Quality Instruction

Building and Evaluating Computer-Delivered Courseware

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Preface

High quality instruction is essential to ensure people learn the knowledge and skills that will enable them to succeed at their jobs. Computer-delivered instruction (including instruction on the Internet) has the potential to provide much of this needed instruction. Although the military and industry are purchasing large numbers of computer-delivered courses, there a lack of methods, supported by empirical and theoretical literature, to determine if this courseware is of good quality. This is true for all types of instruction. However, it is especially critical for computer-delivered courseware because these often do not include an instructor to make adjustments to the instructional content “on the fly.”

The objective of this book is to provide an instructional quality evaluation method (subsequently referred to as the Method) to help instructional developers and instructional program managers determine the quality of their instructional products, both during development and at project completion. The Method also supports the comparison of courseware from different developers or courseware that uses different combinations of instructional media. The Method can be used during all phases of instructional development (i.e., it supports both formative and summative evaluations). Furthermore, it is designed so that an evaluator has the choice of how “deeply” to evaluate, depending on his or her time and other resources.

The Method is based on the results of two earlier efforts. Hays, Ryan-Jones, & Stout (2003) conducted an in-depth review of the literature on learning and instructional evaluation and developed an initial set of evaluation criteria. Hays, Ryan-Jones, & Stout (2005) reviewed additional literature on learning and instructional theories and used these to enhance the initial evaluation criteria and to develop supporting discussions for each criterion. In addition, Likert scaling techniques were used to develop 5-point, anchored rating scales for each evaluation criterion.

The rating scales were designed to “stand alone” if this is the level of evaluation chosen. However, the detailed discussions allow evaluators to obtain additional information on the criteria. The discussions include information on the importance of the evaluation
Quality Instruction

criteria, the empirical support for the criteria, and suggestions for optimizing the instructional quality based on the criteria.

The Importance of Evaluations

Evaluations of instructional programs or products are essential in order to determine if they meet their intended goals. When conducting an instructional quality evaluation, one compares the courseware against one or more standards that have been identified as important contributors to instructional quality. This book presents a set of empirically- and theoretically-based criteria that serve as the standards that enable individuals to evaluate instructional quality.

Two Types of Evaluations

When judging instructional programs and products, there are two main types of evaluations: formative and summative. Formative evaluations are conducted during the developmental stages of program or product development. Formative evaluations are used to identify and correct problems before the instruction is delivered to learners. Summative evaluations are used to assess program or product impacts and outcomes. Summative evaluations are typically conducted after the courseware has been implemented. The results of summative evaluations are used to determine how well the courseware has achieved its intended goals. A saying attributed to Robert Stakes summarizes the distinction between formative and summative evaluations: “When the cook tastes the soup, that’s formative; when the guests taste the soup, that’s summative.” The evaluation Method presented in this book supports both formative and summative evaluations.

The Method

The Method consists of a series of instructional quality criteria that are assigned ratings using anchored Likert scales. It also includes directions for using the scales and detailed discussions about how each of the criteria supports quality instruction. The scales are divided into two main sections: 1) instructional features evaluation criteria, which include four evaluation areas, and 2) user-interface design evaluation criteria, which include three evaluation areas. Each evaluation area includes several evaluation criteria. The scales can be
Preface

used as a “stand alone” evaluation. They allow an evaluator to use the anchor statements and instructions to conduct a meaningful evaluation of instructional programs or products without any additional information. However, if an evaluator has the necessary time and other resources to conduct a more in-depth evaluation, or if he or she wishes additional information on a criterion, he or she may consult the discussion sections. The detailed discussions of each evaluation criterion include definitions of important terms and summaries of the literature that supports the criterion. The discussions also provide suggested techniques to improve courseware by optimizing the instruction from the perspective of each criterion.

Instructional developers and instructional program managers can use the Method during all phases of instructional product development. They can also use it at the level of detail that their time and resources permit. During program or product development, the method can be used to help ensure that no important facet of quality is overlooked. At program or product implementation, the method can help to determine if the instructional courseware is of the highest quality to meet the instructional needs of the learners.

Organization of the Book

Section I includes two chapters. The first chapter discusses the need for instructional quality and the purpose of the Method. Chapter 2 presents a series of 5-point evaluation scales—one for each evaluation criterion listed in Table 1. All the scales include verbal anchors and some include simple examples. The scales are designed to “stand alone.” Using only these scales, evaluators with limited time or resources can still conduct a meaningful evaluation. For more in-depth evaluations, the evaluators can consult the discussions in Sections II and III.

Section II includes five chapters, which provide detailed discussions of the instructional features evaluation criteria. If evaluators are able to devote the time and effort, they can “drill down” into deeper levels of information on one or more of the criteria by reading the discussions in this Section. This is strongly recommended for instructional developers. These discussions provide suggestions on “how to” maximize the score on each criterion. They also include summaries of the literature that supports the criterion.
Chapter 3 is entirely devoted to discussions of the first and most important evaluation criterion (the content is presented in a logical manner). This criterion is influenced by all of the other criteria to some extent. It is recommended that evaluators wait to assign a score on this criterion until all of the other scores have been assigned. Chapter 4 continues the discussion of instructional content by presenting details about the other criteria that influence the quality of content presentation. Chapter 5 examines the criteria used to evaluate the instructional activities that are included in the courseware. The type of activities and the way learners interact with the courseware are major determinants of its effectiveness. Chapter 6 includes discussions of the criteria that are used to evaluate how effectively learner performance is assessed during and at the end of the course. Chapter 7 finishes this section with discussions of the criteria used to evaluate the quality of the performance feedback provided to the learners about how the performed in the course.

Section III consists of three chapters, which discuss the user interface evaluation criteria. These criteria involve how the learner interacts with the computer that delivers the instructional content. Chapter 8 examines the criteria used to evaluate the navigation and operation parameters of the courseware. Chapter 9 includes discussions of the criteria that examine the presentation of the content in terms of its appearance and other uses of sensory modalities. Chapter 10 completes this section with discussions about how a learner installs and registers for the course.

Section IV, the final section, consists of two chapters that provide additional elaborations on the basic Method. In Chapter 11, several adaptations of the Method are presented to evaluate the quality of instructional games. Chapter 12 provides additional details on how to use the Method for both formative and summative evaluations and closes with some recommendations about how the Method can be improved.
SECTION I:
A Method for Evaluating
Instructional Quality

The theoretically- and empirically-based Method presented in this book is intended: 1) to help instructional developers design and deliver higher quality computer-delivered courseware and 2) to help instructional program managers procure higher quality computer-delivered courseware. This section includes two chapters. Chapter 1 explains why we need higher quality courseware and Chapter 2 presents a series of rating scales that are used to determine the quality of the courseware.
CHAPTER 1:
Why Quality Instruction?

The Need for Instructional Quality

Effective learning and, ultimately, improved job performance are the goals of all instructional systems. In recent years, many organizations, including academia and those in the public and private sectors, have turned to computer-based instruction and distance learning (e.g., internet-delivered) approaches as alternatives to traditional, lecture-based courses. However, the majority of instructors surveyed by the National Education Association (over 50%) believe that their traditional course in the same subject matter does a better job in meeting educational goals than their distance-learning course (National Educational Association, 2000). This book presents a Method to help improve the quality of all forms of computer-delivered instruction (including web-based courseware).

In order to help ensure that all instructional programs or products meet their instructional goals, instructional developers and project managers need to evaluate them during development and at the time of delivery. This Method will help them in these endeavors. The development of the Method leveraged earlier work on guidelines for designing web-based instruction (Hamel, Ryan-Jones, & Hays, 2000) and a set of initial instructional quality evaluation criteria (Hays, Ryan-Jones, & Stout, 2003). Hays, Ryan-Jones, and Stout (2005) revised the initial set of evaluation criteria and developed the anchored rating scales for each criterion. They also presented discussions of each criterion. This book includes the rating scales and expanded discussions of each of the criteria. It also includes some adaptations of the Method to evaluate instructional games.

Education or Training?

A distinction is sometimes made between education and training. Education is often regarded as the teaching of general knowledge, while training is believed to focus on the teaching of specific, job-relevant skills. This Method does not dwell on this distinction because it is assumed that both education and training require instruction. In discussions of the evaluation criteria, the term
**Quality Instruction**

Instruction is used to refer to both education and training. Instruction is a structured process through which individuals learn new knowledge and skills. Therefore, learning is the product of the instructional process. If we want effective learning, we need to ensure that the process is working as effectively as possible. The Method provides a way to evaluate the quality of both education and training.

**What is Quality?**

Most people would agree that quality is important in the products we buy, the items we create, and in our “quality of life.” However, less agreement is found when we try to define quality. Hays et al. (2003) discussed some of the ways quality has been defined and conclude that quality is found in the interaction of persons with the world and that it is defined by the standards they set. Botha (2000) described six conceptions of quality, as the term is applied to instructional products.

- **Quality as “exceptional.”** In this sense, saying an instructional product is of high quality means that it is something special, distinctive, of high class, and surpassing very high standards. It is an example of “excellence.”
- **Quality as “perfection.”** This conception of quality means that there are minimal defects (absence of defects) in an instructional product, when measured against a set of standards.
- **Quality as “fitness for purpose.”** When an instructional product does the job it is designed for (e.g., it meets its instructional objectives), it can be said to be of high quality.
- **Quality as “facilitating changes” in learners.** When a learner takes a course, it is with the intent of learning new knowledge, skills, and abilities (KSAs), which are influenced by the learner’s attitudes (affect). The instructional product is intended to transform the learner. If these changes enable the learner to excel in his or her chosen field, the product can be said to be of high quality.
- **Quality as “value for money.”** Instructional products must be “purchased.” If the organization that procures the product believes they have received good value for their investment, the product can be said to be of high quality. For
instructional products designed for military and industrial instructional users, the most unambiguous method to determine good value is demonstrated improvement in job performance or alternatively, demonstrated equivalent job performance for lower instructional costs.

The Purpose of the Instructional Quality Evaluation Method

Broadbent and Cotter (2003) observed that the word evaluation is derived from the word “value.” A quality evaluation seeks to establish the value of the instructional programs or products that are developed and procured. To accomplish this, the instructional programs or products should be evaluated against criteria that address all of the conceptions of quality listed above. The Method provides a set of criteria that meets this objective. These evaluation criteria are shown in Table 1, which also serves as a summary sheet for accumulating evaluation scores. The evaluation criteria are divided into two main sections: instructional features criteria and user interface criteria. Although many of the criteria apply to all forms of instruction, the main focus of the method is the evaluation of computer-delivered courseware that is designed for use without the presence of an instructor.

Formative and Summative Evaluations

The Method supports both formative and summative evaluations. Formative evaluations are conducted during courseware development. They normally focus on the efforts of the development team so modifications and corrections can be made before they negatively impact learning. Summative evaluations are conducted after the courseware has been implemented. They focus on the effectiveness of the instruction and how learners are able to use their new knowledge and skills. The discussion sections for each criterion include recommendations for how to use the Method for both formative and summative evaluations.
### Table 1: Instructional Quality Evaluation Summary Sheet

<table>
<thead>
<tr>
<th>Instructional Features Evaluation</th>
<th>Score (1-5)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rating Criteria</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1. Instructional Content</strong></td>
<td></td>
</tr>
<tr>
<td>1.a. The presentation of content is logical (note: rate this after the other criteria).</td>
<td></td>
</tr>
<tr>
<td>1.b. The purpose of the course is clearly stated.</td>
<td></td>
</tr>
<tr>
<td>1.c. The instructional objectives are clearly stated.</td>
<td></td>
</tr>
<tr>
<td>1.d. The content supports each and every instructional objective.</td>
<td></td>
</tr>
<tr>
<td>1.e. The content is free of errors.</td>
<td></td>
</tr>
<tr>
<td>1.f. The content is job-relevant.</td>
<td></td>
</tr>
<tr>
<td>1.g. “Authority” for content is clearly stated.</td>
<td></td>
</tr>
<tr>
<td>1.h. There are clear indications of prerequisites.</td>
<td></td>
</tr>
<tr>
<td>1.i. There are clear indications of completed topics.</td>
<td></td>
</tr>
<tr>
<td>1.j. Sources for more information are available.</td>
<td></td>
</tr>
<tr>
<td><strong>Content Subtotal</strong></td>
<td></td>
</tr>
<tr>
<td><strong>2. Instructional Activities</strong></td>
<td></td>
</tr>
<tr>
<td>2.a. Activities are relevant (all support LOs &amp; job requirements).</td>
<td></td>
</tr>
<tr>
<td>2.b. The learner is required to interact with content.</td>
<td></td>
</tr>
<tr>
<td>2.c. Instruction is engaging (attracts and maintains learners’ attention).</td>
<td></td>
</tr>
<tr>
<td>2.d. Instructional media directly support learning activities.</td>
<td></td>
</tr>
<tr>
<td><strong>Activities Subtotal</strong></td>
<td></td>
</tr>
<tr>
<td><strong>3. Performance Assessment</strong></td>
<td></td>
</tr>
<tr>
<td>3.a. Assessments are relevant.</td>
<td></td>
</tr>
<tr>
<td>3.b. Assessments are logical.</td>
<td></td>
</tr>
<tr>
<td>3.c. Assessments are varied.</td>
<td></td>
</tr>
<tr>
<td><strong>Assessment Subtotal</strong></td>
<td></td>
</tr>
<tr>
<td><strong>4. Performance Feedback</strong></td>
<td></td>
</tr>
<tr>
<td>4.a. Feedback is timely.</td>
<td></td>
</tr>
<tr>
<td>4.b. Feedback is meaningful (related to objectives).</td>
<td></td>
</tr>
<tr>
<td>4.c. Positive reinforcement is provided for correct responses.</td>
<td></td>
</tr>
<tr>
<td>4.d. Remediation is provided for incorrect responses.</td>
<td></td>
</tr>
<tr>
<td><strong>Feedback Subtotal</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Instructional Features Subtotal (carry to next page)</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: No matter what the overall score, a score of one (1) on any criterion should be considered a major problem and requires redesign of the instructional product. A score of two (2) on any criterion should be considered a problem and may require redesign.*
### Table 1: (Continued)

#### User Interface Evaluation

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Score (1-5)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5. Navigation and Operation</strong></td>
<td></td>
</tr>
<tr>
<td>5.a. User Interface makes course structure explicit</td>
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<td>5.c. Help function is available to explain navigation &amp; operation features.</td>
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</tr>
<tr>
<td>5.d. Includes all necessary navigation and operation controls.</td>
<td></td>
</tr>
<tr>
<td>5.e. Navigation &amp; operation controls are clearly and consistently labeled.</td>
<td></td>
</tr>
<tr>
<td>5.f. Navigation &amp; operation controls are located in consistent place.</td>
<td></td>
</tr>
<tr>
<td>5.g. Navigation &amp; operation controls function consistently.</td>
<td></td>
</tr>
<tr>
<td>5.h. Course show’s learner’s location.</td>
<td></td>
</tr>
<tr>
<td>5.i. Course show’s how learner arrived at location.</td>
<td></td>
</tr>
<tr>
<td>5.j. Course show’s estimated time required for each module.</td>
<td></td>
</tr>
<tr>
<td><strong>Navigation &amp; Operation Subtotal</strong></td>
<td></td>
</tr>
<tr>
<td><strong>6. Content Presentation</strong></td>
<td></td>
</tr>
<tr>
<td>6.a. There are no sensory conflicts.</td>
<td></td>
</tr>
<tr>
<td>6.b. All media are clear and sharp.</td>
<td></td>
</tr>
<tr>
<td>6.c. Screens are aesthetically pleasing.</td>
<td></td>
</tr>
<tr>
<td>6.d. Multi-modal presentation of content is used.</td>
<td></td>
</tr>
<tr>
<td>6.e. Multi-media presentation of content is used.</td>
<td></td>
</tr>
<tr>
<td>6.f. Media are easy to use.</td>
<td></td>
</tr>
<tr>
<td>6.g. External hyperlinks are kept to a minimum.</td>
<td></td>
</tr>
<tr>
<td><strong>Presentation Subtotal</strong></td>
<td></td>
</tr>
<tr>
<td><strong>7. Installation and Registration</strong></td>
<td></td>
</tr>
<tr>
<td>7.a. Course does not require installation or learners can install the course without assistance.</td>
<td></td>
</tr>
<tr>
<td>7.b. Minimal “plug-ins” are required.</td>
<td></td>
</tr>
<tr>
<td>7.c. “Optimization” test is available.</td>
<td></td>
</tr>
<tr>
<td>7.d. Technical support is available.</td>
<td></td>
</tr>
<tr>
<td>7.e. Registration is simple &amp; straightforward (or not required).</td>
<td></td>
</tr>
<tr>
<td><strong>Installation and Registration Subtotal</strong></td>
<td></td>
</tr>
<tr>
<td><strong>User Interface Subtotal (from this page)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Instructional Features Subtotal (from previous page)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total Quality Score (sum of subtotals)</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Note: No matter what the overall score, a score of one (1) on any criterion should be considered a major problem and requires redesign of the instructional product. A score of two (2) on any criterion should be considered a problem and may require redesign.*
Description of the Method

The instructional quality evaluation method (the Method) uses anchored rating scales so evaluators can assign a score on each evaluation criterion. The anchor statements below the scales help to standardize the evaluations make the scales easier for the user. The scales are the essence of the method. They are designed to support an evaluation without the need to consult additional information. If an evaluator has limited time or other resources, the scales contain all of the necessary information to conduct a meaningful evaluation. However, if the evaluator has enough resources, he or she may conduct an “in-depth” evaluation. The discussions can also be used to obtain additional information on the importance of a criterion and help the evaluator understand the empirical and theoretical research that supports it. These discussions include definitions of terms and recommendations for designing instructional programs or products. The discussions also include suggestions for locating resources that provide additional details.

The detailed discussions (Sections II and III) are necessary because evaluation of instructional programs or products is not an easy task. The more an evaluator understands the importance of each criterion, the better he or she will be able to assign a score. Evaluation usually requires the evaluator to invest time and attention for a detailed review of the courseware. In essence, the evaluator may have to “take the course,” sometimes multiple times from different perspectives (e.g., a novice learner, an experienced learner, an instructor, etc.). An example of the recommended steps to follow in evaluating courseware is shown in Table 2 (Coursestar, 2003). This is a good beginning. However, the Method presented in this book is much more elaborate and quantitative. It allows individuals to evaluate courseware on a comprehensive set of empirically- and theoretically-based criteria that support learning.
Chapter 1: Why Quality Instruction?

Beyond “buzz words”. Many existing evaluation approaches recommend criteria, such as “the content has educational value,” “presentation of content is clear and logical,” “graphics are appropriate,” “package is motivational,” or “feedback is effectively applied.” However, these criteria are seldom explained, nor are they accompanied by some form or “anchored” evaluation scale. Also, the terms used in these criteria are usually left to the user to define. Without specific, standard definitions of terms and explanations of the context where each term is applied, evaluators could actually be evaluating different concepts. Therefore, this Method includes “anchored” evaluation scales and the discussions includes definitions and explanations of all terms and how the terms are used in the context of the evaluation criteria.

A Systems Approach. An instructional system (or training system) is the planned interaction of people, materials, and techniques, which has the goal of improved performance as measured by established criteria from the job (Hays, 1992; 2006). The people in an instructional system include, but are not limited to: the learner, the instructor, the course developer(s), effectiveness evaluators, administrators, logistics managers, subject matter experts, instructional media designers and implementers, and sometimes on-the-job supervisors. Some of the materials in an instructional system are: instructional content, instructional media, devices, documents, job-specific equipment, and evaluation instruments (such as the evaluation scales presented in this book). Some of the techniques employed in instructional systems include: needs analysis, instructional design approaches, instructional aids design methods, instructional effectiveness evaluation methods, logistics analysis, and cost-benefit analysis (often called return on investment analysis). Finally, some of the interactions, which take place in instructional systems, include those during development and evaluation. They also include instructor-learner interactions, learner-content interactions, and learner-learner interactions that take place during instruction.