

White Paper

# Technology Enhanced Items for Formative Assessments in Dialogic Curriculums

by  
John Richard Bergan, Ph.D.  
John Robert Bergan, Ph.D.



**Assessment  
Technology  
Incorporated**

**Assessment Technology, Incorporated**

6700 E. Speedway Boulevard

Tucson, Arizona 85710

Phone: 520.323.9033 • Fax: 520.323.9139

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By John Richard Bergan, Ph.D. and John Robert Bergan, Ph.D.  
Assessment Technology, Incorporated

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## I. Introduction

Schools in every corner of the land are about to embark on a major initiative to increase the implementation of technology-based assessment and instruction in public and private educational programs. The movement toward technology-based education is being fuelled by rapid advances in computer and information technology that are altering virtually every aspect of modern life. It is also driven in response to important developments in educational standards and curriculum. Whereas in the past, the main focus of education was on learning and retaining information, the emphasis today has shifted toward the acquisition of problem-solving, critical thinking, and analytical skills that can be used to accomplish tasks that require going well beyond content explicitly taught. Preparation for life in the rapidly changing world that technological advancement has produced requires skills that may assist in addressing the new challenges and opportunities that accompany modern life. Thus, it is not surprising that current educational standards emerging in states across the nation call for the acquisition of high level cognitive skills. In the future we can expect continuing changes in standards accompanying continuing technological innovation. The movement toward technology-based education and the new emphasis on advanced cognitive skills are likely to remain driving forces shaping changes in education in the years ahead.

In order to support districts and charter schools in their efforts to implement the new standards and accommodate instructional expectations, ATI is launching a new assessment and instruction initiative introducing Technology Enhanced (TE) items through formative assessments rendered in the course of dialogic instruction. The paragraphs that follow discuss the components of the initiative and their role in contributing to the implementation of the new standards.

## II. Technology Enhanced Items

We begin the discussion with a review of the TE item types that are introduced in the formative assessment initiative. ATI items banks contain a broad range of TE item types. In addition, the banks include multiple-choice items, yes-no items, true-false items, constructed response items, and short answer questions. The processes of item development, item alignment with standards, classifying item depth of knowledge, item review, and item certification are described in the ATI white paper titled *Item Development and Assessment Construction Guidelines for Common Core State Standards* (Cunningham, Callahan, Feld, & Bergan, 2013). The discussion that follows provides a description of each of the major TE item types included in ATI banks and examples of the cognitive processes required to respond effectively to each item type.

## **A. The Multi-Part Item**

The multi-part item is an item comprised of two or more interdependent questions. Each question may address a different standard. Moreover, the item types for the questions may vary. For example, part one of a two-part item might be a multiple choice item whereas part two could be a constructed response item. Each part of a multi-part item generally represents a different cognitive process. For example, part one of a two-part item might require the student to draw a conclusion based on information in the item. Part two of the item might require the student to provide evidence for the conclusion drawn. The multi-part item tends to demand a high depth of knowledge because the student must coordinate multiple cognitive processes typically involving high level cognitive functions. Because multiple responses are required, multi-part items may necessitate longer response times than other item types.

## **B. The Selectable Text Item**

The selectable text item type presents the student with a scrollable text and a question addressing information contained in the text. The text could be an excerpt from a play, novel, speech, essay, math problem, or science problem. The student answers the question presented by highlighting one or more parts of the text. For example, the student might be asked to highlight evidence in the text supporting an argument presented by the author of the text.

The selectable text item type can be used to address a broad range of subjects. It reflects an authentic approach to activities such as text analysis in that readers engaged in analysis frequently highlight text addressing important elements supporting a point of view or argument. The selectable text item type provides the additional benefit of reducing the probability of guessing the correct answer to a negligible level.

## **C. The Sequencing Item**

The sequencing item is designed for tasks requiring the student to order things in a series. Ordering may involve different dimensions. For example, events may be ordered in time as in a life cycle. By contrast, objects may be ordered by size. Sequencing items are often used to measure student ability to order processes. For example, a sequencing item in science might ask the student to order the processes that produce thunder storms. An item of this type would likely require the student to know each process, its function, and the place of each process in the sequence. Sequencing tasks have a number of advantages. Sequencing is a task that is often encountered in daily living. Thus, the skill of ordering things, which is inherent in sequencing items, is one that the student will use beyond the classroom. An additional advantage is that the probability of guessing the correct order is typically negligible.

## **D. The Expanded Selected Response**

The expanded selected response item is a multiple-choice item that has many alternatives, each of which must be evaluated by the student. Detailed evaluation of alternatives is required because the expanded selected response item may have more than one right answer. The expanded selected response item makes it possible to assess a broad array of content in a single question. Thus, it is a highly efficient form of assessment. An additional advantage is that the probability of getting the correct answer by guessing will generally be quite low.

## **E. The Customized Technology Enhanced Item**

The customized TE item is an item that accommodates a variety of types of items that require specialized formats. One example is an item that involves specialized tools. For instance, an item may call for a protractor, or a calculator, or the ability to write selected equations that cannot be produced in the typical text editor. A second example is an item utilizing sound. For instance, it is useful to have the computer read questions to young children just learning to read. When the computer reads the questions, the children can respond at their own pace. A third example is an item utilizing a specialized control such as the drag and drop control. Items requiring drag and drop are particularly useful for classification tasks. For example, a student may be asked to drag all nouns to one box and all verbs to another box.

## **F. Project-Based Assessment**

Project-based assessment involves the design and implementation of a project that may require an extended time period to implement and that produces student responses that can be scored. A project is typically initiated through an in-class activity that outlines the project and obtains information on prior student knowledge related to the project. The next step requires students to conduct research to gather information relevant to the project. The third step is to analyze the information. The fourth step is to write a report presenting evidence-based arguments for various courses of action. For example, a project might involve investigating the use of unmanned aircraft in rescue operations. The students would be introduced to the project through a class discussion in which they would share their knowledge of the current status of the unmanned aircraft industry. The discussion would be followed by research on the topic. The data gathered through research would then be analyzed, and papers would be written on the subject. The students might then be asked to respond to questions regarding the evidence supporting the use of unmanned aircraft in rescue operations. Student responses to questions and their essays would provide the scored responses for the project.

Project-based assessment is a critical element in the implementation of the Common Core State Standards (CCSS) and state specific standards targeting high level cognitive skills. It is the only way to assess Depth of Knowledge (DOK) at level four, which is the highest DOK classification level. Cognitive processes such as analysis and synthesis of information, critical thinking, and problem solving are prominent in DOK four tasks.

Project-based assessment stretches the boundary between assessment and instruction by directly integrating the two processes. Project-based assessment involves instructional practices that are widely advocated, and combines those practices with scorable assessment information. A scorable project can be treated as a test item and combined with other items to form an assessment. Project-based assessment can be implemented without an online connection. Nonetheless, the research required to implement project-based assessment almost always requires gathering and analyzing data using a computer. Because project-based assessment makes extensive use of computers and online resources, we are including this form of assessment in the classification of TE items.

### III. Formative Assessment

Formative assessments are generally thought of as short assessments intended to guide instruction. Research has shown that these short instruments can provide useful information to inform next instructional steps. Because formative assessments are known to be useful in guiding instruction, they provide an ideal set of tools for introducing students to new types of assessments aligned to new standards. Since we know that formative assessments are useful in guiding instruction, we thought it would be advantageous to put these assessments in an instructional context, which is why we are implementing them in *Instructional Dialogs*. That said, formative assessments can also play a useful role in evaluating and improving curriculum. The paragraphs that follow discuss the ways in which formative assessment can be used to enhance technology-based education through its role in curriculum improvement and instructional guidance..

#### A. Evaluating and Improving Curriculum

Formative assessment was introduced into American education in 1967 by Professor Michael J. Scriven. Scriven (1967) described formative assessment as the collection of evidence that could be used in evaluating a new curriculum during the curriculum construction process. The intent was to gather evidence that could be used for curriculum improvement before a curriculum was put into widespread use. Evaluating curriculum in 1967 was a difficult enterprise. Implementing a formative assessment initiative of the type described by Scriven was extremely challenging. Thus, formative assessment for curriculum improvement was never widely practiced. With the advent of current technology, the evaluation of curriculum has become much easier to manage than was once the case. Today, the instructional efficiency and effectiveness of curriculum units can be evaluated on a continuous basis through formative assessment. As a consequence, it is possible to develop continuously improving curriculums that are modified based on assessment results.

ATI has recently introduced technology to rapidly create and distribute curriculum units and to link online *Instructional Dialogs* providing standards-based instruction to those units. Districts and charter schools participating in the formative assessment initiative will experience these units first hand. We plan to initiate evaluations of instructional efficiency and effectiveness related to these units during the coming year.

#### B. Guiding Instruction

Shortly after Scriven introduced the construct of formative assessment, Benjamin Bloom and his colleagues (Bloom, Hastings, & Madaus, 1971) suggested that formative assessment could also be used to guide instruction. Tests could be developed to measure objectives targeted for instruction. Information regarding student performance on those assessments could be used to plan and implement instruction to improve learning. A meta-analysis conducted by Black and William (1998) played a large role in promoting the instructional guidance view of formative assessment. These investigators reviewed several studies including one of ours (Bergan, Sladeczek, Schwarz, & Smith, 1991) indicating that planning and implementing instruction based on formative assessment results had a beneficial effect on learning. Our study also revealed that the use of formative assessment in kindergarten increased readiness for first grade and reduced referral and placement in special education.



Since the Black and William findings are consistent with our own results, we are hardly in a position to deny the benefits of instructional guidance based on formative assessment outcomes. The evidence is clear. When formative assessment is linked to instruction, learning will increase.

There are two ways to conduct formative assessment to guide instruction. One is to administer short quizzes on a regular basis following instruction. Information from the quizzes is used to guide reteaching initiatives to address knowledge and skills that were not acquired following initial instruction. The second approach is to integrate assessment into the instructional process. In this approach, assessment occurs during teaching. Questions are interspersed with instructional information. The teaching process becomes a continuous dialog between the teacher and the students. The teacher knows immediately whether or not students are learning, and the students can receive immediate feedback to promote their learning. Both types of formative assessment are useful. Accordingly, ATI provides both types.

## IV. Dialogic Curriculum Builder

ATI has adopted a dialogic approach to curriculum and instruction that includes questions as a critical component of instruction. Within the dialogic model, lessons, assignments and other instructional activities are conceptualized as dialogs between one or more teachers and one or more students. Sets of Dialogs are linked to *Dialog Units* specifying what will be taught during a selected time period. The complete set of units for a given subject in a particular grade defines the curriculum for that subject and grade.

### A. Online Instructional Dialogs

*Instructional Dialogs* are comprised of synchronous and asynchronous communications among dialog participants. Dialogs may include assessments, classroom activities, lesson plans, lessons, assignments, and instructional resources. Resources may contain documents, images, video presentations, multimedia displays, web links to online instructional content, and other Dialogs.

As in the *Socratic Dialog*, assessment in an online *Instructional Dialog* is interwoven into the instructional process. For example, questions may be interspersed throughout a Dialog lesson. As a result, the teacher receives a permanent record of information regarding student understanding as the lesson is taught. This information can be used immediately to adjust instruction in ways that increase student understanding while instruction is occurring. The *Dialog Monitoring Report* in the system provides information regarding the responses of all participating students. Thus, information regarding student understanding is not limited to the oral responses of a few students. A teacher using the *Dialog Monitoring Report* can easily adjust instruction for several students at once. Feedback is also provided immediately and automatically during instruction rather than only after administration of a test following instruction. Immediate automated feedback also improves learning during initial instruction.

*Dialogs* typically include an assessment at the end of instruction as well as questions interspersed during instruction. As indicated above, formative assessment during instruction improves learning while initial instruction is ongoing. The purpose of the end-of-instruction assessment is to determine the extent to which students have mastered the material presented in the Dialog. Information on mastery can inform next-instructional-steps to promote learning.

For example, information revealing that a given student has failed to master a given standard targeted for instruction in a Dialog may prompt a teacher to schedule a resource Dialog supplementing the initial Dialog with instruction covering skills known to be prerequisite to mastery of the initially targeted capabilities.

*Instructional Dialogs* can play an important role in assisting schools to make the transition to the CCSS and to new state-specific standards. Implementation of the CCSS carries with it a commitment to online assessment involving a variety of technology-enhanced item types. In some cases, students and/or teachers may have little or no experience with online assessment using new technology-enhanced items. *Instructional Dialogs* make it possible to introduce new item types in the context of instruction designed to enhance learning and support the development of test-taking skills.

In order to make it easy to implement *Instructional Dialogs*, Dialog construction and scheduling are accommodated in multiple locations in the Galileo® application. For example, Dialogs may be created and/or scheduled within a *Dialog Unit* designed to guide instruction during a selected time period. A Dialog may also be created or scheduled from reports designed to accommodate differentiated instruction. For instance, one or more dialogs might be scheduled for a re-teaching intervention designed for a group of students identified as at risk for not meeting standards.

## **B. Dialog Units**

A *Dialog Unit* specifies the scope and sequence of instruction for a selected time period. A Unit generally includes a title, the standards to be addressed in the unit, content to be covered, recommended instructional methods, resources, and *Instructional Dialogs* that can be implemented as lessons or assignments. A Unit may be thought of as a container holding a series of Dialogs aligned to selected objectives. Insofar as Units contain Dialogs, they will also contain whatever resources may be included in the dialogs. In addition, they may contain resources directly attached to the Unit. Resources might include model lesson plans, activities, and assignments. They could also include collections of instructional resources such as multimedia recordings, links to resources available on the Internet, and links to other Dialogs.

A Unit is scheduled using the *Bulk Scheduler* in Galileo. Bulk scheduling ensures broad and rapid dissemination of units to the instructional staff responsible for unit implementation. Scheduling requires that the user indicate the start date and end date planned for Unit implementation and the staff members who are intended to be able to access the Unit. A scheduled Unit appears on the Class Calendar and also on the Teaching Dashboard. Calendar and dashboard placement ensures that the scheduled unit can be easily accessed by teachers. All that a teacher has to do to open a scheduled unit for use is to click on the unit title.

## **C. Dialog Curriculum Books**

As indicated above, the complete set of dialogs for a given subject at a given grade defines the course of study or curriculum for that subject and grade. *ATI Dialog Curriculum Builder* makes it possible to build virtual textbooks reflecting the curriculum defined for a given course of study. A dialog book is created simply by linking dialogs to dialog units and dialog units to a dialog book. *Curriculum Builder* enables the user to enter a title for the book, a description of book contents, the objectives covered in the book, the unit titles and unit content, and the dialogs included in each unit. When a book is created, it can be scheduled and rapidly

disseminated to all students participating in the course of study covered by the book. Dissemination is accomplished by alerting students that the book has been scheduled for their use and posting the book in each student's personal library in the *Student-Parent Center*.

When a book is made available to a student, the student is armed with an essential tool for becoming an independent life-long learner. The student can set his or her own learning goals, skip ahead, review, and explore related topics. Moreover, with guidance the student can develop study skills of critical importance for sustained effective independent learning. One of the most important benefits of the Information Age is the increased rapid access to information that it provides. Books play a critical role in supporting rapid knowledge acquisition because they provide an organizing framework for acquiring and using information. Books that support teaching continually challenge the learner to increase their learning. Implicit in this challenge is the question: Why learn? For some, if not all, the answer will be: The motivation for learning is to understand what is not presently understood. When the motivation for learning is the desire to understand, a firm foundation is built for a life-long passion for learning.

## V. Conclusion

The integration of assessment with instruction makes empirical evidence to advance learning available to the classroom teacher and to school and district level personnel responsible for guiding learning. Assessment information integrated into *Instructional Dialogs* can be used to promote new learning at the time that instruction is implemented in the classroom. Information on progress can be used to evaluate the effectiveness of instructional units at the classroom, school, and district levels. Evaluation information provided continuously using dashboard technology supports the implementation of needed changes in curriculum and instruction in a timely fashion. The goal and the promise of the advances in integration described here is the development of dynamic evidence-based curriculum and instruction systems capable of meeting the challenge of enabling students to reach new levels of academic excellence required for the Information Age of the 21st century.

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