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ABSTRACT

This paper proposes a context-driven model of instructional design incorporating constructivist-oriented methods and strategies for structuring meaningful, purposeful learning environments into the framework of a traditional systematic approach. An evaluation study is also presented that investigated the effects of implementing the context-driven approach into the initial planning of an instructional program. Twenty-one practicing K-12 teachers were presented with case-based material that elicited plans for developing instruction designed to support the learning of specific performance objectives within an electronic media-supported environment. Each teacher developed two plans for specific objectives using both a traditional systems approach as well as the context driven design model proposed. These plans were analyzed and reported according to the number and type of instructional components and elements included, the type of contexts described and the role electronic media played within these contexts, the type of social interaction environments defined by the electronic media, and general attitudes about developing instruction according to the two different approaches. Major planning differences with respect to the inclusion of specific instructional components and elements were identified between the two approaches, as was the role electronic media played between the teachers' different plans. Differences between context selections were also identified and reported. Implications for future research are included. (Author/MES)

Designing Instruction for the Technology-Supported K-12 Classroom

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This paper proposes a context-driven model of instructional design incorporating constructivist-oriented methods and strategies for structuring meaningful, purposeful learning environments into the framework of a tradition systematic approach. An evaluation study is also presented which was designed to investigate the effects of implementing the context-driven approach into the initial planning of an instructional program. Twenty-one practicing teachers were presented with case-based material that elicited plans for developing instruction designed to support the learning of specific performance objectives within an electronic media-supported environment. Each teacher developed two plans for specific objectives using both a traditional systems approach as well as the context-driven design model proposed. These plans were analyzed and reported according to the number and type of instructional components and elements included, the type of contexts described and the role electronic media played within these contexts, the type of social interaction environments defined by the electronic media, and general attitudes about developing instruction according to the two different approaches.

Major planning differences with respect to the inclusion of specific instructional components and elements were identified between the two approaches, as was the role electronic media played between the teachers' different plans. Differences between context selections were also identified and reported. Implications for future research are included in the paper as well.

Introduction

Perhaps the most useful thing to emerge from Instructional Technology's focus on constructivism during the past ten years has been the critical examination of the role context plays within the instructional design process. Although debates surrounding the effects of context within the actual act of learning will most likely continue for quite a long time, the notion that context could and should play a more important role in the design and development of instruction seems to be more universally-accepted among those Instructional Technologists involved in the research and development of improved systematic instructional design models. Improving existing systematic instructional design models through the incorporation of successfully tested and implemented constructivist-oriented methods and strategies represents one of the more important challenges facing Instructional Technology today. The purpose of this paper is to propose one such context-driven model of instructional design that merges methods and strategies for structuring meaningful, purposeful learning environments into the framework of a tradition systematic approach. In addition, this paper also presents the results of a study designed to investigate the effects of implementing a context-driven approach into the initial planning of an instruction program to support the learning of a specific performance objective within an electronic media-supported environment.

Throughout the last decade a number of instructional design theories and models have been researched and evaluated which reflect a decidedly-constructivist perspective. Although it would be difficult to pin down a common design methodology between these models, they all seem to possess a unifying theme: context. Models such as Anchored Instruction, Situated Learning, and Constructionism have been widely evaluated and reported, and a closer examination of their instructional design methodologies reveals that they all value the cultivation of rich learning contexts over simply addressing prescriptive instructional goals.

Anchored Instruction represents a design model in which learning a related set of specific content-area skills, knowledge, and attitudes is "anchored" in a larger community or social context (see Cognition and Technology Group at Vanderbilt, 1992). Such anchors often include case-study or problems-based situations, and the instructional materials afford the learners many opportunities for individual exploration. Situated Learning represents a similar approach to the structuring of instructional environments. Within this model, instruction directed toward the learning of individual performance objectives is situated within a context reflecting a culture in which acquiring and practicing the identified skills "naturally" occurs (see Lave & Wenger, 1991). Social interaction is also a critical component of Situated Learning environments, as the learning culture itself is primarily defined by the interpersonal interactions of its members.

Constructionism represents a subtle departure from other constructivist learning strategies. This model, attributed to Seymour Papert (1993), places a special importance on the role of actual constructions in the learning environment as a support for knowledge construction in the head. Within this theoretical framework, effective learning is both facilitated and represented by the action of individual learners immersed in creation.

Each of these "constructivist-friendly" instructional models could certainly be viewed as providing opportunities for the learners to construct their own meaning to instructional stimuli and, consequently, direct any number of instructional events. Attempting to represent these models within more traditional instructional systems design frameworks could take many different directions. For example, each of these theories/models might be viewed as simply various ways to ensure that the learning of individual SKA occur within contexts that are meaningful and purposeful to learners. They could also be viewed as nothing more, or less, than very complex motivational strategies. Although most "traditional" systematic instructional design models are grounded in behavioralist ideology, the overall purpose of any ISD model is to maximize the probability that learners experiencing instruction will, in fact, learn what the designers intend. Regardless of whether or not an instructional designer considers herself or himself a behavioralist or a constructivist (or an agnostic for that matter), most seem to accept the idea that learners will construct their own meaning to any information they receive through interacting with their environment. Learner interpretation of external stimuli will be influenced by their previous experiences as well as their cognitive abilities, any social negotiations presented within the learning environment, the type of instructional strategies presented, the general manner in which messages are presented, overall motivational levels, and any other physiological and/or emotional factors which define how individuals personally want to learn things. Very few instructional designers would argue that learners interpret events and ascribe their own meaning to external stimuli. generally speaking, this constitutes one of the fundamental design problems facing instructional designers. It is their primary task to structure learning environments which maximize the probability that all (or most) of the learners will interpret events and assign or construct common meanings enabling them to learn the prescribed, defined SKA. In fact, if learners didn't "construct" their own meanings to events then ID would probably be a much simpler affair.

A Context-Driven Model

Many "traditional" instructional design models include fundamental steps similar to those detailed in Dick and Carey's (1996) systematic model of instructional design:

1. Assess needs to identify goal(s)
2. Conduct instructional analysis (including learner and context analysis)
3. Write performance objectives
4. Develop assessment instruments
5. Develop instructional strategy (conditions dependent on type of skill to be learned)
6. Develop and select instructional material
7. Design and conduct formative evaluation of instruction
8. Revise instruction (steps 2-7)
9. Design and conduct summative evaluation

The individual components of this model are relatively consistent with the primary steps described in other popular instructional design models, including Reiser and Dick (1996); Sullivan and Higgins (1983), Hunter (1982), and Merrill, Li, & Jones (1990). Instructional components aren't the only similarity between these different models. Another basic similarity between these different instructional design models is reflected in their treatment of instructional strategy development. All employ some type of conditions-based approach, meaning that the most appropriate type of instructional strategy for any given design is dependent on the type of skill to be facilitated.

Although any given conditions-based instructional design prescription may incorporate a number of motivational strategies, none of the more popular instructional design models address the role(s) that the entire learning context plays within every aspect of the instructional decision-making and implementation process. It could be argued that the deconstruction of instructional events for the purpose of designing instruction for given performances can effectively occur outside specific contexts. But if developing contextual learning environments is the goal of the designer, then the identification of a meaningful, purposeful context as well as the role(s) that the media used to define the context will play within the entire instructional experience should be incorporated into the instruction design process from the beginning. Since many instructional design models today are directed toward the use of some form of electronic media, it makes sense to take advantage of the manner in which electronic media are commonly defined with respect to the context they help facilitate (see Figure 4). By capitalizing on the emerging roles that electronic media are playing within the real world, instructional designers can begin to construct more well-defined context-driven instructional models which designed to facilitate more meaningful, purposeful technology-supported learning environments. The following illustrates an instructional design model that is driven by a context integrating electronic media into the instructional planning and implementation process:

1. Assess needs and/or identify instructional goal(s)
2. Identify a context in which goal is applied/practiced in the real (or the learner's) world
3. Decide which electronic media-supported context(s) best approximate the essence of the real world context (see Appendix E):
4. Revise instructional goal to reflect identified learning context
5. Conduct instructional analysis and write objectives related to both goal (content) AND context
6. Develop assessment instruments
7. Conceptualize and articulate a "Big Picture" for the planned instructional program based on the identified prerequisite skills, the context to be established, the content area, and the instructional goal
8. Develop instructional strategy (see Figure 1) in which conditions (see Figure 3) are dependent on type of skill to be learned(see Figure 2)
9. Develop and select instructional material
10. Design and conduct formative evaluation of instruction
11. Implement instruction
12. Revise instruction (Steps 2-10)

Like its predecessors, this context-driven model of electronic media-supported instructional design is also conditions-based. Unlike other design models, however, it emphasizes the identification of a meaningful learning context very early in the design phase, and the context itself is incorporated into the goal and subsequent instructional analysis. Context identification is based on two important elements:

- How the instructional goal "practiced" in the real world
- How electronic media help approximate real-world contexts

Although it would impossible to systematize the identification of how any given goal might be practiced in reality, it is not quite so difficult to categorize the manner in which electronic media have traditionally established and cultivated different types of contexts. Many books dealing with electronic media and education have identified contexts similar to those described in Figure 4: Creation/Construction, Situation Exploration (including case-based situations), Simulation, Reference Exploration, Tutorial (direct instruction), Drill and Practice, Game (cooperative, competitive, puzzle), Communication, "Real" (Allesi & Trollip, 1991; Merrill, et al, 1996; Grabe & Grabe, 1996). Since these context categories represent time-tested development enterprises which have conformed to the various parameters of electronic media itself (specifically computers), it makes sense to use them as guidelines for instructional designers charged with the task of developing instruction specifically for a particular electronic medium. Although a strong argument could be made against the development of an instructional design model that incorporates media-specific strategies and procedures, in today's electronic media-rich work and school cultures it is common practice to articulate instructional needs and media needs in the same statement.

As indicated earlier, this context-driven model follows a traditional systematic instructional design framework while incorporating the learning context into most of the decision-making processes. Once an instructional goal is clearly identified, the designers are directed to identify a meaningful context based on how the goal is practiced in the learners' real world. The instructional designers are then presented with the listing of electronic media contexts (Figure 4) and encouraged to categorize their chosen context into one or more of the contrived types. This step may also aid in the selection of a meaningful learning context if the skills indicated within the goals aren't readily identifiable as real-world performances (see most Math and Social Studies curricula for plenty of examples).

After a meaningful learning context has been identified, the instructional designer is directed to review the initial instructional goal and incorporate the context into the goal if the context will require the learning of context-specific outcomes. For example, consider the following goal statement: "Given the length of one side of a right triangle as well as the internal angle measurements, the learners will use the Pythagorean Theorem to calculate the lengths of the unknown sides." Since the Pythagorean Theorem is often used to calculate the height of objects too tall to measure directly, the designer may choose a context in which the learners must calculate the height traveled by a model rocket. The revised goal statement might then read "Given the distance from an observer and a rocket launch pad (meters) along with the length (meters) of the hypotenuse for the right angle formed between the observer, the launch pad, and the rocket at its zenith, the students will calculate the height of the rocket to the nearest meter." This new goal statement focuses the entire instructional design experience around rockets and how math can be used to make calculated inferences about observed events. And including the context within the goal statement itself helps ensure that context-dependent skills (such as "define zenith") are addressed in the subsequent design.

The next step in the design process requires performing a complete instructional analysis of the goal/context to identify all subordinate skills that must be learned in order to accomplish the stated goal within the identified context. Following the instructional analysis, all performance outcomes are sequenced and placed into units or lessons. Each lesson is then treated separately, with each lesson developed according to the instructional design components indicated in Figure 1.

Experience with context-driven instructional design has indicated that certain context types lend themselves better than others to the implementation of specific instructional design components. Tessmer and Richey (1997) defined the role of any context as orienting, instructional, and/or transfer. These categories of context "functions" are easily correlated to those instructional design components included in Figure 1. This correlation indicates that an orienting context can successfully accomplish some or all of an effective instructional program introduction, an instructional context can accommodate part of an introduction, the activities/information, the practice/feedback, and perhaps the review. And a transfer context can accommodate those elements within an effective transfer component. Classifying the type of context and then determining its function is useful in identifying those components of good instructional design that may not be fully accommodated by the chosen context. If deficiencies in the design are detected, the designer is encouraged to develop additional, specific instructional components that complement the context, but are separate from it (A good example of this occurred during the development of the Jasper Woodbury Problem-Solving material. See CTGV, 1992).

By following the basic instructional design steps indicated, the instructional designer is encouraged to create an effective learning experience that is integrated within a purposeful, meaningful environment. Since the contrived contexts described in this model (Figure 4) were derived from a review of the way computer-based environments are typically described, perhaps a model such as the context-driven model described in this paper will further the cultivation and definition of those attributes of electronic media that can provide meaning and purpose to learning.

As this context-driven model of instructional design was being developed and tested, a number of research and evaluation experiences took place. On one specific occasion, the model was evaluated formally against a more traditional systems approach in the initial planning stages of design by teachers enrolled in an advanced instructional design and evaluation course. During this evaluation study, identical procedures and treatment materials were implemented, and these tests will be referred to in the following section as "The Evaluation Study."

The Evaluation Study: Introduction

The purpose of this evaluation study was to explore the effects of using a context-driven model of instructional design on the initial planning of electronic media-supported instruction. Practicing K-12 teachers were charged with the task of planning instruction for specific instructional objectives while incorporating the use of specific electronic media, and they were compelled to articulate their instructional plans through both a traditional instructional design approach and the context-driven method described earlier in this paper. This investigation was conducted in an effort to answer the following questions about possible differences in the instructional plans developed by novice designers using a more traditional systems approach versus a context-driven design:

- Will practicing teachers incorporate different numbers and types of effective instructional components/elements between their two plans?
- Will they make different decisions about the role electronic media should play in the learning environment between their two plans?
- Will the manner in which student interactions with each other and the media be different between the two plans?
- Will practicing teachers' attitudes about designing instruction be different between the two plans?

Previous to this evaluation study, it had been the experience of the author that a context-driven approach to instructional design not only helped to produce more effective instructional programs than more traditional approaches, but that utilizing a context-driven approach made it easier for instructional design novices to describe instructional plans that inherently included effective design components. It had also been demonstrated informally that forcing designers to categorize the role electronic media would play in the design process into one of the contrived categories described in Figure 4 resulted in the media itself playing a bigger part in the planned instructional program. In addition, the task of developing instruction seemed to be more enjoyable by those novice developers assigned to projects involving the comprehensive design and development of electronic media-supported instruction. These observations prompted the author to take a more empirical approach toward identifying the value of a context-driven instructional design model.

The Evaluation Study: Method

Subjects

The twenty-one subjects for this evaluation study were all practicing teachers enrolled in either an Instructional Technology (IT) or a Curriculum and Instruction (CI) graduate program at a major research and teaching university in the eastern United States. These students were enrolled an instructional design and evaluation course designed to teach an instructional systems design (ISD) model similar to Dick and Carey's (1996) general systems design framework described earlier in this paper.

Procedures

The treatments for this evaluation study consisted of a case-based instructional design scenario which elicited two different instructional plans following both a "traditional" instructional systems as well as a context-driven planning design approach. The case prompted the subjects to "...imagine you are an instructional design consultant currently working for a publishing company interested in developing instructional material to support social-studies Standards of Learning (SOL) for K-8 schools. This company has previously developed a variety of electronic media-supported material addressing math and English SOL's and successfully marketed them to a number of school districts. Electronic media, in this case, refers to the use of computers, video, and audio within the instructional program, and most of the school administrators and teachers indicated that the electronic-media aspects of the material are what they really valued about the instruction. The role electronic media played within these successfully-implemented instructional programs ranged from simply providing information and examples in conjunction with traditional text-based material to complete, individualized direct-instruction multimedia computer programs presenting information, practice and assessment. You have been enlisted by the company to create a plan for developing electronic media-supported instruction for one specific 7th-grade social studies standard. No decisions have been made about the type of mediated material to be developed or the role that the media itself will play in the finished instructional product, but all the electronic media-based components of each company products are designed to accommodate the following general classroom/school technology parameters: 25 students per class, three networked (Internet access) multimedia computers in each classroom, one 25-inch television connected to a VCR as well as one of the classroom computers, one audio "boom box" with cassette tape and CD player, one overhead transparency projector, and access to a school computer lab with 16 networked multimedia computers for a minimum of 2 hours per week."

As indicated, the subjects were instructed to design a plan for developing electronic media-supported instruction for a specific social studies SOL. The two standards (one per type of design) used within the case were taken from the Standards of Learning for Virginia Public Schools (Virginia Board of Education, 1995):
The student will compare the American political and economic system to systems of other nations, including Japan, China, and leading Western European nations, in terms of

- governmental structures and powers;
- the degree of governmental control over the economy; and
- entrepreoneurship, productivity, and standards of living.

7.10 The student will interpret maps, tables, diagrams, charts, political cartoons, and basic indicators of economic performance (gross domestic product, consumer price index, productivity, index of leading economic indicators, etc.) for understanding of economic and political issues.

Following the portion of the ID course presenting the basic ISD model but before examining the specific role(s) context plays within the design process, the subjects were presented with the case-based scenario for the current study. They were informed that the material (represented as a course "pretest") was going to present them with an instructional design scenario followed by a series of questions. They were instructed to answer each question with as much detail as needed to convey their messages clearly yet concisely. They were also told that their answers were not going to be graded for points; rather, all answers were going to be used as part of the second portion of the course. In addition, the subjects were instructed to answer each question without looking ahead to subsequent items or going back to change any answers once they had initially completed them.

The first treatment experience consisted of the case presentation, with 19 randomly-assigned students receiving standard 7.8 ("The student will compare the American political and economic system...") and the other 19 receiving standard 7.10 ("The student will interpret maps, tables, diagrams...") as the specific objective for which they needed to plan electronic media-supported instruction. Subjects were then asked to respond to the following questions, corresponding to a more traditional instructional systems planning approach:

1.1 List all the non-electronic and electronic media (textbooks, hand-outs, worksheets, teacher-led lectures, video, audio, filmstrip, computers, etc.) that this instructional program will employ and describe the role each will play within the instructional program.
1.2 Describe how your instructional program will introduce the selected topic to the learners.
1.3 Describe the activities and/or information that the learners will experience within the instructional program.
1.4 If applicable, describe the type of practice and feedback that the learners will experience within the instructional program.
1.5 If applicable, describe the review that the learners will experience before the posttest.
1.6 If applicable, describe the posttest that the learners will experience within this instructional program.
1.7 If applicable, describe any opportunities in which the program will provide the learners with an opportunity to apply the skills, knowledge and attitude indicated within the standard to another situation.

Following their experience with the case scenario as it applied to their first assigned standard (objective), the subjects were asked to perform the same task for the other standard. This time, however, they were asked to answer the following set of questions reflecting a context-driven planning approach:

2.1 Describe a situation in which the skill(s) indicated in Standard 7.X are used in the real world.
2.2 Review the different types of contexts that electronic mediated learning environments support (see Figure 4) and select a context type that you feel could be structured or cultivated within the instructional program you are developing which might approximate, in some way, the real-world application described in 2.1. State the context type (from the choices provided in Figure 1) you plan to develop within your program, and briefly describe how it will be structured.
2.3 Rewrite the standard so that it reflects the context you have selected as well as the skill it originally communicated.
2.4 List all the non-electronic and electronic media (textbooks, hand-outs, worksheets, teacher-led lectures, video, audio, filmstrip, computers, etc.) that this instructional program will employ and describe the role each will play within the instructional program.
2.5 Describe how your instructional program will introduce the selected topic to the learners within the context you have structured.
2.6 Describe the activities and/or information that the learners will experience within the within the context you have structured.
2.7 If applicable, describe the type of practice and feedback that the learners will experience within the context you have structured.
2.8 If applicable, describe the review that the learners will experience before the posttest.
2.9 If applicable, describe the posttest that the learners will experience within this instructional program.
2.10 If applicable, describe any opportunities in which the program will provide the learners with an opportunity to apply the skills, knowledge and attitude indicated within the standard to another situation.

Upon completing the second set of planning questions, the subjects were directed to respond to a series of items reflecting their attitudes about planning electronic media-supported instruction for the two different standards.

Responses to each question were evaluated and tabulated by the author. In an effort to determine how well each instructional plan corresponded to specific instructional design criteria, the responses for items 1.2-1.7 as well as 2.5-2.9 were categorized according to the instructional design components and elements indicated within Figure 1. For example, items 1.2 and 2.5 asked the subjects to describe "..how your instructional program will introduce the selected topic to the learners..." Responses to this item were evaluated based on how many of the following elements of an effective introduction were included in the answer:

- Gain learner attention
- Articulate in some way the SKA already needed to succeed within the new learning environment
- Identify opportunities in which learners will relate what is about to be learned (goal) to what they already know how to do
- Inform learners of objectives (o.k. to be vague)
- Fit objective(s) into a "Big Picture"
- Present the utility (relevance) of the SKA to be learned
- Clearly identify the incentives/rewards for learning the SKA and succeeding within the learning environment
- Establish clearly-perceived learner accountability, role(s) and task(s) within the learning environment
- Establish clearly-perceived instructor role(s) and learner support mechanisms
- Employ specific content-area methodologies if applicable (ensuring that all other elements are properly addressed)

Similar evaluation methods were conducted on each item related to the other instructional design components. In addition to the tabulation of instructional design element frequencies, the type of media selected as well as their described functions were also recorded. A comparison of the different context types by electronic media selection was also determined between those plans facilitated within the traditional model and those plans facilitated within the context-driven approach.

Results

As described earlier, individual responses to each treatment item were categorized and then tabulated according to each standard (7.8 "The student will compare the American political and economic system..." versus 7.10 "The student will interpret maps, tables, diagrams...") and design approach (traditional versus context-driven). The purpose of initially tabulating data by standard was simply to determine if any major differences existed between responses to the two different standards themselves regardless of which design approach was utilized. Although some minor differences were identified, it was the judgement of the author that a pattern of differences between the two standards did not exist; consequently, no formal reporting or discussion will ensue with respect to this variable alone.

Table 1 reports the results of analyzing the treatment items that elicited specific responses to the planning of discrete instructional design components. These data indicate that a total of 65 elements of an effective Introduction were described within the plans following a traditional ID planning approach, and 98 elements of an effective introduction were described within the plans following the context-driven approach. A breakdown of individual introduction elements (delineated in Figure 1) are not included in Table 1.

The data presented in Table 1 also displays the number of Activity/Information design elements included in the planning responses. These data indicate that 93 total elements were described in the plans for the subjects' responses using the traditional deign approach, while 103 total elements were described in the plans for responses using the context-driven approach. Table 1 also reports the number of Practice/Feedback elements included within the instructional plans. These data indicate similar totals for each type of design, with 58 instances of Practice/Feedback elements reported within the plans facilitated through the traditional model and 62 elements were identified within the plans described using the context-driven design approach. Likewise, responses between design approaches for the Review and Assessment components were very similar. The data in Table 1 indicate that 35 review elements were described within the traditional design approach plans while 31 instances of review elements were detailed within the context-driven plans. In addition, the data in Table 1 indicate that 22 assessment plans described within the traditional approach explicitly matched the "...performances and conditions indicated within objectives," while only 15 plans using the context-driven approach described such element. The final instructional design component analyzed was Transfer, and there appeared to be little difference in the number of transfer elements described within each design approach. The data in Table 1 indicate that 15 instances of transfer elements were described by subjects using the traditional approach, and 15 instances were described within the responses elicited from the context-driven approach.

Table 2 reports the data for the classification of contexts described within the instructional plans, and the frequency of different context types are broken down further by type of media utilized. Although the treatment materials specifically encouraged the subjects to select a single context within their context driven plans from the descriptions provided in Figure 4, most plans (context and traditional) included descriptions for more than one context type. These data indicate that five Creation contexts were described by subjects within those plans which followed the traditional design approach, while 9 were described by subjects using the context-driven design. All contexts in this case were described as facilitated through the use of computers. Two plans following the traditional approach reported Simulation contexts facilitated with the help of computers, and one traditional plan described a video-supported Simulation. This contrasts with 11 computer-based Simulation contexts described within the context-driven plans, and one video-supported Simulation context described within a context-driven plan.

The data in Table 2 also indicate that ten traditional ID plans described Situation Exploration contexts, with six of these computer-based and four video-supported. Sixteen Situation Exploration plans were described within the context-driven plans, with 13 being computer-based and three video-supported. Also, 14 Reference Exploration contexts were described within the traditional plans (11 computer-based, three video) while only nine of these contexts were described within the context-driven plans (seven computer-based, two video). Seven traditional plans and five context-driven plans described computer-based tutorial contexts, and 14 Drill and Practice contexts were described within traditional plans (10 computer-based, one video, two overhead transparency-based, and one audio) while only five computer-based Drill and Practice environments were identified in the context-driven plans.

Table 2 also displays data indicating that six traditional plans described Game contexts (five computer-based, one video) while only three computer-based Game contexts were detailed in the context-driven plans. In addition, seven computer-based Communication contexts were described, all within the context-driven plans. The data in Table 2 also indicate that one computer-based Real context was depicted within a traditional plan, while six Real contexts (five computer-based, one video) were identified in the context-driven plans.

Table 2 also reports data for the Linear Information Presentation context, representing those instructional plan descriptions which utilized media only to present information to the learners in linear fashion with little or no implied interaction. These contexts were only identified within the traditional plans, with five computer-based, two video, one overhead transparency, and two audio contexts described.

The data in Table 3 present information about the general type of social interaction environments facilitated by the different types of electronic media within the instructional plans. Instances of individual, small group, and/or entire class structures were identified and categorized by electronic media type. These data indicate that only one traditional plan described computers facilitating an entire class experience, seven plans described small group and 14 plans described individual activities. Computers were described as facilitating two entire class activities within the context-driven plan descriptions, 18 small group activities, and six individual learning experiences.

Table 3 also displays data for the type of social interaction environments defined within video-supported plans. These data indicate that nine entire class experiences were defined within the traditional plans, and three small group as well as two individual activities were identified. Video in the context-driven models was used for entire class activities within three plans, five plans described small group while two described individual video-supported learning activities. Use of the overhead projector was not described in many plans, with one class and one small group experience identified within the traditional models, and only one entire class experience depicted within a context-driven plan. Similar results were identified for the use of audio, with two class and one individual experience described within traditional plans and no audio experiences detailed in the context-driven plans.

Finally, responses to a few attitudinal items were tabulated. The first attitude item asked the subjects to identify "...which SOL was it easiest to develop instruction?" Six subjects responded that standard 7.8 ("The student will compare the American political and economic system...) was easiest, 11 felt that standard 7.10 ("The student will interpret maps, tables, diagrams, charts...) was easiest, and four reported that they were both the same. When asked "If each instructional program were to be developed according to your plan, which do you think would be more effective for the target audience (7th graders)?" 12 subjects responded that their context-driven plans would be more effective, while only three indicated that their traditional plans would be more effective. Six subjects felt that they would both be equally effective. Similarly, when asked "If you were given the job of actually creating the instructional program you described, which would you rather develop?" 15 subjects responded that they would rather develop the instructional program following the context-driven plan, three responded that they would rather develop the program described within their traditional plan, and three responded that it wouldn't make any difference to them.

Discussion

Although differences were subtle between the manner in which subjects were directed to plan for technology-supported instruction using a traditional versus context-driven approach, there appeared to be definite differences in how certain aspects of their plans were articulated. This, in itself, is relatively important because it illustrates that instructional planning by practicing teachers can be affected by the presence of specific resources (Figure 4) and differences in planning question strategies.

The data in Table 1 indicate that plans following the context-driven model included many more elements of an effective introduction. A closer examination of these results revealed that, in describing the introductions to the proposed instructional programs, nearly twice as many context-driven plans addressed prerequisite skills and made provisions for connecting what the learners were about to learn to what they already knew how to do. In addition, more than twice as many context-driven plans articulated the relevancy of the new skill to be learned. Inclusion of these important Introduction elements would most likely improve the overall effectiveness of the instructional program, and the fact that the context-driven plans facilitated more of these elements indicates that "real" contexts necessitate more effective and complete introductory experiences. It's likely that the subjects felt the 7th-graders receiving the instruction would be less accustomed to a real-world context in the classroom and would therefore need more information up front. Conversely, the instructional plans following the traditional approach included twice as many instances of the Activity/Information elements dealing with relating the skills to be learned to a clearly-defined content domain, providing learner guidance for the application of the information presented to the target skills, and breaking down the process of performing rules into steps. It's possible that provisions for the more directed nature of these elements were not considered by the subjects as they incorporated those less-directed contexts constituting a majority of the context-driven plans: creation, simulation, or situation exploration. This represents an important point that has no doubt been identified by developers of creation or simulation environments: How much guidance is appropriate within these types of environments?

On the other hand, a closer examination of the elements included in the activity/information component showed that the context-driven plans described many more opportunities for the learners to explore the learning environment with minimal instructor guidance, and these plans also offered many more instances of examples and nonexamples. Again, these effective Activity/Information elements were most likely inherent in the chosen contexts, which lends support to the value of structuring these types of environments. However, another example of a potentially harmful use of more student-directed learning environments is apparent in the data for the Practice/Feedback component. Surprisingly, most of the plans included provisions for appropriate practice provided to all the learners. But nearly twice as many instances of providing initial learner guidance within the practice was identified within the traditional plans. Initial learner guidance is an important element of effective instruction (Hunter, 1982; Merrill, 1994), and it is quite possible that the meaningful learning contexts depicted within the context-driven plans were conceptualized by the subjects as requiring or demanding less direction from the instruction/instructor. This attitude may diminish the potential effectiveness of successfully implementing such learning environments within the classroom, and may in fact represent some of the reasons why teachers often have mixed results when structuring more student-directed contexts.

Subjects reported many fewer elements of effective reviews or transfer opportunities, and this was consistent across both design types. Either they were simply tired of writing, or they neglected these important elements of effective instructional design.

The biggest difference between the plans following the traditional versus context-driven approaches was the type of contexts selected and described. Thirty-three context descriptions for Creation, Simulation, Situation Exploration, Communication, and Real types were identified in the traditional plans, while 51 of these contexts were described in the context-driven plans. These contexts generally represent more student-directed environments favored by constructivist designers. This big difference in frequencies indicate that simply encouraging the designer to consider how the skills are used in the real world and then make a context selection from an existing list can have a dramatic impact on the type of context selected. It is interesting to note that, without such prompting, a good percentage of the traditional plans communicated more tradition uses of electronic media to define learning contexts: Reference, Game, Drill and Practice, Tutorial. And in the analysis of the different plans, the category "Linear Information Presentation" needed to be included to accommodate those traditional plans that could not be categorized into one of the other context types. Perhaps the most important thing about this data is that no use of electronic media to deliver linear instruction was identified within any context-driven plan.

Perhaps one of the most important findings within the data analysis was the role computers played in encouraging different social environments in the classroom. Eighteen context-driven plans described the use of computers in small groups, compared with only six context-driven plans for individual computer-based instruction. This was nearly the opposite of the traditional plans which described seven instances of small group computer use compared with 14 plans for individual computer-based instruction. While individual computer use can prove to be a very effective learning situation, the benefits of grouping students around computers and sharing the resources may contribute to a more effective overall learning environment, especially in classroom where computer resources are limited (see Johnson, Johnson and Holubec, 1990).

Taken as a whole, the results from this study offer both promise and insight into the possibilities of utilizing context-driven instructional design. The limited results reported in this study indicate that, in order to maximize the potential efficacy of a context-driven design, certain learning conditions or instructional component elements must be explicitly addressed. Providing initial learner guidance for practice, connecting instructional information to the target skills, relating target skills to a particular content domain, and breaking down the process of learning intellectual skills into steps represent important aspects of the learning environment that may not be inherent within the implementation of those meaningful learning contexts described.

Most of the subjects reported that they would prefer to design instruction following the context-driven model. They also felt as if the context-driven plan would be more successful in the classroom. This indicates that a context-driven type of design may help motivate designers to develop more effective and creative instructional programs.

The contrived list of contexts seemed to have a profound impact on context selection. Although most instructional design models shy away from providing such contrived lists and descriptions of media use or content/context methodologies (presumably to increase the generalizability of the model), it may benefit novice designers to have such tools at their disposal. This may also benefit the novice designer in the area of media selection. It is interesting to note that computers represented the medium of choice within most of the designs. Some contexts (like Communication) are more dependent on computers, but it's possible that computers were favored because teachers and novice designers lacked the training and/or experience to conceptualize how other media might be used to facilitate meaningful, purposeful learning environments, with much less expense involved.

Results from this simple study raise a number of questions suitable for future research consideration. For example, will a context-driven model of instructional design actually result in a more effective instructional program than a more traditional ISD model? How can context-driven versus more traditional ISD models be compared? Is it possible to determine if different context types favor the natural inclusion of specific instructional components/elements? Do different types of electronic media favor different context types or context functions? What, if any, is the relationship between describing how a particular skills is used in the real world and selecting the type of context to be cultivated within the classroom ? It is the hope of the author that the quest toward answering these types of questions will help instructional technologists develop more productive, innovative, creative, and effective models of instructional design.

Figure 1: Basic Instructional Design Model

Component	Elements	Context Function[7]
Introduction	• Gain learner attention • Articulate in some way the SKA[1] already needed to succeed within the new learning environment • Identify opportunities in which learners will relate what is about to be learned (goal) to what they already know how to do • Inform learners of objectives (o.k. to be vague) • Fit objective(s) into a "Big Picture"[2] • Present the utility (relevance) of the SKA to be learned • Clearly identify the incentives/rewards for learning the SKA and succeeding within the learning environment • Establish clearly-perceived learner accountability, role(s) and task(s) within the learning environment • Establish clearly-perceived instructor role(s) and learner support mechanisms • Employ specific content-area methodologies if applicable (ensuring that all other elements are properly addressed)[3]	
Activities	• Establish <u>in context</u> the appropriate conditions for the type(s) of new SKA facilitated[4] • Relate all SKA to a clearly-defined content domain[5] • Provide learner guidance for learners as they apply information presented <u>in context</u> to SKA being facilitated • Present a variety of clear, concrete examples and nonexamples <u>in context</u> • Provide opportunities for learners to explore the learning environment with minimal instructor guidance and intervention	
Practice & Feedback[6]	• Provide initial learner guidance • Must match performances and conditions indicated within objectives and presented <u>in context</u> • All should get practice • Feedback as immediate as possible (unless delayed feedback is desirable)	Instruction
Review	• Provide opportunities for learners to summarize the key ideas (including how these ideas fit into the "Big Picture"), what they learned how to do, and how they personally learned it • Restate objectives	
Assessment	• Must match performances and conditions indicated within objectives (goal may be only thing assessed)	
Transfer	• Present new context which elicits the same performances under different conditions • Make the utility of succeeding within the new context apparent • Present cues within the new context which aid learners in selecting and applying the appropriate previously-learned SKA • Clearly identify the incentives/rewards succeeding within the new context	Transfer

Notes:

[1] SKA refers to Skills, Knowledge, and Attitudes. Unless otherwise noted, "SKA" represent content-domain as well as context-specific (including social interaction) performances.

[2] A "Big Picture" often consists of a text and/or graphic representation of how a goal's SKA fit into a particular context (like saving the rain forest, meeting a client's need, running a small business), a content domain (like biology, American Literature, project management), a cognitive-behavioral domain (like problem-solving, study skills, self-esteem, physical fitness), and/or social domain (like cooperative learning, team building, role-playing). Big Pictures often present a bridge between what the learners already know how to do and what they are going to learn how to do.

[3] Examples of content-area methodologies include "Math Their Way," Distar Reading Program, and biology learning cycles.

[4] The manner in which learning activities (including information presentation) are structured depend on the type of behavior stated in each objective (see the <u>Classifying Performances</u> and <u>Learning Conditions for Different Outcome Types</u> charts).

[5] "Content domain" refers to the general body of knowledge (information) in which the SKA are associated. For example, music, biology, football, world history, and team building all represent various content domains.

[6] Once an objective has been established, practice and feedback are the most important elements of any instruction. The most important things humans learn are acquired through informal information presentation and lots of practice and feedback.

[7] These context functions are described by Tessmer and Richey (1997) as context "types." The orienting type represents a context which precedes the learning event (information and examples directed at the target SKA) and contains factors which influence the learner's readiness to learn the target SKA. The instructional type represents a context in which conditions specific to the acquisition of the target SKA are presented. The transfer type of context is presented after learners have demonstrated they have acquired the target SKA. Transfer contexts provide an opportunity for learners to apply SKA to conditions outside initial learning context. It is important to identify which component(s) are addressed by a chosen context type because it helps the designer determine which elements of the learning environment need to be presented before, during, or after the learners experience the events associated with the context.

The ID components and elements presented in this chart are based on Gagné & Driscoll (1988), Keller, (1987), Merrill & Tennison (1994), Sullivan & Higgins (1983), and Tessmer & Richey (1997).

Figure 2. Classifying Performances

Category	Description of Performance Outcome	Common Verbs
Verbal Information (Declarative Knowledge)	Verbal information the students must **state**, including: facts, dates, people, names, principles, generalizations etc.	State, Recite, Tell, Declare, Name, List, Define *[Bloom: Knowledge]*[1]
Intellectual Skills*: *(Procedural Knowledge)* *Discriminations	Distinguishing objects, features, or symbols (smooth versus not smooth, for example)	Distinguish, Differentiate,
Intellectual Skills*: *Concepts	<u>Concrete Concepts</u>: Objects (parts of the body, for example), Classes of objects (plants, cells, etc.), Object features (5 arms, red, etc.), and Object relations (above, near, etc.) *...that can be pointed out and identified.* <u>Defined Concepts:</u> Objects, principles, classes, features, and relations that *cannot be identified by pointing them out. They must be defined.*	Identify, Label Classify instances, Sort, Categorize *[Bloom: Comprehension]*
Intellectual Skills: Rules	Rules make it possible to *do* something using symbols (most commonly, the symbols of language and math). Rules include the application of single principles to explain, describe, or predict phenomena or events. Rules make it possible for students to respond to a *class* of things with a *class* of performances.	Solve, Show, Demonstrate, Generate, Develop, Create, Determine, Calculate, Predict *[Bloom: Application]*
Intellectual Skills: Higher-Order Rules (Problem Solving)	Higher order rules employ more than one rule or principle to solve problems, perform tasks, or explain, describe, and predict phenomena or events. Students must decide which rules or principles must be utilized to perform tasks or explain, describe, or predict phenomena or events.	Solve, Show, Demonstrate, Generate Develop, Create, Determine, Calculate, Predict, Defend, Support *[Bloom: Analysis, Synthesis, Evaluation]*
Motor Skills	Motor skills represent physical activities requiring movement and coordination of all or part of the body.	Execute, Perform, Swim, Walk, Run Climb, Drill, Saw
Attitudes	Attitudes represent intrinsically motivated choices people make. Some of the most important outcomes are really attitudes.	Choose, Decide, Participate *[Bloom: Evaluation]*

[1]Schools often use Bloom's Taxonomy of Educational Objectives (1984) as a basis for classifying outcomes and standards in an effort to ensure that skills at variety of cognitive levels are being addressed.

Figure 3. Learning Conditions for Different Outcome Types

Performance Type	Strategies or Conditions for Presenting Instructional Events
Verbal Information	• Use the term or definition in a sentence. • Relate the information (term or definition) to preexisting knowledge. • Present all terms clearly using the fewest number of words to convey the meaning. If more than five terms or units of information are to be presented in one lesson, group related terms or units into five or fewer clearly defined categories. • Use a variety of concrete (observable) examples when possible, emphasizing the clear and well-defined features that relate directly to the information. • Explain clearly how learners will be expected to recall the information.. • Make information readily accessible to learners, and provide opportunities for them to explore "nice-to-know" information associated with the knowledge • **Practice with immediate feedback!**
Intellectual Skills	• Present varied examples or instances of concepts and rule applications, calling attention to the distinctive features of examples, definitions, and procedures. • Present nonexamples or noninstances of the concept if they will help to clarify the concept. • Encourage learners to recall previously learned information or examples that illustrate concepts or rules being presented. • Clearly communicate the definition of defined concepts, using the fewest words. • Break down the process of performing or applying rules into steps, and clearly communicate these steps to the students. • Demonstrate an application of the rule for the students. • Provide learners with opportunities to "play" with concepts and rules within simulated or "real" environments, identifying and selecting their own examples and nonexamples of concepts and rule applications if possible. • **Present a variety of contexts or experiences that allow the students to practice applying the rules or identifying/describing concepts, providing guidance throughout early stages of practice.**
Attitudes	• Clearly identify examples of choices made by people who possess the desired attitude (credible and attractive-similarity, familiarity, appearance). • Clearly identify instances in the students' lives in which making choices are based on the attitude being presented. • Make students aware of the personal benefits gained by making choices based on attitudes (preferably by someone the students admire). • **Allow students the opportunity to practice making choices associated with the desired attitude (role-playing, group discussion, etc.) and give them feedback.**
Motor Skills	• Verbally guide learners through routine. • Visually present example of routine execution. • **Practice with immediate feedback.** • Encourage the use of mental practice.

Figure 4. Classifying Electronic Media-Supported "Educational" Contexts

Context	**Description**
Creation:	This type of context provides opportunities for learners to create something. [O,I,T][1]
Simulation:	This context type allows the learner to make decisions in the development and subsequent operation of a simulated environment or situation. Simulations often try to replicate real-world environments. This type of context is often "problem-solving" in nature. [O, I, T]
Situation Exploration:	Unlike a simulation context, this type of context does not allow the learner to make decisions regarding the development of a simulated environment, but the learner can freely explore within a simulated environment or situation. This type of context is often "problem-solving" as well case-based. [I, T]
Reference Exploration:	This context type allows the learner to freely explore and access reference-type information. [I, T]
Tutorial (Direct instruction):	This context type generally presents "new" information (usually in a linear or stepwise format), and either provides a certain degree of practice using the information in some way, or applies the SKA to specific example(s). [I]
Linear Information Presentation (No-practice tutorial):	This context type simply provides the learners with the linear presentation of information and examples. That's it. [I]
Drill and Practice:	Generally, this type of environment does not present "new" information, but provides practice and feedback over specific skills (often knowledge, defined concepts and rules). [I]
Game:	This type of context usually engages learners in competition, cooperation, puzzles, or strategies, often for the sake of entertainment. Other contexts may employ this context to because of the motivational advantages of games. [O, T]
Communication:	This context allows learners to communicate with other people via text, audio, binary files, and/or video information. [O, I, T]
Real:	Contexts in this category could fall into any of the above groups, or none. The distinguishing characteristics for these contexts are simply that they constitute real-world situations and settings (home, school, work, play). [O, I, T]

[1] In general, each context type lends itself to one or more ID context functions. O = orienting function, I = instructional function, T = transfer function.

Table 1. Total Instructional Component Element Occurrences by ID Type and Standard

	Number of Component Elements Described					
	Standard 7.10 (Maps)		Standard 7.8 (Compare)		Total	
Instructional Component	Trad. ID	Context ID	Trad. ID	Context ID	Trad. ID	Context ID
Introduction	27	46	38	52	65	98
Activity/Information	45	46	48	57	93	103
Practice/Feedback	30	27	28	35	58	62
Review	20	17	15	14	35	31
Assessment	9	8	13	7	22	15
Transfer	10	8	5	7	15	15
Total	141	152	147	172	288	324

Table 2. Context Type Selected by Electronic Medium and Scenario

Context Type	Media[1]	Standard 7.10 (Maps) Trad. ID	Standard 7.10 (Maps) Context ID	Standard 7.8 (Compare) Trad. ID	Standard 7.8 (Compare) Context ID	Total Trad. ID	Total Context ID
1: Creation	C	3	5	2	4	5	9
	V	0	0	0	0	0	0
	OHP	0	0	0	0	0	0
	A	0	0	0	0	0	0
2: Simulation	C	1	1	1	2	2	3
	V	0	1	1	0	1	1
	OHP	0	0	0	0	0	0
	A	0	0	0	0	0	0
3: Situation Exploration	C	4	7	2	6	6	13
	V	3	1	1	2	4	3
	OHP	0	0	0	0	0	0
	A	0	0	0	0	0	0
4: Reference Exploration	C	5	2	6	5	11	7
	V	3	0	0	2	3	2
	OHP	0	0	0	0	0	0
	A	0	0	0	0	0	0
5: Tutorial (Direct Instruction)	C	4	3	3	2	7	5
	V	0	0	0	0	0	0
	OHP	0	0	0	0	0	0
	A	0	0	0	0	0	0
6: Drill and Practice	C	6	3	4	2	10	5
	V	1	0	0	0	1	0
	OHP	0	0	2	0	2	0
	A	0	0	1	0	1	0
7: Game	C	4	2	1	1	5	3
	V	0	0	1	0	1	0
	OHP	0	0	0	0	0	0
	A	0	0	0	0	0	0
8: Communication	C	0	2	0	5	0	7
	V	0	0	0	0	0	0
	OHP	0	0	0	0	0	0
	A	0	0	0	0	0	0
9: Real	C	1	3	0	2	1	5
	V	0	0	0	0	0	1
	OHP	0	0	0	0	0	0
	A	0	0	0	0	0	0
10:Linear Information Presentation	C	4	0	1	0	5	0
	V	1	0	1	0	2	0
	OHP	1	0	0	0	1	0
	A	1	0	1	0	2	0

[1]C = Computer, V = Video, OHP = Overhead Projector, A = Audio

Table 3: Social Interaction Environments by Electronic Media

Electronic Medium	Interact	Standard 7.10 (Maps) Trad. ID	Standard 7.10 (Maps) Context ID	Standard 7.8 (Compare) Trad. ID	Standard 7.8 (Compare) Context ID	Total Trad. ID	Total Context ID
Computers	Class	1	0	0	2	1	2
	Group	3	10	4	8	7	18
	Indv	13	8	15	5	14	6
Video	Class	2	1	5	2	7	3
	Group	1	2	2	3	3	5
	Indv	1	0	1	2	2	2
Overhead Projector	Class	1	1	0	0	1	1
	Group	0	0	1	0	1	0
	Indv	0	0	0	0	0	0
Audio	Class	0	0	1	0	1	0
	Group	0	0	0	0	0	0
	Indv	0	0	0	0	0	0

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