms of how they interacted with their slides – some instructors added little detail to their slides (i.e., they primarily read the content and moved to the next slide) while others added extensive detail. These added details included elaborations, emphases, demonstrations, stories, and examples.

A reference book given to the course participants represents an important element of the instructional approach. This book contained copies of all of the presentations given during the 2\_ day short course, and a table of contents. The book was bound, organized by body part, and grouped by speaker (with blue sheets of paper between speakers). The book was approximately 200 pages (double sided).

The course also included a much smaller number of exam demonstrations. For example, two of the instructors demonstrated a shoulder exam (with one serving as the patient). The instructor conducting the exam talked through each activity. Unlike the lectures, which were based on PowerPoint slides given to participants, the information contained in demonstration portion of the course was not recorded anywhere for the participants.

## **Appendix 2: Field Observation Guide**