An Assessment of Lesson Review as a Formative Evaluation Tool

MTC Report #8

January 1977

Eileen Call-Hirwich

COMPUTER-BASED EDUCATION RESEARCH LABORATORY
UNIVERSITY OF ILLINOIS, Urbana-Champaign

An Assessment of Lesson Review as a Formative Evaluation Tool

MTG Report #8

January 1977

Eileen Call-Hirwich

COMPUTER-BASED EDUCATION RESEARCH LABORATORY
UNIVERSITY OF ILLINOIS, Urbana-Champaign

This research was supported in part by Advanced Research Projects Agency of the Department of Defense under U.S. Army Contract DAHC-15-73-C-0077 and indirectly by the National Science Foundation (USNSF C-723).

Acknowledgements

I would like to thank the staffs of the MTC and PEER groups for tneir contributions to the content and form of this report. I'd especially like to thank Al Avner, Larry Francis, Alec Himwich, and Lynn Misselt.

Special thanks also to Elaine Avner for proofreading and editing and Julie Garrard for typing the manuscript.

Table of Contents

Abstract

For the last three years the Military Training Centers (MTC) PLATO support group has been experimenting with the development of a number of formalized techniques for assisting authors in writing instructionally effective courseware. These methods, collectively referred to as "lesson reviewing", vary widely depending on individual authors' needs. Basically, however, a lesson review is a set of comments about the lesson ranging from alternative instructional strategy suggestions to grammatical corrections, from content accuracy to punctuation (see Lesson Review, MTC report #3, 1976, Larry Francis, Merle Goldstein, and Eileen Call-Himwich for examples and complete descriptions of review techniques).

This report describes the evolution of the lesson review process and discusses review effectiveness in terms of resulting lesson revision and author training. The report also details a number of recommendations for improving review effectiveness in the future. The foliowing areas:

--reviewer characteristics
--reviewer/author relationship
--review content/format

are emphasized. Some specific recommendations are that the reviewer should be on-site, that the reviewer's actual or perceived authority should be equal to the author's, and that the reviewer and author should reach either a contractual or lesson formalized agreement about the purpose of the review and about what specific feedback each expects.

Preface

Due to the personal nature of critiquing lessons, data for the following report is largely anecdotal. Some information has also been gathered through the questionnaire in Appendix A or in face to face or phone interviews. During the course of our "reviewing" experiments and evaluation work, we have observed a marked inconsistency between what authors say and what they do. Some authors replied with nothing but praise both to reviews themselves and to the questionnaire, but had rarely responded to anything more than the most rudimentary recommendations in reviews. This dichotomy proved to be our nemesis for quite a time before we finally began hearing the "metatalk" underneath the words--what was really being communicated rather than the words that were being said.

Introduction

For the last three years the Military Training Centers (MTC) support group has been experimenting with the development of a number of formalized techniques for assisting authors in writing courseware that is more instructionally effective. These methods, collectiveiy referred to as "lesson reviewing", vary widely depending on individual authors' needs. Basically, however, a lesson review is a set of comments about the lesson ranging from alternative instructional strategy suggestions to grammatical corrections, from content accuracy to punctuation.

Lesson reviewing was originally conceived for the dual purpose of:

1. aiding authors in lesson revision
2. training authors in instructional design.

The purpose of the following report is to both describe the evolution of the lesson review process and discuss review effectiveness in terms of lesson revision and author training.

Lesson Reviews

Rationale

When the MTC group first began reviewing lessons, the rationale behind the need for reviews was grounded in a threefold problem. First, while a number of ARPA authors had teaching experience, few were familiar with either computer-based education or instructional design. Many authors found the transition from classroom to computer both perplexing and frustrating. What once could have been taught in a lecture format now required a more innovative approach. Instructors who could once comfortably rely on standardized course objectives and lists were suddenly wrestling with the subtleties of student behavioral objectives and credible criterion testing. In addition, since the MTC group offered a two to three week course in both the TUTOR language and the rudiments of instructional strategy, many authors felt somewhat harried over having to learn TUTOR, instructional design, and the mechanics of the PLATO keyset and editor all at one time. Part of that frustration was the sometimes stated, more often implied conviction that instructional design seminars "interrupted" the "more important" task of learning TUTOR. Having trained a number of diverse author groups, we've found the premise that instructional strategy is basically intuitive and that authors need little if any assistance in lesson design to be a particularly persistent, widely held attitude. This is especially true of former instructors who sometimes feel that knowledge of one medium implies knowledge of another medium, i.e. success in a lecture situation implies "knowing how to teach" using an approach even as dissimilar and individualized as CBE.

Another element of author frustration, however, was also the problem of being bombarded with a variety of new concepts simultaneously. Thus, the MTC group saw lesson reviewing as one method of continuing training even after authors had returned to their sites.

Finally, even experienced authors can benefit from an outside, objective appraisal of their work, particularly in those areas not readily analyzable from student performance data, i.e. amount of interaction, organization, alternative approaches, visual presentation, etc.

Lesson reviewing, though by no means ideal, seemed a potentially effective way of handling all three situations.

Evolution of the Reviewing Process

End-of-lesson reviews. Although MTC did a few early reviews at Chanute, the first formalized reviews were written for the Aberdeen Machinist Course Project at Aberdeen Proving Grounds. By the end of the Aberdeen project, approximately fifteen MTC-reviews had been written. These early reviews, later referred to as "end-of-lesson" reviews, were often a combination of coding and instructional design suggestions with the main emphasis on the latter. While the tone and slant of each review certainly varied with individual reviewers, end-of-lesson reviews all had a number of common characteristics.

1. They were always written after the lesson had been completed.
2. They were always rendered in written form, frequently including an annotated printout of the lesson suggesting coding changes, textual revisions etc.
3. They generally required from one to two months to be written and delivered to the author.

The substance of end of lesson reviews centered on any or all of four levels of lesson development:

--planning
--design
--implementation
--polish

Each level in turn spanned a variety of possible problem areas and recommendations or suggestions for alternatives. The following examples detail many of the sorts of issues that were dealt with.

Level One--Planning

--intentions, goals, objectives of the lesson
--assumptions about students' entering ability and knowledge of the subject (e.g. terminology)
--the relationship between the individual lesson and the overall curriculum
--the relevance of individual topics to the lesson as a whole

Level Two--Design

--choice of teaching strategies
--selection/appropriateness of media
--individualized routing
--organization of content.

Level Three--Implementation/Development

--effective utilization of teaching strategies and medium
--corrective feedback and remediation
--appropriateness of tone and style
--reliability of the criterion test (if present)
--transition from frame to frame, topic to topic
--quality and quantity of student interaction
--clarity of text
--appropriateness of reading level, illustrations, etc.

Level Four--Polish

--grammar, spelling, typographical errors, etc.
--consistency of terminology, instructions, keys, etc.
--visual presentation (including textual layout)

Reviews were generally formated to include the following elements:

1. a cover letter enumerating the major points brought out in the body of the review

2. approximately six pages (reviews ranged from 4-11 pages) of general comments and suggested changes

3. flowcharts of both the present lesson structure and suggested organizational revisions

4. an annotated printout of the program itself with line-by-line textual or coding suggestions.

For a complete description of Aberdeen lesson development, reviews and courseware see Summary and Analysis of Aberdeen CBE Project (Call-Himwich, 1977; Himwich, 1977)

While Aberdeen authors usually claimed that the comments and suggestions they received in reviews were "useful" and "helpful", they also seemed inclined to simply file reviews away and forget about them. MTC reviewers conceded that they generally had scant success with getting authors to make anything other than superficial lesson revisions (i.e. correcting misspellings, etc.). In addition it was often difficult to get authors to comment about the reviews themselves with anything more than a perfunctory "thank you". MTC reviewers felt that definite changes in reviewing needed to be made. The establishment of the Sheppard project presented an excellent opportunity to experiment with alternative review methods.

Reviewing pitfalls. Hampered by a lack of author feedback, MTC reviewers were forced to draw their own conclusions about the new form or direction reviews should take. They began by assuming that the quality of the reviews was not in question, but rather that other more subjective or ambiguous elements were involved. The fact that authors were so reluctant to talk about reviews seemed to support the assumption

that feelings rather than issues were at stake. Thus, MTC turned its attention from revising review comments to revamping review techniques, and from the impact reviews had on lessons to the effect they had on authors. In emphasizing the subjective elements of reviews, reviewers set about trying to pinpoint the possible technical or psychological pitfalls in effect at the time a lesson was reviewed.

Psychological Elements. From MTC's perspective, three psychological factors played heavily in the acceptance or rejection of a lesson review. First and most obvious was the problem of the author's subjective involvement in the lesson. As one (male) author effused, "Writing lessons is a very creative, difficult thing. It's like giving birth." Thus, just as artists sometimes find it difficult to separate themselves from their work, authors often find it difficult to separate themselves from their lessons. To criticize the lesson was to criticize the author. This was especially true if the author and reviewer had never met. In this instance the reviewer was often regarded more as an adversary than an ally, the review itself more as a threat than a tool.

Apart from the question of subjectivity, there was the problem of time. A thorough end-of-lesson review typically required a number of weeks to prepare. During that time the author had usually begun work on a new lesson. Since enthusiasm for the old lesson was usually replaced by the preoccupation and momentum of work on the new lesson, revision was often relegated to a limbo status to be carried out "as soon as this new lesson is finished". As the old lesson got "colder", revision seemed less and less important until it was easiest to regard a lesson as "finished" simply because coding was complete.

Perhaps the most detrimental drawback of end-of-lesson reviews, however, was the problem of the part versus the whole. Any task is more burdensome viewed as a whole rather than in parts. Singly, each criticism or suggestion a reviewer made may have seemed reasonable. Collectively, however, the suggested changes may have been overwhelming. After receiving a printout annotated in red ink, one author ruefully observed, "It looks like it bled to death." He also chose to ignore it.

Technical Elements. The two major technical problems we perceived centered around one outstanding dilemma--time. At the ARPA sites we worked with, authors were under considerable pressure to meet semester dates, project deadlines, etc. Thus, they sometimes felt an understandable reluctance to "waste time" revising lessons which were essentially considered finished.

In addition, reviewers sometimes found themselves suggesting changes which would have required a major overhaul. The need for such substantial revision might well have been averted had the author and reviewer been able to consult in the planning stages, using the review as a proposal rather than a post mortem.

The problem of author/reviewer consultation was also a stumbling block. Almost by definition, an end-of-lesson review was a lengthy, one-sided excursion through the lesson's strengths and shortcomings. This monologue quality, coupled with the other inhibitive elements, probably did little to enhance any real exchange of ideas between author and reviewer.

In-progress reviewing. With the onset of the Sheppard AFB paramedical project, NTC felt that the time was right for experimenting with different review techniques. The main problem was to develop a flexible process that could:

1. reduce author defensiveness by examining the lesson before the author's subjective involvement became too strong

2. capitalize on lesson momentum by giving the author immediate feedback while the lesson was still "current"

3. optimize author time by enabling the author to make any necessary modifications or corrections before they became habitual.

The most reasonable first step seemed to be to begin reviewing lessons as they were being written, in bits and pieces and at various stages of development. To maintain continuity and an overall perspective, in-progress reviewing was intended as a cumulative (rather than fragmentary) approach in which the reviewer would reexamine "old" sections of a lesson in addition to each successive "new" section. Since the reviewer had only to deal with part of a lesson at a time, review comments could be written much more quickly. In order to provide immediate feedback we also established an on-line "review" file in which reviewers wrote general comments, and authors were encouraged to make replies or rebuttals, ask questions, etc. Additional more specific comments were then sent somewhat later (usually within the week) in a hardcopy form along with a lesson printout mainly noting suggestions for textual changes, alternative wordings, etc. The only problem was that since the author was continually revising and expanding the lesson the hardcopy comments were sometimes outdated by the time they reached him (her).

The development of PLATO inter-terminal communication and monitoring capabilities[1] also added another dimension to reviewing. It was now

[1] This PLATO communications feature enables two people at two different terminals to go through a lesson "together". One person enters a lesson, presses certain keys, and the lesson appears simultaneously on the second terminal. Any responses entered into the first terminal also cause the display on the second terminal to react identically. Authors are also able to "talk" to each other on-line while in this monotoring framework.

possible for the author and the reviewer to be at different sites and yet go through a lesson together while simultaneously being able to "talk" with each other. Since the reviewer usually had specific comments in mind about a number of different sections of the lesson, the author usually monitored the reviewer so that the reviewer could direct their progress through the lesson. This method not only made it easier for each to explain various comments or thoughts about the lesson, but also enriched the review as more an exchange of ideas and less a set of directives given over to the author. While many authors favored this method, it was extremely time consuming, ranging from 1½ to nearly 3 hours in length, and requiring a good deal of mental stamina on the part of both the author and the reviewer.

In-progress reviews covered essentially the same areas and levels as end-of-lesson reviews. Whereas end-of-lesson reviews tended to be more lesson oriented, reviewers tried to make in-progress reviews more author oriented. Written comments were always prefaced with a recitation of what the reviewer had especially liked about the lesson, i.e. "The graphics in unit x are especially effective", or "You generally provide helpful feedback for incorrect answers". Reviewers also tried to intersperse remaining comments with specific examples not only of what could be changed but what was good. Wherever possible the reviewer tried to reference one part of a lesson and apply it as a solution to another part, e.g. "This section might be more easily illustrated by using the same sort of graph you used in section __".

By the end of the Sheppard paramedical project, MTC reviewers had performed over 100 lesson reviews for Sheppard authors. For a thorough

description of MTC review techniques with sample reviews see Lesson Review (Francis, Goldstein, & Call-Himwich, 1975).

Conclusion

Having experimented with a number of reviewing approaches, we find ourselves in some senses boggled by even more hypotheses than when we began. As is so often the case, the more one learns, the more there is to be learned. Our increasing understanding of the subtleties of working simultaneously on an intellectual and emotional level has left us with more questions than answers. Therefore, the following section enumerates not only what we know but what we don't know.

The conclusions fall into two categories--what was accomplished and what might be accomplished. Topics in the first category include assessments of review effectiveness in regard to MTC's dual goal with related incidents and author comments. Topics in the second classification center on recommendations for improving review effectiveness in the future.

Before examining the relative "success" of each type of reviewing, some concomitant philosophical issues should be explored. Two major quandaries plagued reviewers (and probably authors) throughout the course of critiquing a project's courseware. What is the relationship between author and reviewer? What is the purpose of the review? Obviously these two questions are interrelated. Very often the rapport between author and reviewer determines the purpose or importance of the review. This is exactly the problem. In our experience, neither the reviewer's authority nor responsibility was ever clearly defined. As a result, reviewers generally felt that suggested lesson changes that were instituted were usually a result of whatever powers of persuasion or cajolery they could summon. While the reviewer had no actual authority, s(he) usually felt

some ethical responsibility for the quality of the lessor Consequently, reviewers found themselves continually vexed with the question of whether their responsibility ended with aiding authors to meet the author's own standards or whether they (reviewers) should try to entice the author into conforming to their standards. Usually they tried to aim somewhere between these two points, relenting in some areas while holding to others.

Authors sometimes complained about the "university approach" to lesson writing claiming that military students were "different", so certain instructional approaches (increased interaction, open-ended questions, etc.) were neither applicable nor feasible. It is true that there are differences between a military and university setting. Aberdeen authors were writing lessons for a widely varied group ranging from high school dropouts to college students. Also, the course material required very few cognitive skills, centering largely on mechanical skills required to machine various sorts of keys, keyways, gear teeth, etc. As one author wrote, "It is a drastic change to step from the University of Illinois into an army classroom. Idealism and the university approach can be disastrous." It is true that some aspects of "technical training" differ from academics, and reviewers gradually began to phase out comments in some areas. However, many techniques MTC suggested which were labeled "university approaches" were actually strategies recommended or mandated by instructional design guidelines and rules for the individual armed services. Most so-called "university approaches" were never shown to either succeed or fail since authors often refused to try them saying, "That would never work with our students." After a while we began to understand that very often citing "the difference" was really a way of

saying, "I don't like that", or "I don't want to do that." In one instance reviewers suggested that authors at one ARPA site try a visual technique that had originated at another ARPA site. In this instance also authors at the first site claimed that their students were "different" so such a technique was neither "necessary" nor desirable. Reviewers began to conclude that something other than "the university approach" might actually be the problem. Some authors even implied that the problem was a matter of defensiveness, of feeling that the second site was getting praise from reviewers while the first was mainly getting criticism.

Consequently, reviewers felt trapped between two conflicting convictions. While they believed that lesson quality was mainly the author's responsibility, they also felt that failing to comment on a serious or recurring problem might be misinterpreted as condoning or even encouraging something the reviewer in fact regarded as ineffective or even detrimental.

What Was Accomplished

End-of-lesson reviews. Viewed with the inevitable clarity of hindsight, the end-of-lesson review technique was almost a complete failure both as an author aid and as a training tool. Authors mainly made only minor punctuation, spelling, or working changes, or coding changes (though reviews didn't usually stress coding revision). In a number of instances even execution errors[2] which were pointed out in a review went

[2]Execution errors are programming errors so serious that the lesson will cease to function when the student gets to that point within the lesson. Typically, the student is then taken to a display that says, "There's an error in this lesson. Try another one" and then rerouted back to a course index.

unchanged. As one author wrote, "I changed coding but fought most suggested changes to our instructional design plan." When asked what the main advantages of reviews were another author wrote, " . . . help with coding--corrections, a shorter, better way to code, etc." One explanation is that coding changes are easier to make than strategy changes. As one author said, "We tend to get involved with the computer and forget the desired result, training the students."

Author comments about the deficiencies of end-of-lesson reviews center on three synergetic problem areas. First, authors commented that reviews were too detailed (a problem shared by in-progress reviews). One author commented "Your attention to detail will destroy a new, marginal or struggling author." This partially supported our conclusion that the sheer numbers of comments resulting from reviewing a lesson in its entirety could be devastating. A second and perhaps more serious problem was lack of communication that resulted not only because of the divergence between "professional" and "lay" people, but between civilian and military approaches. One author commented, "Your wording of changes and new coding was very, very poor for those programming 1,000 miles away," while another author wrote, "(an ex-military MTC member) was best able to review [our] lessons because he could speak our language. The majority of the other reviewers were good but the communication gap was real difficult to cross." Yet contrary to this claim, even this ex-military reviewer's comments went largely unheeded. A third, related theme that reverberated throughout nearly every ARPA project was the element of culture shock resulting from civilians and military personnel working in a cooperative effort. When asked to rate the importance of a number of areas included

in reviews, one author wrote with reference to content accuracy, 'In our case you could not help, even in areas where you all were trained i.e. test construction. The idealistic university approach prevailed." Since one of the two (at that time) MTC reviewers held a master's degree in instructional design, and since many suggestions were taken directly from Air Force instructional design regulations, such a criticism did not seem valid. Furthermore, the review recommendations were, once again, never tried and proven effective or ineffective. As one author said, "The authors never gave the reviewers a fair chance.".

In-progress reviews. In-progress review techniques were considerably more successful in effecting short range lesson changes, but only marginally successful as a long range training device. Authors instituted an average of 50-75% of the changes suggested in MTC reviews. These changes consisted mainly of adding graphics to replace or clarify text, adding various types of questions, improving existing questions, distilling wordy text, rearranging or breaking up heavily texted displays, punctuation, spelling, etc. The relative "success" of in-progress reviewing was due in part to the rapport built up through almost daily communication between site authors and MTC reviewers. The "success" of in-progress reviews, however, also supports our assumption that criticism should be doled out a little at a time.

This is, of course, not to claim that in-progress reviews are free of snags. A number of issues still remain unsolved. For example, since there were only two MTC reviewers who performed in-progress reviews, it seemed to evolve that authors usually had lessons critiqued by the same reviewer each time. Working on successive lessons together of course

resulted in authors and reviewers building up a certain rapport. Thus, the author came to know what sorts of comments that particular reviewer was liable to make, and the reviewer came to understand what sorts of comments would be accepted and what would not. As a result some comments were eventually dropped entirely or at best categorized as perpetual debates. For example, one author and reviewer continually debated whether the author's lesson material actually belonged on PLATO or on a printed handout. The reviewer would say, "Just for the record, my old objection still stands", and the author would acknowledge the comment and then ignore it. Both knew that the suggestion would be made and that it would be ignored.

Another more serious problem was the author dependency that sometimes resulted for reasons which are not entirely clear even now. Some authors relied heavily on lesson reviews as the sole "validation" of a lesson. For example, in spite of repeated promptings, one author insisted on relying on reviewers to find problems in the lesson rather than running students through the lesson before it was given to actual project students. When actual students did take his lessons for the first time, they naturally found a number of errors that reviewers had not been able to anticipate. Rather than proving the need for student testing, however, the incident resulted in the author's loss of faith in the value of reviews. From his standpoint, reviewer credibility was at a fairly low level for the remainder of the project.

Not all authors responded in this manner, however. A number of authors made the comment, "Often when you say something in a lesson isn't working, in fact the students object to it too. How do you know what they'll object

to?" One such author did see the need for student testing to validate lessons, and in fact went to great lengths to recruit students to go through lessons before actual course students started going through the PLATO course.

Authors also reiterated the theme "Our students are different than any others because . . ." with students either being viewed as "too smart" or "too dumb" for a suggested approach. Since in-progress reviewing was honed mainly on a paramedical project, the variation reviewers heard most frequently was, "Our students are even different from other military students because they're so highly motivated that all you have to do is present the material and not really worry too much about how you do it. Sophisticated approaches aren't really necessary and only slow them down." When three of the original sixteen students (an alarming rate for this paramedical course) flunked out of the paramedical program entirely and the remainder of the students asked to be reassigned to the regular classroom, the theme became, "These students are so poor that 'sophisticated approaches' are beyond them." For example, a common reviewer comment was that questions were aimed at too low a level of learning, requiring the student to demonstrate simple recall rather than apply a concept to a new situation. Here again, review comments conformed to actual Sheppard course document requirements which specified the need for teaching to and testing at the highest cognitive levels (analysis, synthesis, evaluation, etc.) over recall or restatement. At the beginning of the project, some authors claimed that "sophisticated approaches" took up the student's valuable time. Later, after reviewers again made the same objection to a number of later lessons, the same authors retorted that "these" students

were at too low a level for "sophisticated" questions, and had to be "spoonfed" the material. Some authors also admitted that part of the problem was the difficulty in coding short answer types of questions, though a full-time programmer was on staff at the site.

Over the course of the project, MTC reviewers observed a number of author behavioral changes, without apparent corresponding attitudinal changes. For example, one author consistently resisted writing student objectives for his lessons. In a number of consecutive reviews, the reviewer reiterated the usefulness of specific student objectives in assisting the author in knowing what material to include, how the information should be organized, what he actually expected from the student and how he was going to test whether the student had learned what he intended, etc. After a while, the author finally began to write objectives, at times even submitting objectives for review apparently before the lesson had even been started. The reviewer assumed this represented a change (or rather an addition to) the author's instructional philosophy. However, when it was pointed out that the objectives and content of one of his lessons didn't match he replied, "Ok, I'll write the objectives over again." The thought that it was simpler to just rewrite the objectives showed a lack of understanding of what the purpose of stating objectives really was.

In another instance, an author and reviewer debated at some length the value of interspersing the lesson with interactive questions in reinforcing the lesson material, giving the student practice at utilizing information he would later be tested on, "monitoring" the student's progress, etc. One of the sources of disagreement was in their conflicting

definitions of "interaction". The reviewer defined interaction as any situation in which the student is required to respond by writing a comment, asking a question or giving an answer. The author defined interaction as any student input whatsoever including simple keypresses (NEXT, BACK, etc.). The author finally began to put "interaction" into his lessons, but since his definition was so broad, simply increasing the number of student inputs did not appreciably raise the quality of his lessons. Also, what questions he did include were mainly yes/no or copyframe types in which the student simply scanned the page for the correct answer and then "recorded" it. In some cases, questions were not even at the level of simple recall. It seemed apparent that he was including interaction strictly for interaction's sake.

In another episode, a number of authors at one site were producing strictly linear lessons with all students routed through the same path. While a linear format is certainly not inherently detrimental, the reviewer tried to persuade authors to consider including at least a small number of lessons in which the student had more autonomy. Indexes, "crossroad" type choice pages, etc. were suggested. Soon the reviewer began to see a flurry of index pages appear. However, students were still instructed to go through the lesson in the order given. In one case, while a lesson index was supplied, it seemed in fact to be more a table of contents since the student was never allowed to choose where to go.

In all these instances, it is apparent that, while external changes were certainly made, the attending internal changes never crystallized.

In none of the preceding incidents is it clear whether the problem was the reviewers' collective lack of persuasive ability, lack of

communication, or simply that, rather than debate the issues any longer, authors chose to make token changes. In a number of instances real changes were made. For example, a number of authors at one site began to eliminate "copyframe" questions almost entirely from their lessons, learning instead to write questions aimed at higher levels of learning. In many cases, however, it seemed apparent that, though authors' approaches sometimes changed, the attending attitudinal changes never metamorphosed.

What Can Be Accomplished

In spite of our sometimes frustrating experiences, we feel very strongly that some sort of lesson review is essential not only for inexperienced authors but also for already established authors. In the same way that the publishing industry exercises editorial standards, CBE needs some quality control methods to insure at least minimum lesson standards. Reviewing can be a valuable tool for lesson development, a "soft" step between programming and feedback from student runs. Based on our experiences and perceptions, and comments from authors at various sites, we feel confident in making the following recommendations. While nearly all our testing and theorizing has been done with the military, many suggestions should apply with equal validity in any number of situations.

After compiling and sorting through past recollections and comments, three major areas of concern standout:

--reviewer characteristics
--reviewer/author relationship
--review content/format

The following discussion deals with suggestions in all three areas.

Reviewer Characteristics

In a resounding expression of unanimity, all authors agreed that a lesson reviewer should be on site. This is perhaps the strongest and most widely expressed recommendation we will make. As one author wrote,

> Of all the reviews that I had, I felt the most useful one was the one which I had side by side with ___ when she was down here. I felt I learned more in that 2-3 hour period than in all the other reviews. There were alot of things she said and did that just wouldn't have been included in a review. Reviewers should have come down to deliver the reviews personally or to do the reviews right there. I'm not sold on the idea that you can do reviews long distance.

Some authors also felt that a reviewer should have teaching experience, though there was wide disagreement over whether the reviewer should also be a subject-matter expert. Most authors seemed to think that subject-matter expertise was not necessary. One author even said, "Sometimes it was good that the reviewer didn't have subject-matter experience. It's too easy [for a subject-matter expert] to miss some things . . . an outsider can ask 'what's going on here?'" Since most sites are generally staffed with a number of subject-matter authors, we feel no real need for the reviewer to be a subject-matter specialist, too. A number of non-ARPA sites (as well as one notable ARPA site) have observed the tendency for subject-matter experts to "review" lessons solely on the basis of content accuracy. In fact, some projects and authors specifically requested subject matter reviews only, stating explicitly that comments on presentation, instructional strategy, etc. are of no interest. This is certainly a valid area, but by no means the breadth of what a lesson is or the only criterion for lesson effectiveness. Though some content specialists would disagree, content expertise does not presuppose instructional expertise. By the same token, lack of content experience need not imply lack

of credibility. A lesson needs to be critiqued from a number of different perspectives, one of which is from the instructional design point of view. Thus, just as it's reasonable to ask a content expert to review the content, it's also reasonable to rely on an instructional designer to review the instructional approach.

A more illusive but equally important quality is reviewer personality. Nearly all authors agreed that a reviewer must be able to "handle" a variety of author temperaments. Typical author comments are, " . . . it's very tough to find the right individual who can handle each author individually and appropriately", and "Personality requirements vary with author temperament." A reviewer needs to be something of a psychologist, able to employ various approaches. For a complete description of review techniques used throughout the MTC project see Lesson Review (Francis, Goldstein & Call-Himwich, 1975).

Reviewer/Author Relationship

Many authors (and reviewers) felt that the success or failure of a review was a direct result of the relationship between author and reviewer. As one author said, "It's all so personal. It's all in the relationship between the reviewer and author." Another author stated, "Rapport is important . . . it's intangible, but it effects the results." Rapport will always be a factor in any cooperative effort. However, the heavy reliance on rapport in reviewing is often counterproductive. A number of steps can be taken to reduce the importance of the subjective relationship between author and reviewer and to clarify the purpose of the review itself. First, if the reviewer is to be in any way responsible for the

quality of the lessons produced, (s)he should be accorded some authority at the outset by the funding agency or project management. A "consultant" position is not a strong vantage point from which to effect change. In any project (particularly in the military), if an on site reviewer is a member of the military, his/her rank should be equal to that of the highest ranking author. At one ARPA site, the only instructional design specialist was an enlisted man while all but one of the remaining authors were officers. His suggestions were not well received, and were in fact either totally ignored or never requested at all. If the reviewer (either on or off site) is a civilian working with military authors, his/her perceived authority must be equal to that of the authors. This, of course, contains the seeds of a reverse sort of problem. If the reviewer has higher authority, some authors may follow the letter rather than the spirit of suggestions to give the impression of obeying a superior. In the long run, the most important factor may still be the relationship between author and reviewer.

If the reviewer is off site, his/her credibility can be greatly enhanced by frequent site visits at which times (s)he can become familfar with authors problems in the environment in which they must function. This would also help in dispelling the "ivory tower" syndrome. For example, two authors at one ARPA site repeatedly discounted portions of what MTC reviewers suggested, saying, "You don't understand. You don't understand our students or our problems." When a reviewer finally visited the site, both authors commented, "Now that you've seen our students, you won't have any trouble reviewing", though the reviewer had in fact only literally "seen" the students in hallways, etc. rather than in a scheduled PLATO class. Though the reviewer felt there was little discernable difference in the

comments she made in successive reviews, both authors seemed to be satisfied that now her reviews were "better". How much credibility exists in fact and how much in the eye of the beholder is sometimes speculative. If the problem exists, however (and it usually does), debating the point will never solve it.

A second step toward clarifying the purpose of the review would be to contract at the outset for specific feedback the author would like from a review. This is particularly important if the reviewer is seen only as a consultant. To facilitate this and to establish some common instructional ground, the author and reviewer should also meet before even the first review is requested and try to establish an instructional design concensus. This would also afford each an opportunity to get a better feeling for the other's biases, nomenclature, etc.

Review Format/Content

One of the most important recommendations we could make is the establishment of on-site, peer reviews as a regular part of the workings of a project. This could take the form of regular group meetings, or individual, more informal one-on-one types of reviews. At every site at which peer reviews were a regular routine, authors said they relied approximately half on MTC reviews and half on peer reviews both for feedback and as a tool for revision. In order to effectively review each other's lessons, however (i.e. comment on more areas than spelling, punctuation, content accuracy, etc.), authors also need more explicit training in instructional design.

If possible, reviews should always be performed face-to-face with the

reviewer involved in the lesson from the planning stages on. If reviews can't be done in person, on-line monitoring or even over-the-phone reviewing are good alternatives and preferable to end-of-lesson or hard-copy-only type reviews.

A lesson should also be reviewed in segments. We found this to be a highly effective deterent to the buildup of author defensiveness or subjectivity.

Finally, depending on the contracted specific feedback, reviews should stress organization, alternate instructional approaches, clarity of text, quality/quantity of interaction, etc. Since enumerating misspellings and grammatical errors both is time consuming and increases the number of perceived "criticisms" in a lesson review, the lesson should already have been proofread for such incidentals before a review is requested.

Appendix A: Author Attitude Questionnaire

1. The following is a list of suggestions you may or may not have been looking for in an MTC review. Please indicate the importance of those items you WANTED by using the rating scale provided. Items you were NOT interested should rate as 0.

    4 -- wanted and very important
    3 -- wanted and important
    2 -- wanted and moderately important
    1 -- wanted and minimally important
    0 -- NOT wanted

    _____a. grammatical usage, spelling punctuation, etc.

    _____b. quality/quantity of student interaction

    _____c. appropriateness of tone and style

    _____d. clarity of explanations

    _____e. effectiveness/arrangement of graphic displays

    _____f. content organization

    _____g. content accuracy

    _____h. alternate instructional strategies

    _____i. coding efficiency

    _____j. other (if other, please specify)

2. Using the following scale, please rate the importance in lesson development of the sources of information listed below.

4 -- very important
3 -- moderately important
2 -- minimally important
1 -- not important
0 -- don't know

_____a. local review by project member(s)

_____b. review by NTC

_____c. review by instructor/users

_____d. review by outside experts

_____e. observation of students

_____f. comments or questionnaire responses from students

_____g. student data (on-line)

_____h. test or quiz results

3. What were the main disadvantages of MTC reviews?

4. What were the main advantages of MTC reviews?

5. I regarded the MTC reviews I received as:

   a. Generally a waste of time
   b. Interesting but not very useful
   c. Moderately useful
   d. Very useful

6. In what way, if any, did you change your approach to lesson writing based on the information you received in MTC reviews?

7. How would you characterize the "ideal" reviewer with respect to: subject-matter knowledge, personality, geographical location, teaching experience, instructional design experience, etc.?

References

Call-Himwich, E. Analysis of the Aberdeen courseware. In A. Himwich (Ed.), Summary and analysis of Aberdeen CBE project. Urbana, Ill.: University of Illinois, Computer-based Education Research Laboratory, 1977.

Francis, L., Goldstein, M., & Call-Himwich*, E. Lesson review. Urbana, Ill.: University of Illinois, Computer-based Education Research Laboratory, October 1975.

Himwich, A. Some aspects of the project establishment and management. In A. Himwich (Ed.), Summary and analysis of Aberdeen CBE project. Urbana, Ill.: University of Illinois, Computer-based Education Research Laboratory, 1977.

*Originally published under the name Eileen Swaeney