Measuring Thinking Worldwide

This document is a best practices essay from the international, multidisciplinary collection of teaching and training techniques, “Critical thinking and Clinical Reasoning in the Health Sciences.” Each essay in this set provides an example of training reasoning skills and thinking mindset described by international experts in training clinical reasoning.

Developing On-Line Cases for Teaching Critical Thinking and Clinical Reasoning Skills

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This chapter is for all of us who strive to write case scenarios that will be effective for training clinical reasoning. The chapter has been contributed by a wonderful team of health science educators headed by Dr. Sara Kim at the University of Washington in Seattle. They demonstrate exceptional production of course materials on difficult topic matter by using the disclosure of a medical error as the content area for the on-line lesson. We’ve included descriptions of the health science roles of all who helped develop this lessons as an example of how others might collaborate to achieve high quality course offerings.

Sitting (from left): Robins, Gallagher, Prouty, Charpentier (Project Coordinator), Shannon.
Standing: Odegard, and Kim. Not pictured: Brock
Bio-sketches of this collaborative team from the University of Washington

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**Her colleagues in the School of Medicine:**

**Doug Brock**, Ph.D. trained in Personality and Social Psychology who has been funded by the Centers for Disease Control to design computer-based and web-based educational applications.

**Thomas Gallagher**, M.D., an internist trained in Medical History & Ethics and a previous Robert Wood Johnson Clinical Scholar who has been funded by the Agency for Healthcare Research and Quality and the Greenwall Foundation to research the communication dimensions of conflicts of interest, research ethics, and disclosure of medical errors and adverse events.

**Carolyn Prouty**, D.V.M., is a veterinarian-turned-researcher examining patient care errors and end of life communication issues.

**Lynne Robins**, Ph.D., a researcher of the effects of physician communication behaviors on patient health outcomes who has designed curricula to promote patient safety, the assessment of clinical competency, cultural competence, and interpersonal communication skills.

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**Sarah E. Shannon**, Ph.D., RN, funded by the Agency for Healthcare Research and Quality to study error reduction in rural hospitals and by the National Institute of Nursing Research to test possible improvement in the care of the dying patient in the intensive care unit.

**Her colleague in the School of Pharmacy:**

**Peggy Odegard**, Pharm.D, CDE, BCPS, the Director of the Geriatrics Program and a Clinical Pharmacy Specialist and Certified Diabetes Educator who researches communication aspects of diabetes and pharmacist interventions.

Thanks to all of you for sharing this amazing example of an on-line case based training module.

**The class session and the student group**

Our team has been working together for the past year developing content materials for training and assessing health care providers’ knowledge, attitudes, and skills in disclosing medical errors to patients and their families. The graduate seminar we present here is based on the team’s work and framed in the context of training graduate students in examining the role of technology in learning. This graduate seminar, titled “Survey of Educational Technology” is offered in our College of Education and is typically attended by masters and doctoral students in Education, Nursing and Medicine.

**Background**

Most health science educators believe, and we tend to agree, that case-based teaching is an effective instructional method for improving students’ critical thinking skills, decision-making skills and acquisition of content knowledge. When case based teaching is done well, students are challenged to analyze problems presented in cases, make inferences based on limited information, and make decisions on uncertain, ambiguous, and conflicting sets of issues that simulate a real professional context. But in spite of the long history of using cases for training purposes in many academic disciplines including medicine, there is a paucity of scientific evidence for how best to design, use, and evaluate cases for use in curricula. In addition, there is little research on the benefits of this method of teaching with cases in comparison to taking a more didactic approach. With the growing importance of the Web-based case teaching, the need is particularly acute for developing the knowledge base in computer-based case design and for evaluating these curricular offerings. In developing this course we had both of these goals in mind.
Our Learning Goals and Objectives

The overall goal of this session is for students to explore and examine Web-based case teaching modules that incorporate case design principles identified from the literature and that optimize Web features for enhancing interactivity on the part of the learner. Students are expected to gain an appreciation of how theory guides practice and how practice advances theory using case-based teaching as an example. Students are asked to critically examine the role of technology in instruction with a focus on trainees in the professions of multiple disciplines.

This year, the course focuses on applying case-teaching methods in the development of Web-based case materials. We are using an existing mock-up version of Web-based case modules for students to view and analyze from the theoretical perspective of case-based learning.

An equally important goal for this course is for students to strengthen their critical thinking skills. The analysis of curricula and its effective transformation to an on line, Web based, technology supported offering that facilitates student learning requires high level critical thinking. We want our students to be equipped, at least at the novice level, with the ability to produce their own case based curricular materials at the end of the course. Actually, our goal is even more difficult to accomplish, but not more ambitious than what should be achieved by strong graduate training programs in professional education. We want our students to develop the ability to create materials that foster critical thinking in other health care and educational professionals.

Learning objectives:

1. At the end of this session, students will be able to describe recommended case design principles that promote critical thinking skills, particularly methods for making case content engaging and challenging for learners.

2. Using an example of Web-based video cases simulating health care providers’ discussions of a medical error, students will be able to discuss Web enabled features that best deliver a sense of realism and immersion from learners’ perspectives.

3. Students will develop a mock-up version of Web-based cases that illustrate case development principles and interface design targeting critical thinking abilities in trainees.

How we teach this Lesson:

This exercise is carefully designed and deeply layered to assure that students understand the theory behind teaching with online cases. The topics involve providing the background theory, providing an actual experience of an interactive Web case, and guiding the evaluation of the case using the theoretical principles we propose for case design.

A. Theoretical Framework

First, students are introduced to the theoretical background of case development. The conceptual framework is developed from a review of 100 reports from multiple disciplines including business, dentistry, education, engineering, law, medicine, and nursing (Kim et al., 2006). Figure 1 summarizes five main dimensions (real, realistic, engaging, challenging, and instructional) and their associated strategies applicable to developing cases.
For example, for cases to be relevant to students’ needs, the content should

(a) target an appropriate level of learners;
(b) match both faculty’s and students’ goals; and
(c) specify the setting of the narrative to help students know how to relate to the story.

The level of student engagement is increased when cases

(a) include rich content to facilitate students’ exploration of the situation, characters, and their interactions;
(b) present multiple voices and perspectives of parties involved in the situation;
(c) use a branching feature to show different consequences associated with students’ decisions.

For cases to have instructional value, the content should

(a) build upon students’ prior knowledge;
(b) offer multiple cases for students to practice target skills so that their learning can transfer to novel situations;
(c) incorporate an assessment method to measure students’ learning;
(d) provide specific and corrective feedback; and
(e) offer teaching aids, such as branching diagrams to support decision-making, case-related questions to stimulate critical thinking, and expert modeling of problem-solving approaches.

B. Review of a Web Case Example

Following the discussion of the theoretical framework, we have students read and discuss the publication of a recent study (Kim et al., 2007) that applied these case development principles to evaluating Web-based medical cases. For the purposes of the study, Web sites were selected from a pool of Web cases developed for training medical students, residents, and practicing physicians. The study found a minimum use of interactive features in the majority of web sites reviewed. Students are invited to discuss how the lack of interactive features on these sites might compromise trainees’ meaningful gains from the posted learning materials.

Next, students will be given a demonstration of a mock-up version of a Web case module that was designed as part of an ongoing grant study.
A sample case scenario is as follows:

“You have admitted a diabetic patient to the hospital for COPD exacerbation. You handwrite an order for the patient to receive “10 U” of insulin. The “U” in your order looks like a 0. The following morning, the patient is given 100 U of insulin, 10 times the patient’s normal dose, and is later found unresponsive, with a serum glucose level of 35 mg/DL (1.94 mmol/L). The patient is resuscitated and transferred to the intensive care unit. You expect the patient to make a full recovery” (Gallagher et al., 2006).

The Web case modules deal with a disclosure of medical errors to patients and families by health care providers, and we use this topic in our seminar cases. There are multiple levels of knowledge, attitude, and skills that health care providers, such as physicians, nurses, and pharmacists, need to acquire in order to participate in an effective discussion around medical errors. Here are some of the skills involved:

- recognize that an error has taken place
- define the nature of the error
- assume responsibility for the error
- consider the perspectives of other health care providers on the team
- recognize and respond to less than desirable team interaction dynamics, should they arise
- develop a plan for communicating the cause and implications of the error with patients and families
- handle unanticipated reactions from team members and patients during disclosure

While ‘recognition’ is often considered a low level skill, it actually entails a high level of reasoning skill in novel or emergent situations. Assessing the situation and determining how to intervene involves the critical thinking skills of analysis, inference, and explanation, and a well made judgment in this situation requires the disposition to honestly evaluate the likelihood of potential consequences of any actions (or inactions). Completing the case well requires the students to anticipate and to prepare to address unforeseen challenges that might arise during the team discussion of the event or during the actual disclosure of an error to a patient. In addition to strong critical thinking, the skilled disclosure of medical errors requires strength in communication. This is regarded as a sophisticated skill in a health care provider. Our educational research project, funded by the Agency for Healthcare Research and Quality, aims to train health care providers in this wide range of skills involved in error disclosure communication.

The Web mock-up cases are media rich and so we are not able to demonstrate all of the case materials here, but the cases use the following interface design elements: (a) segmented video cases which simulate discussions of a medical error among team members and with a patient; (b) embedded questions prompting trainees to provide rationales for their actions; (c) case scenarios of increasing difficulty levels to challenge trainees; and (d) interactive features to engage trainees with case materials. Using the Adobe Flash Player technology, segments of video clips are presented to trainees with various questions associated with each clip. Figure 2 and Figure 3 are sample screenshots from this mock-up case.
After selecting an answer to the question, “Who is contributing most constructively to the discussion?” the trainees are prompted to explain the reasoning behind their actions using open-ended text as a way to demonstrate higher-level critical thinking skills. Asking someone to explain ‘why’ is the most central strategy to increasing the critical thinking component in any class session. In this case students provide evidence of their thinking in the box at the bottom of the frame (Figure 2).

In Figure 3, the screen shot illustrates a video clip simulating a health care provider making a disclosure to a patient regarding a medical error. Trainees are instructed to put themselves in the role of a coach and provide timely and appropriate feedback to the health care provider portrayed in the video. To do that, they need to be able to interact with the video scenario. This is facilitated by enabling the trainees to pause the clip whenever feedback seems necessary, enter the timestamp linked to the clip, and type their feedback in the space next to the timestamp.
When we examine these typed entries we are able to see how students analyzed and evaluated the words and actions of the provider portrayed in the video and how they themselves might have responded to the scenario in real time. Before the students are asked to evaluate the teaching and learning strengths of this method of Web based case scenarios, it’s important that they first experience the case example themselves. When they are asked to evaluate the effectiveness of the Web mock up case, they can use their own learning experience as relevant data.

After viewing the demo, students are invited to discuss the following questions:

1. To what degree are case development principles integrated in this Web mock-up case?

2. Do the interface design features used in this case effectively translate case development principles and help achieve an engaging learning experience?

3. What additional interface design features would you recommend for further development?

4. If you were asked to revise this mock-up version, what would be your main recommendations?

5. In what way do you think the theory needs to be further refined in case development for improving critical thinking skills?

What I expect from the class participants:
We anticipate that students will complete assigned readings and come to this session well prepared to discuss how theory and practice intersect as illustrated in this example of case teaching principles and designing Web-based interactive cases. Our students are typically fully engaged in the class discussions. Later they develop the ability to demonstrate their own mock-up Web cases and to defend the development of these using the theoretical framework.

The Student work product:
Students develop and present to the class their version of a mock-up Web case. In the presentation they are expected to articulate the educational values of the interface design features they propose in their mock-up products. We encourage feedback about this class exercise, asking students to reflect back on key learning points they acquired and suggestions for improving the session.

References:


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Although this series focuses on health science content, the techniques are transferrable to all types of training programs and educational projects.

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