Constructivism's Implications For Formative Evaluation

Charles Lake
Faulkner State College

Martin Tessmer
University of South Alabama

Introduction

Advocates of constructivism claim that a "revolutionary" paradigm shift is occurring, one that radically affects the foundational principles of instructional design (Bednar, Cunningham, Duffy, & Perry, 1991). Opponents of constructivism refute its tenets, replying that constructivist theories are not established with sufficient empirical research to support an alternative prescriptive instructional theory (cf. Jonassen, 1991). In the process of such discourse, factions have emerged within the field of instructional design relative to where designers place themselves in their approaches to learning theory and instructional design (Cooper, 1992).

Educational technologists subscribing to constructivism have described its impact on the instructional design field in general (Lebow, 1993; Ertmer & Newby, 1993). However, there is little research on how constructivist principles impact particular design tasks such as needs assessment or formative evaluation. While formative evaluation is considered one of instructional design's defining activities (Tessmer, 1993; Braden, 1992), constructivist literature has not yet treated it in depth. Several otherwise comprehensive discussions of constructivism and ID practice have omitted formative evaluation (Wilson, Teslow & Osman-Jouchoux, 1995; Willis, 1995). Dick (1992) has questioned how constructivists may conduct formative evaluations without depending upon objective performance data.

This presentation will indicate how the planning and conduct of formative evaluation can change in light of constructivist theory, and how these changes raise further evaluation questions that are yet unanswered.

Constructivist Assumptions

From Kant to Vygotsky, constructivism has a variety of schools of thought and degrees of epistemological extremism (Phillips, 1995; Reeves & Okey, 1996). However, there are at least four general constructivist assumptions that impact formative evaluation (Wilson et al, 1995; Lebow, 1995; Bereiter & Scardamalia, 1992). They are:

- knowledge is constructed, not discovered, by the learner;

- learning is a social process of negotiated meanings;

- the role of a teacher (or other form of instruction) is to scaffold student's learning, and

- learners should participate in establishing goals, tasks, and methods of instruction.

While these assumptions affect a wide variety of formative evaluation practices, we will focus on several of the most distinct changes to traditional evaluation goals and processes. These changes do not so much disprove classic formative evaluation goals and tasks as much as to redirect them into less popularized evaluation roles, tasks and tools. The tenets of Constructivism suggest evaluation options that have received little published consideration.

Constructivist Implications for Evaluation Goals, Roles, Tools & Stages

Evaluation Goals - the major goal of formative evaluation has been to improve instruction, although final evaluation stages may also seek to prove instructional effectiveness via objectives-based performance (Tessmer, 1993; Markle, 1989). In addition to learner and expert commentary, the goals of improvement and effectiveness are assessed by learner performance on objectives. These objectives are set by designers or evaluators (Dick & Carey, 1996).

Constructivism maintains the basic formative evaluation goal of instructional improvement. However, the learning objectives are now set by the learners, as part of the design team. Moreover, the learning process, as opposed to product (objectives) is an indicator of revision needs and success measures. There is a shift from asking *if* the learner learned to *what* the learner acquired during learning and *how* they acquired it. Congruent with a goal-free evaluation approach, the "what" routinely includes unanticipated objectives that emerge from the learning enterprise (Willis, 1995). The "how" includes knowledge exploration skills or reflective self-knowledge obtained by learners during instruction (Lebow, 1995; Jonassen, 1992a).

Learners' evaluation roles - formative evaluation has traditionally used learner comments and performance to improve drafts of instructional materials. The evaluator then interprets these comments to decide upon revisions that must be made. Materials are usually designed and produced apart from the learner, with revisions made by developers (Dick & Carey, 1996; Tessmer, 1993).

A constructivist evaluation will emphasize the learners' role in*designing* and *revising* the instructional materials: the learner helps determine the objectives, features and strategies of the materials. As part of a design team, the learner reacts to the team's instructional plans, helping to propose production features, strategies, even objectives (Jonassen, 1991; Lebow, 1995). Characteristic of problem based learning approaches (Savery & Duffy, 1996) the learner gains ownership of the problem solving process (instructional design) as well as the problem itself (what has been designed).

This evaluation-design process has been successfully used with learners as young as early elementary school, who have designed multimedia strategies and interfaces by reacting to a prototype of the multimedia (Reiber, 1995). From the constructivist perspective, formative evaluation becomes more merged with the design process as a continuous strand of front-end analysis, although discrete learner or expert reviews may be taken at latter stages. The process also facilitates constructivism's need for multiple perspectives in the evaluation process (Jonassen, 1992a).

Evaluation tools - Formative evaluation emphasizes learner's role in evaluating drafts of instruction. However, if learners are to participate as team members in collaborative evaluation and design, formative evaluation efforts will initially precede the creation of draft materials. To focus a collaborative evaluation, two pre-draft instructional versions may be used: design scenarios (Willis, 1995; Tessmer & Wedman, 1995) or prototypes (Reiber, 1995; Wilson, et al, 1995; Willis, 1995).

A prototype is an abbreviated but operative version of the instructional product, more like a shortened final version than a rough draft. Prototypes can be used to visualize the characteristics of the final product, and to negotiate strategy and media features of the final product. Scenarios are verbal descriptions of the implementation of the instruction: the scenario tells a story about the instructional context in which instruction will be used (Tessmer & Wedman, 1995).

A design team may use a scenario to illuminate how the product will be used, the characteristics of the learners and teachers who use it, and the contextual factors that inhibit or facilitate its use. Scenarios and prototypes facilitate an "analysis-by-synthesis" approach that allows for collaborative and contextual instructional evaluations (Tessmer & Wedman, 1995). These tools are congruent with the learner's ownership of the evaluation process and role as instructional designer and reviser.

Evaluation stages - formative evaluation has traditionally involved four major stages: expert review, one-to-one evaluation, small group evaluation, and field test. In these stages two assumptions are implicit: 1) experts evaluate instruction separately from learners, 2) learners' individual comments and performance (with the exception of cooperative learning) are compiled by the evaluator to indicate revisions (Nathenson & Henderson, 1982; Dick & Carey, 1996).

Formative evaluation theorists have warned that interviewing more than one learner reduces evaluaton effectiveness (Dick & Carey, 1996). However, constructivism stresses the role of learner collaboration and negotiation of instructional meaning. Not only is knowledge socially constructed but (in formative evaluation) the instruction's weaknesses and revisions are collaboratively determined by a community of learners (and experts). This negotiation process can be facilitated by one of the alternatives to standard formative evaluation methods: the *focus group* (Tessmer, 1994). A hybrid of one-to-one and small group approaches, The focus group can involve either learners or learners and experts (teachers, producers) in the evaluation process. In this process, instructional strengths, weaknesses and revisions are discussed, with group negotiation and consensus replacing individual error spotting or designer-subject interviews.

The focus group allows learners and experts to collectively evaluate and revise instruction. Such a process facilitates the exchange of perspectives as much as information. For example, learners can perceive the didactic beliefs of teaching experts or the content needs of subject experts. At the same time, these experts (and the designers) can perceive learner needs and desires via a dynamic conversation about, not examination of, the instruction

Using Constructivist Roles and Goals: An Exploratory Study

To illustrate how the preceding constructivist approaches might yield a different set of formative evaluation data, we asked two groups of community college freshmen to evaluate a rough instructional draft. The draft was a six-page print introduction to the Internet for novices.

The aim of this trial study was to determine if a change in evaluation goals and roles, two of the four constructivist implications discussed in this paper, might yield different types of revisonary information. The major research questions were:

1. *Evaluation roles - What types of revisionary information is produced when learners assume the peer roles of expert and designer rather than student evaluators*? To investigate this question two groups of three students were asked to individually edit the text for use by their classmates. Each group acted as editors rather than reacting to prepared one-to-one evaluation questions posed and controlled by the evaluator.

Figure 1
Revisions Identified by Two Three-Person Student Editorial Groups

Revisions From Each Group	Single Group Revisions
• Added explanations*	
• Revised unclear statements	• Revised word spacing*
• Replaced technical wording*	• Revised factual content*
• Clarified punctuation	• Deleted unnecessary content*.
• Requested more information from experts.	

** less likely to occur in one-to-one evaluations*

Acting as editors, learners made revision decisions rather than just identifying weaknesses for which the designer made revisions. These results indicate that learners were able to adapt to the role of an "expert" evaluator. Their evaluation role was more that of designer and reviser, with more ownership into the design process, than might occur in an evaluator-led one-to-one evaluation. In a one-to-one evaluation, learners react to prepared

questions and structured guidance from the evaluator, primarily to identify areas that are unclear (Tessmer, 1994; Dick & Carey, 1996).

In a second study, 16 novice learners were asked to individually review the draft and answer a questionnaire about the instruction, similar to a small-group formative approach. Eight learners were randomly assigned to a group asked to identify areas where the instruction was unclear. These questions followed a more traditional, learner-reactor approach. The other eight learners were asked to assume the role of teachers and indicate changes they would make to the materials. These questions followed a more constructivist, student-expert role.

Figure 2.
Types of Revisions Identified by
Classic vs. Constructivist Question

What Was Unclear? (Classic)	***If You Were Teaching..* (Con.)**
8 Novices - 10 Comments	8 Novices - 10 Comments
• Unclear statements = 7	• Content addition = 3
• Strategy change = 1	• Teaching strategy = 1
• Content addition = 1	• Additional detail - 1
• Nothing at all = 1	• All OK = 5
7 "Sophisticates" - 4 Comments	7 "Sophisticates" - 4 Comments
• Unclear statement = 1 • All OK = 3	• Content addition = 3 • Strategy addition = 1

Conforming to the classic formative evaluation approach, students were given a rough draft of the print instruction as part of their initial evaluation. The major changes to the traditional approach were that different questions were asked and different evaluation roles were adapted, as well as a change in grouping (independent group review vs. one-to-one evaluator-directed).

Based on the results of this initial study, the constructivist approach questions and roles yielded somewhat different revisionary data from the traditional approach, as well as including much of the data that an evaluator

might expect from the traditional questions and roles. The constructivist approach yielded several more content additions than the classic approach and a suggestion for a completely new instructional strategy.

2. *Evaluation goals - do learners generate objectives beyond those intended in the lesson*?
To investigate this question learners were asked to describe what they learned, not if the instruction met prespecified objectives or what they thought the objectives might be. Example comments of unanticipated learnings would be “

The sixteen students of the second study were asked to describe what they had learned from the lesson. The majority of comments were about content memorized or skills acquired (25 comments on 17 different content areas), directly or indirectly reflecting the lesson’s intended objectives. No unintended outcomes were generated, other than two comments about the ease of learning the Internet. Based on their comments, students mainly learned what was planned for them, and the formative evaluation question did not reveal unanticipated learnings.

The lack of unintended learning results from students may have been due to students believing that they were to describe the literal contents of the lesson, instead of reflecting upon their own personal learning. Thus, students may require training to answer such a question, particularly if they are schooled in passive learning roles. In passive roles they are expected to grasp the instruction’s objectives, not generate their own learning from it. In addition, the relatively simple and direct lesson content may not have allowed for much knowledge exploration or personal interpretation. The formative evaluation of unanticipated outcomes may be better suited to richer learning environments such as problem based learning, collaborative learning or computer-based microworlds.

Study Limitations

This study did not give students the opportunity to engage in a constructivist-oriented concurrent design and evaluation process. In this process the students would participate in the initial content analysis, strategy selection, and message design, prior to evaluating any prepared drafts or prototypes. This concurrent process could lead to a different set of revisionary suggestions and a

different set of instructional materials, compared to those generated by traditional one-to-one and expert review processes.

The number and type of comments is determined in part by the sophistication of the materials and the skills of the student reviewers. That is, materials with glaring content omissions or poorly designed strategies may invite revisions from learners, whether a classic or constructivist approach is used. Similarly, highly sophisticated or critical learners may take on the role of expert and designer regardless of the role assigned to them. In this study the materials were relatively prepared and polished, and the learners were naive and hesitant about the evaluation process, so these caveats may not have influenced this study. However, future studies should utilize diverse groups of learners and materials to more accurately determine their influence on constructivist evaluation approaches.

Summary

Constructivist perspectives have generated some alternative perspectives to instruction and instructional design. Specifically emerging constructivist perspectives on evaluation and learning suggest alterations to more traditional approaches to formative evaluation. Evaluators do not have to be constructivists to embrace these alterations in methodology and tools, nor do they need to develop instruction from a constructivist perspective. For example, the use of alternative evaluation goals and roles may be as profitable to a programmed instruction text lesson as well as a problem-based multimedia module. Evaluating instruction for the presence of constructivist approaches, on the other hand, would necessitate a normative list of instructional features for the instruction (generative learning, reflection, personal meaning, scaffolding, etc.)

Future formative evaluation theory will generate a more extensive list of constructivist-based evaluation procedures and questions. Evaluation research will determine the informational benefits of using these procedures and questions to not only revise instruction, but to design it as well.

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