Levels of teaching: A taxonomy for instructional design

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Abstract:
Instructional designers traditionally classify educational software by type of activity, using such terms as drill, tutorial, simulation, cognitive tool, expert system, and so on. It is generally believed that certain elements of this typology are more valuable than others for developing higher order thinking, but little attempt has been made to order or rank instructional methods by the capability for cognitive development in the learner. This paper presents a framework to inform the selection of educational methods and guide instructional design. Our goal is to articulate and order educational strategies used by instructional designers. We hope this classification will help designers select and develop instructional methods that elicit appropriate cognitive engagement. We anticipate this taxonomy will provide a progressive (i.e. cumulatively advancing) plan through which designers and teachers can advance their pedagogy.

Introduction

Educational uses of technology, indeed pedagogy in general, often remain mired in traditional notions of instruction that focus on information delivery (Clark & Mayer, 2002). A diverse range of methods are available for instruction; these choices have been expanded by the wide availability of computing and the Internet. However, in general, instructional methods are not ordered or ranked according to their educational value. This paper presents a framework to inform the selection of educational methods and guide instructional design.

Instructional designers traditionally classify educational software by type of activity, using such terms as drill, tutorial, simulation, cognitive tool, expert system, and so on. It is generally believed that certain elements of this typology are more valuable than others for developing higher order thinking. For example, we often disparage educational drills as ‘drill and kill’ software to demean their cognitive value, without recognizing their place in a larger hierarchy. Moreover, little attempt has been made to order or rank instructional methods by the capability for cognitive development in the learner. We often state that we want "to stimulate higher order thinking skills", but we rarely extend our thinking to prescribe strategies for how this might occur. Instructional designers lack a framework to clarify the relative value of various methods. Our goal in this paper is to develop an ordered framework; a taxonomy.

By design, the most widely accepted educational framework, Bloom's Taxonomy, was not created to categorize instructional methods, but to order learning outcomes. “It should be noted that we are not attempting to classify the instructional methods used by teachers, the ways to which teachers relate themselves to students, or the different kinds of instructional materials they use.” (Bloom et al, 1956, p. 12.) Nevertheless, as a taxonomy (i.e. the ordering of cognitive results), it has proven useful for many in our educational system; even the newest teacher will probably have some knowledge of Bloom's Taxonomy.

Conversely, our goal here is to articulate and order educational strategies used by instructional designers. We hope this classification will help designers select and develop instructional methods that elicit appropriate cognitive engagement. We anticipate this taxonomy will provide

a progressive (i.e. cumulatively advancing) plan through which designers and teachers can advance their pedagogy.

Much of this taxonomy describes the interaction between learners and the questions asked of them (or lack thereof). The presence, complexity, and authorship of questions, and their more developed and complex form, problems, is at the essence of the taxonomy. In this article, questions are distinguished from problems. Questions may vary in complexity and may be answered through different procedures, but usually have only one correct answer. Problems are viewed as being more complex and having multiple correct solutions.

Five levels of instructional methods

We have defined a taxonomy of five levels (see Table 1), beginning with the simplest and perhaps most common forms of instruction, and extending to what could be described as the best learning experiences. Each is explored and diagrammed below. While most instructional methods can be easily described at a specific level of the taxonomy, instructional processes are often more complex than presented here and are a combination of levels. In general, higher level instructional methods require greater cognitive effort on the part of the learner. The levels are cumulative; each builds on the previous types of activities, as higher level methods necessarily include the processes of lower levels.

Level 1	**Reception**	Receiving information.
Level 2	**Application**	Applying ideas.
Level 3	**Extension**	Extending ideas.
Level 4	**Generation**	Generating solutions.
Level 5	**Challenge**	The learner's challenge.

Table 1: Five levels of instruction: A taxonomy for instructional design

Level 1: Reception

The simplest form of educational activity involves the transmission of information (see Figure 1). Lectures, books, and informational web sites are the most common expressions of this approach. At this level of instruction, answers are given to students, not questions to answer or problems to solve. All of the analysis, synthesis, and problem solving has been done by the instructor. Requirements for attendance, seat time, and/or contact hours are common expressions of this form of education.

Students and faculty, indeed society in general, often believe education's role to be one of conveying information (Adler & VanDoren, 1940). We know that by itself, the distribution of information does not cause the development of knowledge for most learners. Mere access to content does not bring about learning. Many educational activities occur at level one, and such entrenched use could explain the failure of many efforts of education technology such as early televised education and computer based instruction. As instructional designers or teachers, we need to ask ourselves how much we rely on this level of instructional method.

Critically, in level one methods, the learner is considered an information receiver, and the challenge for instructional designers is to transmit the proper content in the proper sequence in

the most efficient manner possible. Material is organized and presented to the learner through a generally linear procedure according to principles of instructional message design.

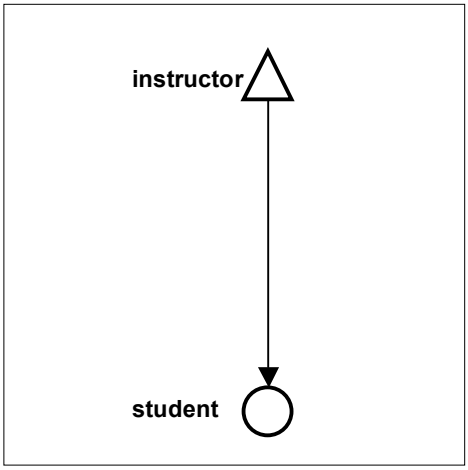

Figure 1: Instruction as information transmission.

In reality, presenting content well is rarely sufficient to foster understanding. Indeed, the cognitive effort of clarifying and organizing material for efficient delivery is probably more beneficial to the instructor than for the student. This is analogous to nutritional concerns about overly refined elements of our diets; the processing of flour or sugar removes many beneficial nutrients, and often leaves only calories. Similarly, this cognitive refining may only provide the 'empty calories' of information.

Questions, and their corollary forms, problems, are the most important component to learning and teaching at higher levels. Beyond language itself, the *question* may be the most significant technology used in education; much of the differentiation in this taxonomy is due to the use, complexity, and origin of questions.

Level 2: Application
At level two, and for higher levels, some interaction or practice is required of the learner; the learner applies the instruction though activities such as answering questions, summarizing information, or following a specific procedure presented by the teacher (see Figure 2). For example, a student learning to add large numbers learns a "carry" process by repeated drill and practice, which consists of arithmetic problems that are similar to those already presented by the instructor. In this case, knowledge is developed through repetition. This level of learning may be described as "near transfer."

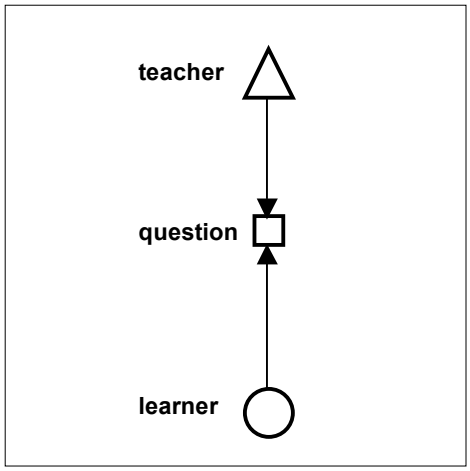

Figure 2: Application: Instructor poses simple questions; learner responds.

Lessons at this level could include activities such as answering questions or communicating about the topic. For the first time education becomes more effective than the distribution of content; the learner must apply or demonstrate their understanding. Application involves more than the repetition or re-presentation of content; interactivity in computer based instruction involves more than navigation. Answers, however, are specific and easily defined, as questions have been distilled from the content and are generally not authentic. The way to respond to a question is evident, even if the answer is not known.

Level 3: Extension

Instruction at the third level encourages learners to apply the principles of what they have learned to solve a new and different question (see Figure 3). Learners at this level extend a lesson to a different or authentic context. This level of development can also be described as "far transfer". Previously learned facts or procedures are applied in new situations. For example, in arithmetic, the "carry" method works with much larger numbers or smaller numbers, but also needs to be used with multiplication. The learner might say: "I remember answering a similar question: I'll use the same idea to figure this one out." Questions or problems posed in levels two or three generally have specific answers, but differ in terms of the relationship of the question to the previous instruction. In level 3, the way to answer the question is not evident and the evaluation of questions may take into account the processes used and the principles applied.

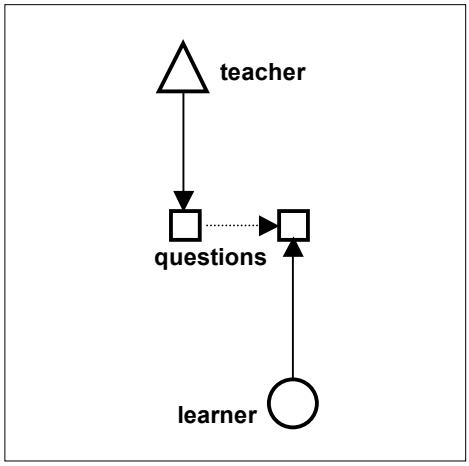

Figure 3. Extend: Far transfer as learner solves indirect questions.

Level 4: Generation
Learners must eventually learn to **generate or create** their own solutions to complex problems (see Figure 4). At level 4, the instructor poses a problem to be solved; learners must recognize, regulate, and marshal the resources needed for a successful solution. Examples of instruction at this level include the case study approach seen in business and medical schools. Demonstrating a learning effort beyond far transfer, this range of skills could be described as "meta-transfer". The cognitive effort required to address and resolve multiple issues in a problem is much more valuable to learning. "…the problem drives the learning, rather than acting as an example of the concepts and principles previously taught." (Jonassen, 1999).

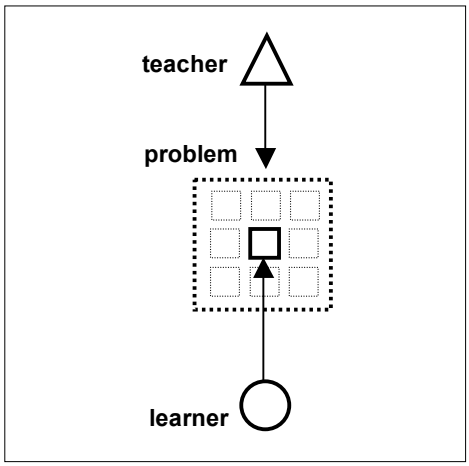

Figure 4: Generate: Learner solving an instructor posed problem.

Designing is a very well known generative learning method. Architects, for example, learn by designing buildings and solving a broad range of complex problems. In our own field, instructional designers are given a challenge, such as being directed to improve math skills among unwed mothers, where a specific solution has not been defined previously.

One distinction between levels 3 and 4 concerns whether students' answers converge or diverge; that is, whether students' answers can be objectively assessed as being right or wrong. Typically,

level 4 answers do not converge on a single solution as problems are more complex than questions posed in earlier levels and have ill-defined solutions. Answers are evaluated subjectively, as there are few absolutely correct answers; some solutions are better than others.

Level 5: Challenge
The highest level within our learning taxonomy is for learners to **challenge** others (and themselves) to learn. (see Figure 5) Those who seek, find, pose, and eventually resolve exploratory problems for themselves, challenge their own limits of learning. The most widely understood example, the dissertation, is a sophisticated problem posed by the learner.

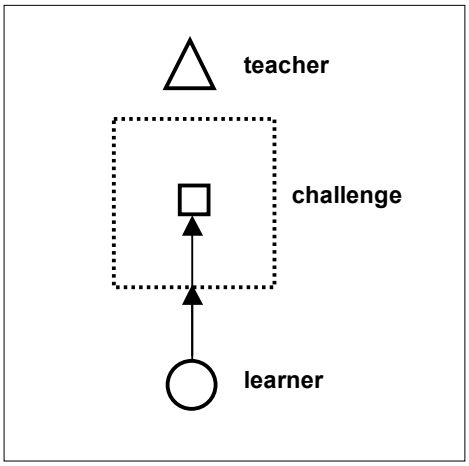

Figure 5. Challenge: Learners seeking their own problems to solve.

On a broader scale, we see **challenge** methods throughout our academic structure; at the individual level, it is seen through the constant growth and development of each professor, bringing new knowledge back to the classroom through their active research agenda. On a larger scale, it is the richness of the educational system, developing new knowledge and then helping others extend that same knowledge.

One can see a parallel development of our taxonomy across the pedagogy of a typical research university. Entering students often suffer through large lectures, **receiving** information. Frequently, early education employs drills and exercises, **replicating** specific processes with little diversion from protocol. As they progress, students **extend** their skills through more difficult and different problems. Upper level students address complex problems through research projects or design problems, **generating or creating** their own solutions. Finally, through their dissertations, doctoral students **challenge** themselves with their own questions and by posing their own problems to solve.

Level:	1	2	3	4	5
	(Receptive)	**(Applicative)**	**(Extending)**	**(Generative)**	**(Challenge)**
Instructional Concept	Delivery	Near Transfer	Far Transfer	Meta-transfer	Defining problems
Educational concept	**Here it is**; Content oriented; experience it/read it/listen/view/etc.	**Answer these questions** that are directly related to the content. Principles and concepts are directly applied.	**Answer these more difficult questions**; questions are less defined and seek specific answers; decide which principles and concepts apply.	**Solve this;** Problem based learning; selective methodology; meta-transfer; selecting means of solving problem; cognitive tools.	**Find a problem to solve.** Identify a problem, develop instructional support, create scaffolding, get it accepted by the learner.
Instructional method	Information is delivered.	Instruction includes using questions for practice.	Instruction includes posing more complex questions.	Subjective answers or solutions are sought to complex problems posed by instructor.	Instructors guide and support students in developing their own challenges; learners seek challenge through exploration or teaching.
Application	lecture	drill and practice	indirect questions	problem solving	authoring, teaching
Questions	Questions are not generally not included as part of instruction.	Simple questions are posed that are directly related to the presented content.	Objective questions are asked that indirectly relate to the content.	Subjective, complex problems are posed that generally relate to the content.	Questions or problems are found or developed by the learner related to (but not limited by) the content.
Answers	Instructor provides answers as part of information delivery.	Answers are subjective, simple, directly derived from content.	Answers are subjective, but indirectly related to extended content.	Solutions are divergent and derived from multiple resources including content.	Answer integrated into the process of problem seeking and resolution.
Assessment	**Quantity of the information**; Retention.	**Quantity of correct answers;** Applying processes directly.	**Quantitative summary** nuanced application; process is valued.	**Quality of the answer**; subjective judgment based on criteria	**Quality of the challenge and solution.**
Noise	Instructor clarifies information, ideas.	Questions are distilled from the content; knowledge not authentic.	Learners required to select the principles and concepts for solution.	Learners regulate and marshal resources for a successful solution. Answers are not evident.	Questions not evident; must be developed.
University examples	Freshman lecture class	Drills and exercises; cookbook labs.	Ability to solve or synthesize answers to complex questions	Design projects; case studies; research projects.	Thesis or dissertation; select your own project to demonstrate skills.

Table 2: Elements of the taxonomy.

Application
As the taxonomy is not designed for any specific domain, it may be applied to any topic. Our goal in this section is to illustrate this process by examining how the five levels can be used to generate increasingly sophisticated designs in diverse settings: learning a foreign language, software training, distance education, and adventure learning. For each example, we will consider the nature of the instructional experience and the expected learning outcomes within each level.

Foreign language education Applying the taxonomy to the teaching of a different language, such as Spanish, provides a good example of its use. Many K-12 students take a foreign language class, and many adults experience the need to develop their own foreign language skills for business or pleasure.

Level one instruction in foreign language learning is relatively common. It involves hearing the definitions or translations of the language and repeating the words to improve pronunciation. For example, in a Spanish class, the instructor might say that the word "hablo" means "I speak", and ask the students to repeat the word "hablo".

In level two, the student uses learned information to answer questions, but is required to generate a response rather than simply repeating information. For example, the student might be asked to translate English phrases and words into Spanish.

Language instruction often extends this pattern and asks the learner to anticipate words and the application of rules; for example, gender is an important characteristic of many languages, and knowing the masculine form of a word and the method for adjustment to a feminine form, the student should be able to develop the feminine version of the same word. What is more effectively learned is an understanding of the gender based word rules; "uno" (male) becomes "una" (female), "el" becomes "la".

Some language instruction integrates these three levels of instructional method in their processes. Consider this transcribed portion of an audio CD for learning Spanish (Pimlsleur, 2002). Here, the learner is directed to speak the English phrases in Spanish. Next, the phrase is given in Spanish, followed by an opportunity for the learner to repeat the phrase correctly. Spanish is italicized and English to be translated is in bold for clarity; comments are in brackets:

Let's go to the restaurant.
(Pause for student response)
(Level 2, near transfer, use of known words and structure)
Vamos al restaurante.
(Pause for student response)
(Level 1, demonstrating pronunciation)

I want…
(Level 2, near transfer, use of known words and structure)

Yo quiero… Yo quiero…
(Level 1, demonstrating pronunciation)

…a beer.
Escuche y repita:
(directions in Spanish to listen and repeat)
(Level 2, applying known words and structure)
una cerveza
(Level 1, demonstrating pronunciation)
Cerveza…za…..veza…cer…cerveza…una… una cerveza
(Level 1, demonstrating pronunciation)

Say 'I want a beer'.
(Level 2, near transfer, use of known words and structure)
Quiero una cerveza…Una…
(Level 1, demonstrating pronunciation)

Try to guess whether 'beer' is an 'el' or a 'la' word…
(Level 3, far transfer, application in new context)

Extending and combining words and phrases are the basis for most conversations, and use of the new language in such a structure is a level 3 activity. Given a sufficient base of vocabulary words, learning can progress and be more effective with level 3 methods than with level 2 methods. It's widely recognized that use of the phrases and words in conversation is necessary for progress in the language. Use of the new language in an unscripted and contemporaneous conversation is much more difficult, and a Level 4 activity. Use of the language in an immersive environment provides significant cognitive development and improvement of language skills; the challenge, engagement, and experimentation of new social interaction through language is a level 5 instructional method.

Software training One common activity experienced by instructional designers involves learning how to use a new software application. Many methods of instruction are available to achieve this goal. For example, a designer might take a class to learn how to use Macromedia Flash. The class itself could involve a number of different instructional methods. By applying the framework to this learning experience we hope to illustrate how the taxonomy can be applied.

The first level, reception, involves 'telling' the user about the software. The instructional media might include an in-person lecture, books, or video demonstrations about the program. The learner is simply receiving information, and the medium is often considered irrelevant: The method is one of supplying information, not using it or applying the new tool.

The second level, application, involves learners completing exercises that vary little from a proscribed process. Lessons include information and activities to help learn the content. Little deviation from the norm is expected in the solution of questions; answers are right or wrong. In our Flash example, programming code might be copied verbatim for use in an animation, a button created by following directions, or, a picture imported through a step-by-step process.

Little learning occurs in these examples because little cognitive effort is demanded of the learners: Moreover, current theory on software training encourages the early inclusion of authentic and relevant tasks (Carroll, 1998), a logical advance to level 3 of this taxonomy.

Level three involves applying what one has learned in a new situation. Questions or problems provided by the instructor are more complex and require divergent answers, which have not been directly provided in the instructional materials. A typical Flash assignment would be to apply programming code to different situations, but without specific instructions on how to solve each task.

Level four involves the learner generating a solution to a supplied problem. At this level the learner needs to recognize and regulate their understanding in order to solve a complex or ill-defined problem. For example, we could ask our Flash student to design a clock in Flash; here, our goal is not for students to produce a single, objectively defined answer. Instead, each learner assembles and combines skills and resources to create a solution that must be evaluated subjectively.

Finally, learning the software at its highest level involves seeking problems to solve. These problems may be our own learning challenges, or may be used in teaching others. For example, we may challenge ourselves to understand advanced programming techniques, or to teach such concepts to others.

Adventure learning The next example involves adventure learning. Adventure learning involves the development of Internet-based activities to support instruction while students and teachers follow the pursuits of remote explorers. Participants become virtual co-travelers in the expeditions. Students interact with the explorers, other students, and teachers around the world through vicarious travel and cultural experiences. The expeditions are intended to simulate discovery and exploration while promoting cultural understanding.

In many cases, teachers and students follow the exploits of a team of adventurers by accessing audio and video clips while following the explorers on a map: This is a level 1 activity. Level 1 occurs when teachers follow the progress of the explorers, but do little more than to access the files made available on the expedition website. It can be as educational as viewing your neighbors vacation photos and videos. How can a teacher integrate adventure learning into the classroom to make the experience more than a simple observation of the explorers and more of a personal learning experience? The taxonomy can guide more successful implementations of adventure learning such as Maya Quest or Arctic Transect into the classroom by encouraging more cognitively challenging activities.

Teachers and curriculum developers can encourage interaction at level 2 by asking objective questions or including simple questions/polls such as “What’s the temperature at the explorer’s camp?” or “How does that compare to here?” At level 2, activities are included that require the students to locate specific information from their regular reports.

Level 3 would include questions that require students to **extend** their knowledge to more diverse questions, such as "What do you expect the temperature to be tomorrow at the base camp?" At

level 4, students could be asked to **generate** routes for explorers to take or to propose solutions to authentic and sometimes complex issues. For example, instead of simply observing explorers taking water samples in the Arctic Ocean, they could investigate the water quality in their own communities. Many of us are very familiar with the NASA program that has students create experiments for inclusion into the Space Shuttle program, which could be a level 5 instructional method.

Distance Education Many universities have been developing distance education courses. Given that distance education remains largely undefined and that guidelines to stimulate effective development are rarely provided, it is probably not surprising that distance education courses often on-line lectures, and their methods frequently replicate existing pedagogical procedures. Often, online education involves little more than students accessing posted content and completing summative tests. The fundamental method of instruction remains the delivery of structured information.

By applying the five phases it is possible to develop insight into new methods of online education. The scenario just described is a classic case of level 1: A heavy emphasis on content presentation. Level 2 distance education involves integrating quizzes and other activities into the instruction. Such activities would apply content in settings similar to the instructional context.

In Level 3, students are asked to develop solutions to problems that are specifically addressed in the content; answers to these questions tend to be categorized as right or wrong. In contrast, at level 4, problems posed by the instructor are more complex and open ended. Indeed, usually, no two responses from a set of students will be the same. At this generative level, students do more than answer questions; they solve complex or ill-defined problems, with the greater depth of investigation that implies. For a distance education course, an instructor may ask individuals or small groups to generate solutions to case studies. Instructors assess the quality of students' work by applying subjective measures since the end results will always vary between solutions. Meta transfer may occur through the recognition and regulation of resources needed to solve a problem.

The principal difference between level 4 (i.e. generate) and level 5 (i.e. challenge) concerns problem authorship. In level 5, learners define and structure a complex problem that they then solve. Level 5 activities involve finding and posing problems that marshal the resources needed to generate an appropriate solution. For example, in a distance education course each student might become responsible for posing a question; that question can be subjectively evaluated through this same taxonomy; does it simply require reproducing information? Does it challenge the learner to transfer knowledge to other settings? Does it stimulate a solution requiring analysis and synthesis? Does it challenge the learner to pose their own questions for themselves to solve?

As we have seen, instruction at Level 1 is easy to present with technology. As we move through the levels of the taxonomy, exactly how technology will support instruction becomes more difficult. Indeed, our challenge as instructional technologists is to develop methods to manage level 4 and 5 tasks. For example, ‘team-ware’ such as Tree-Map (a graphic representation of news trends) or social software such as wikis (i.e. communally authored web sites) are being developed to help people to collaborate.

In Table 3 a series of examples illustrate the use of the model in various domains. The challenge to the reader is to apply the model to other domains. How would you apply this taxonomy to your subject matter? What does instruction look like that helps people learn through answering questions or solving problems?

Level	1: Receive	2: Apply	3: Extend	4: Generate	5: Challenge
Foreign language instruction	Hear an explanation; repeat: "hablo" yields "hablo"	Simple translation and use in phrases: "I speak" yields "hablo"	Anticipating use of new words; entiende/entiendo: habla/_____; applying learned rules to other situations	Converse in an unscripted extemporaneous manner; understanding, analysis, and response.	Helping others to learn Spanish; immersion in a Spanish speaking culture.
Software (Flash)	Telling users about the features of the software. Demonstrations.	Exercises with substantial direction that demonstrate software capability.	Applications of ideas to different and more complex exercises.	Solving a problem using Flash; "create a clock".	Exploring the data manipulation capabilities of Flash.
Distance Education	Providing information by the Internet.	Including a simple quiz within internet based information.	Online complex discussion questions based on content and own experience.	Online learners are given a case study to resolve.	Learners define and solve a complex problem.
Adventure Learning (Arctic Transect)	The temperature at base camp is -23 degrees Centigrade.	What is the temperature at base camp today? Where are they?	What do you expect the temperature to be at base camp tomorrow? Where will they be tomorrow?	How should the explorers proceed over the next five days? Why?	Design and carry out experiments in local environment that are similar to those attempted by explorers.
Math (Vectors)	Rules for use presented by lecture reinforced by reading text.	Practice exercises in drawing vectors.	Applying understanding to more complex problems;	Authentic problems with multiple possible solutions solved through vectors.	Teaching the use of vectors; finding and addressing a problem through using vectors.
History	Here are the dates; here's why it happened.	What were the dates? Remembering dates and trends.	How did contemporary external events affect our study area?	Analysis of ideas and trends; why were these trends important?	Creating a challenge or posing a hypothetical problem; "what if?" questions.
Science	Lecturing on science; reading about science.	Cook book experiments; answering simple questions.	Questions that extend concepts to different situations.	Development of their own experiments to investigate given concepts.	Wise; creating challenges from which others can learn.
Music/Guitar	Notes, motions and chord shapes presented in isolated form.	Note naming and counting drills; motions developed through drills.	More complex drills and pieces; new combinations of notes.	Simple classical pieces combining all techniques available; new, unrelated chord shapes.	Students compose their own pieces or arrangements.

Table 3: Examples of taxonomy use.

Implications

Theoretical examinations of the field of instructional design generally deal with methods of production, proscribing processes for the creation of instructional materials. The taxonomy described herein, however, focuses instead on articulating the range of instructional methods available to instructional designers. There is an order to the taxonomy implying a direction for improvement: Higher levels of instructional methods will encourage greater cognitive development.

In addition to being used to help develop instructional designs, the taxonomy can also be employed for more specific educational uses. For example, it can be used to regulate one's own learning, to diversify one's teaching, or as a means to evaluate educational processes (i.e. classes, teachers, books, software, etc.).

The taxonomy can be used to monitor one's own learning, balancing learning activities from multiple levels. Highly effective learners value and include lower level methods in their learning. For example, architectural students designing a new fire station need to access basic information about firefighting. They test and try out various information patterns (i.e. near transfer) and explore complex and divergent solutions (i.e. far transfer) in order to support their level four design work.

Many of the best learners have internalized instructional methods that replicate the effects of multiple levels of the taxonomy; while listening to a lecture, for example, they test themselves with simple questions or divergent problems, and often establish their own learning challenges from the ideas presented in the lecture. It is ironic that those with the fewest internalized learning capabilities, such as college freshmen, are often exposed to the lowest level of instructional method.

Given the range of capabilities in learners, it is also interesting to consider a balance or range of instructional approaches to a given problem. A successful instructional design could include activities from all of the levels of the taxonomy. For example, doctoral candidates are challenged by their advisors to generate their own topics for investigation (a level five activity) but still need to engage in literature review or finding existing information (a level one activity). This is similar to the practice of many artists, who find information on a given topic or media (level 1), experiment with procedures (level 3), and finally challenge themselves to address a complex aesthetic or cultural issue (level 5).

By contrast, novice teachers or instructional designers tend to focus on levels 1 and 2, designing activities for others that deliver information in the most efficient manner, possibly including near transfer activities in attempting to make the experience more 'interactive.' Novice teachers often use numerous worksheets in their classrooms, whereas more experienced teachers tend to provide more complex and cognitively richer experiences. The most effective teachers pose problems that require/allow students to generate divergent solutions to complex issues and encourage students to pose and solve their own challenges. As a general goal, teachers should strive to advance their instructional methods by moving up the levels of the taxonomy.

Finally, the taxonomy can also be used as an evaluation instrument. For example, the taxonomy

can be used to examine one's own instructional methods. To what extent do we lecture in class (a level one activity) or ask only simple questions that encourage only near transfer (level two)? How often do our instructional methods encourage learners to design responses to complex problems (level four)? How often do you, as learner, seek the information inherent in level one, without investing the mental effort required by the higher levels of the framework?

In theatre, the expression 'breaking the fourth wall' refers to extending the play into the audience. In that spirit, we address these questions to the reader: Can you name and summarize each of the five levels of the taxonomy? Extend Table 3 to include examples at each level for your own subject area. Write an article challenging the ideas presented in this paper. How would you teach the taxonomy to others for their own use?

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