

1998 Premier Award for Excellence in Engineering Courseware Evaluation Criteria

February 28, 1998 - Draft

The criteria listed here are based upon the 1997 Premier Award Criteria and evaluation forms used by the judges. This information is provided to give potential submitters for the 1998 Premier Award an idea of what criteria will be used as the basis for the evaluation of their courseware. We do not anticipate major changes to the criteria set forth in this draft.

The criteria are divided into 3 sections—Engineering Content, Software design, and Instructional Design—each of which will require the judges to “wear a different hat,” and each of which is progressively more extensive. Overall, there are 13 separate criteria. For each criteria we provide guidelines to assist the judges’ decision-making. Guidelines are separated into 1) statements that should be true under all conditions, 2) statements that need be true in only certain circumstances, and 3) statements that describe features of the courseware that should contribute to a higher rating for the criteria, but that don’t necessarily need to be true to give the courseware a high rating. (Not all criteria have all three categories of guidelines.)

These criteria were developed with the input from numerous sources over the last three years. If you are interested in the development of these criteria and the references used to develop the criteria, please read the following paper:

Eibeck, P.A., "Criteria for Peer-Review of Engineering Courseware on the NEEDS Database," IEEE Transactions on Education, Special Issue on the Application of Information Technologies to Engineering and Science Education, Volume 39, Number 3, August 1996.

The full paper is available at:

<http://www.needs.org/needsinfo/papers/IEEE96.eibeck/index.html>

We would like to acknowledge the contributions of Judith L. Stern; Pamela A. Eibeck; Sherry Hsi; Brandon Muramatsu; Martin Ramirez; Jeffrey C. Huston and the other members of the Synthesis Quality Review of Courseware Committee; participants of the Synthesis 1995 Quality Workshop; participants of the 1997 NSF Engineering Education Innovators’ Conference; and the students at the University of California at Berkeley and Northern Arizona University.

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PART I: Engineering Content

In this section, you will be evaluating the courseware solely on its content. The expertise you need to bring to bear is that of an engineer.

ACCURACY OF CONTENT

The content is accurate.



To meet this criteria, the following should be true:

The content is error free.

Ideas are accurately and clearly presented.

ORGANIZATION OF CONTENT

The content is structured in a way that is consistent with typical engineering instruction.



To meet this criteria, the following should be true:

Topics are presented in a logical, ordered manner.

CONSISTENCY WITH LEARNING OBJECTIVES

The content is appropriately chosen to match the stated learning objectives.



To meet this criteria, the following should be true:

The content is at the right level for the intended audience.

The depth and breadth of the content is appropriate for the intended audience.

PART II: Software design

In this section, you will be evaluating the courseware as a piece of software (not necessarily as an instructional piece of software). You need to be thinking about whether the software is generally well-designed, and what the end-user experience would be. The expertise you need to bring to bear is that of a software and interface designer.

ENGAGEMENT

The software would hold the interest of a diversity of users.

1 2 3 4 5 6 7 8 9 10
 Software would **not** hold interest <—————> Software would hold interest

To meet this criteria, the following should be true:

- The software is stimulating and challenging.
- The software does NOT contain stereotypes (racial, gender, ethnic, age).
- Speed of software is satisfactory.

If appropriate, the following should also be true:

- The user would use it more than once.
- There are user-tailorable interface settings.

In addition, you may want to look for:

- The software is visually appealing and attractive in the design of its screens.
- There is consideration for users with physical impairments.

USER INTERFACE AND NAVIGATION

The software is easy to use.

1 2 3 4 5 6 7 8 9 10
 Software is hard to use <—————> Software is easy to use

To meet this criteria, the following should be true:

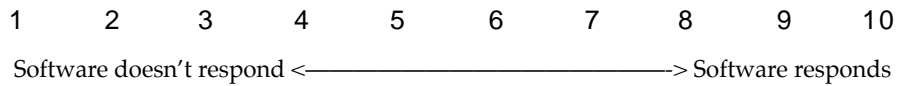
- The software is consistent in its design and response to user actions.
- The user would not get confused about how to proceed.
- The user can form a mental map of where they are and how to get around in the software (whether because an explicit map is provided or because the software is simple enough that no explicit map is needed).

If appropriate, the following should also be true:

- There are multiple forms of navigation (e.g. table of contents, next & previous buttons, index, search engine).
- Icons and graphical symbols are clear and unambiguous.

INTERACTIVITY

The user and the software interact in satisfactory ways .



To meet this criteria, the following should be true:

- The software responds appropriately to user actions.
- The user has control over the pace, order, and depth of what she sees.
- Choices that students make are meaningful (and not "just for the sake of making choices").

Note: Interactivity is further addressed in Instructional Design section later in this document.

MULTIMEDIA USE

Multimedia is used appropriately.



To meet this criteria, the following should be true:

- Multimedia is not distracting.
- Multimedia is not gratuitous.

If appropriate, the following should also be true:

- Media elements are of high visual and aural quality.
- Multimedia elements are clearly labeled, so the learner doesn't have to struggle to figure out what they are looking at, or why the element is there.

Note: Multimedia is further addressed in Instructional Design section below.

TECHNICAL RELIABILITY

The software performs without technical errors.



To meet this criteria, the following should be true:

- All buttons function.
- Software crashes occur very rarely, if at all.
- There are no obvious software bugs.

If appropriate, the following should also be true:

Screens can be viewed without scrolling.
Text is not cut off (because of font problems).
Text on screens cannot be erased.

PART III: Instructional Design

In this section, you will be evaluating the complete instructional experience (courseware in prescribed context) using criteria that is indicative of success in promoting learning. The expertise you need to bring to bear is that of an educator and/or instructional designer.

When evaluating the courseware in this section, you need to go beyond examining only the piece of software. You should be thinking about the entire instructional experience that will occur. Factors contributing to this will include teacher interactions, off-line activities, and any other items described in the instructional guide.

INTERACTIVITY

The student and courseware will be active participants in the learning process when using this courseware in its prescribed context, and will interact in appropriate ways to enhance learning.

1 2 3 4 5 6 7 8 9 10

Limited interaction, passive student <—————> Much interaction between courseware & student

To meet this criteria, the following should be true:

Student input is solicited. (In other words, communication is 2-way.)

The courseware allows students to make decisions about what they want to learn, in what order, and how deeply they want to concentrate on specific topics.

If appropriate, the following should also be true:

There are questions and challenges to monitor student progress.

There is an analysis of student input and useful, appropriate feedback.

There are relevant problems available for the user to solve (with exemplary solutions).

In addition, you may want to look for:

Students are informed of their progress so they can make informed decisions about how to proceed.

The learner can select the kinds of media by which she wants to learn.

The system adapts (its delivery style or content) based on student actions.

COGNITION/CONCEPTUAL CHANGE

The instructional experience will be one where student learning will be significant and long-lasting (a strong and useful cognitive model will be built).

1 2 3 4 5 6 7 8 9 10

Superficial level of understanding <—————> Significant levels of understanding

To meet this criteria, the following should be true:

Reflection/ deep thinking /knowledge integration/making connections is encouraged and supported. It appears that students will be able to transfer what they've learned to areas beyond what is specifically covered in this courseware.

If appropriate, the following should also be true:

Higher order thinking skills (e.g. analysis, synthesis, etc.) are required to progress through the courseware.

Students are encouraged to make predictions, provide self-explanations, or reorganize information.

In addition, you may want to look for:

This courseware has been tested with real students and there is evidence that enhanced learning has occurred for a majority of students.

Mechanisms are provided so that students can monitor their own understanding and correct misconceptions and poor mental models, if necessary.

CONTENT

The content is appropriately chosen and structured.

1 2 3 4 5 6 7 8 9 10

Content seems ill-chosen or structured poorly <—> Content is well chosen & structured

To meet this criteria, the following should be true:

The scope of the content is appropriate for the intended learning task.

There is a default sequencing of material that makes sense for learning (concepts build on each other).

The structure of the knowledge to be learned is clearly conveyed.

The content that is provided has been chosen to build on prior knowledge that students can be expected to have.

If appropriate, the following should also be true:

There are useful links between content areas.

MULTIMEDIA USE

Multimedia is used effectively, with learning goals in mind.

1 2 3 4 5 6 7 8 9 10

Multimedia use distracts from learning <————> Multimedia use adds to learning experience

To meet this criteria, the following should be true:

None of the multimedia representations used are ambiguous, lead to serious misconceptions, or are likely to be misinterpreted by learners.

Media is used appropriately and not gratuitously. Some examples of appropriate use include computer generated animations used to help visualize complex processes or systems, or digital video to present real world examples.

If appropriate, the following should also be true:

Multiple media types are available to support each other. For example, text transcripts are available for audio data, or audio data narrates an animation.

Multiple representations are used to help users construct interrelated knowledge.

In addition, you may want to look for:

The courseware has multimedia elements that in themselves are interactive (e.g. student can interact with animation of a system, pressing buttons or moving levers, etc.).

INSTRUCTIONAL USE/ADAPTABILITY

The courseware can be used successfully in a variety of settings.

1 2 3 4 5 6 7 8 9 10

Can be used only in a single setting <—————> Can be used in many settings

To meet this criteria, the following should be true:

Instructions are provided that clearly explain how this software should be used to be effective, as well as who it is for.

The intended use is NOT so narrowly defined that only a select few could successfully use this software.

There are either suggestions in instructors guide or mechanisms built into the software to assess student learning.

If appropriate, the following should also be true:

The courseware provides opportunities for or suggests options for collaboration with other students.

Help functions and guides are provided.

In addition, you may want to look for:

There are either instructor configurable software settings or clear suggestions for alternative uses in the instructional guide.

This courseware has the potential to improve the way instructors spend their time.

The courseware provides different levels of use (e.g. beginner, intermediate, expert).