LoTi Survival Kit:

Train-the-Trainer Manual

LoTi survival kit train-the-trainer

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LoTi Survival Kit

Session #1:

Technology Assessment

Technology Assessment

Time Allotment: 20 minutes

Session #1 introduces participants to the topic of technology assessment and specifically, about teachers' expectations regarding how students use technology in the classroom. The goal of Session #1 is for participants to reflect on the concept of technology assessment and begin to think about specific criteria for assessing student products using technology (e.g., productivity tools, multimedia applications, internet resources).

Provided below is a suggested outline for implementing Session #1 of the LoTi Project Implementation.

1.0

Ask participants to brainstorm criteria for assessing different types of student products that use technology in some capacity (e.g., multimedia, web-based, video production, spreadsheet program). When using this strategy before, some teachers have identified the following: *Content Focus, Presentation, Appropriateness, Higher Order Thinking Skills, etc.* as criteria for assessing technology-based student products.

Training Tip: *It is suggested that you model some aspect of technology use (e.g., projection unit connected to a computer using Inspiration or CMAP) as teachers identify verbally their criteria for assessing student products.*

2.0

Have participants view the student product, *This Train Revised*, to conduct an informal assessment of a technology-based project (*this_train_revised.mov*). First show the interview with the high school student, Melissa, prior to showing her presentation (*interview.mov*). *Note: This multimedia presentation addresses the World War II Holocaust based on the theme, Intolerance, and as such, includes a few graphic scenes.*

Training Tip: *Immediately after showing the multimedia presentation, have faculty work in groups to generate a consensus score for the presentation on a 1 -10 scale where a score of 1 represents the low end and a 10 represents the high end. Once each group shares their overall score, ask them about the criteria used to generate that score.*

Technology Assessment

Training Tip: *In the past, this multimedia presentation has been scored anywhere from a 2 to a 10. Those groups scoring the presentation on the lower end indicated that though the presentation showed the technology literacy of the student, the actual presentation revealed very little about her content understanding of either the theme, Intolerance, or the issues occurring prior to the start and during the aftermath of World War II. Groups scoring the multimedia presentation on the higher end point to the emotional impact of the product as well as the organization and flow of the work including the student's selection of the song, This Train Revised.*

3.0

Due to the graphic nature of the student project, *This Train Revised*, you may want to substitute it with another project based on your audience. It is recommended that you substitute it with any existing student project from your school building that models the use of technology. If one is not available, you may access any one of the following URL's containing samples of project-based learning.

Keaukaha School Web Site: http://www.k12.hi.us/~keaukaha/kkh/56.html
INTEL Unit Plans Web Site: http://www.intel.com/education/unitplans/
George Lucas Educational Foundation Web Site: http://www.glef.org/
Education for a Sustainable Future Web Site: http://csf.concord.org/esf/

4.0

Have participants arrive at a consensus as to what criteria should be used to assess technology-enhanced student products.

5.0

Distribute copies of the articles, *Assessing Current Technology Use in the Classroom: A Key to Efficient Staff Development and Technology Planning*, *Enhancing Students' Thinking Skills: Exploring Model Technology-Implementation Sites*, and *Levels of Technology Implementation: A Framework for Measuring Classroom Technology Use*, included as part of the Session #1 handouts.

LoTi Survival Kit

Session #1:

Participant Handouts

For Tech Leaders

Assessing Current Technology Use in the Classroom

A Key to Efficient Staff Development and Technology Planning

By Christopher Moersch

Subject: Technology Staff Development

Grade Level: K–12 teachers

Online Supplement: www.iste.org/L&L

How exactly can we quantify how teachers are using technology in the classroom and the general academic achievement that results from their instructional technology (IT) practices? As school systems nationwide plan their purchases of additional hardware, software, and related peripherals as well as their related staff development activities, information about each school's current IT practices is critical. Recent studies have found strong links among technology, academic achievement, staff development, and classroom instructional practices. Using test scores from the 1996 National Assessment of Educational Practices, for example, Wenglinsky (1998) found that:

- Eighth graders whose teachers used computers mostly for "simulations and applications"—generally associated with higher-order thinking—performed better on NAEP than did students whose teachers did not.
- Eighth graders whose teachers used computers mostly for drill and practice—generally associated with lower-order thinking—performed worse.
- Fourth graders whose teachers used computers mainly for math or learning games scored higher than did students whose teachers did not.
- In both grades, students whose teachers had professional development in computers outperformed students whose teachers did not.

Middleton (1998) found a statistically significant difference between student performance on standardized test scores and how teachers were implementing technology in the classroom. When teachers used higher levels of technology to augment instruction, their students had significantly better scores on the Metropolitan Achievement Test than did students whose teachers used little or no technology in class.

Most research studies that have explored connections between IT and academic achievement have concentrated on specific software delivery approaches such as integrated learning systems (Brush, 1997; Clariana, 1996) or software applications and their effects on learners. However, trying to determine the effectiveness on learners of every conceivable application from Excel to Kid Pix is both impractical and of little benefit to educational technology.

To bridge the gap between technology use and instruction and provide a data-driven approach to staff development and technology planning, the Level of Technology Implementation (LoTi) questionnaire was created. This questionnaire is designed to determine the level of a classroom teacher's technology implementation by generating a profile for the teacher across three specific domains: LoTi, personal computer use (PCU), and current instructional practices (CIP) (Moersch, 1995).

The PCU profile assesses each classroom teacher's comfort and proficiency (e.g., troubleshooting simple hardware problems, using multimedia applications) with microcomputers. The CIP profile reveals the teacher's inclination toward instructional practices that are consistent with a learner-based curriculum design. Table 1 shows three developmental levels of instructional practices and the changes that occur as a teacher moves from a subject-matter approach to a learner-based instructional design.

The relationship between a teacher's LoTi profile and CIP is significant. As a classroom teacher progresses from one level to the next in the LoTi framework, a corresponding series of changes to the instructional curriculum can be observed. The instructional focus shifts from a teacher-centered to a learner-centered orientation, while the use of computers shifts from an emphasis on isolated uses (e.g., drill-and-practice applications) to an expanded view of technology as a process, product, and tool to help students find viable solutions to real-world problems.

The LoTi questionnaire can generate information about each teacher's CIP, PCU, and LoTi and thus help educators target specific follow-up interventions that address each classroom teacher's current IT needs. In this way, an overall staff-development program can increase its efficiency and its effectiveness. Research has found a statistically significant correlation among students' academic achievement, the amount of professional development, and a teacher's LoTi. As mentioned earlier, students whose teachers were using a higher level of technology in their instruction scored much higher on standardized tests than did students whose teachers used little or no technology in the classroom.

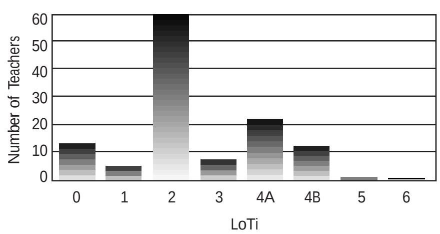
Case Study

Teachers from a school cluster in the Los Angeles Unified School District (LAUSD) recently participated in a technology audit using the LoTi questionnaire. More than 120 respondents assigned scores to the LoTi's 50 statements using the following scale:

Score	Description
0	Not Relevant or Applicable
1 or 2	Not True of Me Now
3, 4, or 5	Somewhat True of Me Now
6 or 7	Very True of Me Now

For example, if a statement was not true of the respondent's classroom IT practices now, then the statement would be scored 1 or 2. If a statement accurately described the respondent's classroom IT practices, then it would be scored 6 or 7. The questionnaire considered neither the complexity of software applications used at the school site nor the frequency of their use. The information reflected only the perceptions of staff members who took the survey.

Teacher LoTi Ranking



Score	*Description*
0	Not Relevant or Applicable
1 or 2	Not True of Me Now
3, 4, or 5	Somewhat True of Me Now
6 or 7	Very True of Me Now

Figure 1.

Figure 1 shows the LoTi ranking for the 122 teachers from the school cluster who participated in the technology audit. Based on their responses, 49% of the teachers' highest level of instruction achieved a Level 2 classroom use of technology. This means that technology-based tools supplement existing instructional program as tutorials, educational games, and simulations. The electronic technology is used as either extension activities or enrichment exercises.

Approximately 28% of the teachers' highest level corresponded with Level 4 classroom technology use. This means that technology-based tools are integrated in a way that enriches students' understanding of pertinent concepts, themes, and processes. Technology—multimedia, telecommunications, databases, spreadsheets, word processing—is perceived as a tool to identify and solve problems related to an overall theme or concept.

Staff Responses to Each LoTi Level

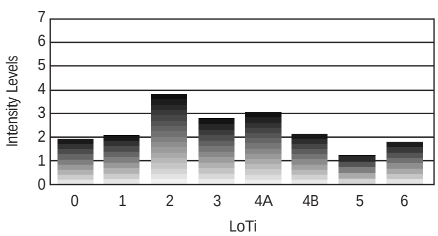


Figure 2.

Figure 2 shows the intensity of staff responses to each LoTi level. The average staff member perceives Level 2 or Level 4A as somewhat true of their current classroom technology practices. The remaining six levels generally ranked in the no-longer-true-of-me category.

Table 1. Stages of Instructional Practices

Element	Stage 1	Stage 2	Stage 3
Content	Content organized and delivered by traditional scope and sequence; focus on teacher-based questions	Concepts and processes organized and presented based on interests of teacher, learner, or both	Concepts and processes emerge based on learner's needs; focus on learner-based questions
Learning Materials	Organized by content; heavy reliance on sequential instructional materials	Emphasis on hands-on investigations and predefined problem-solving activities	Determined by problem areas understudy; extensive and diversified resources
Learning Activities	Traditional verbal activities; problem-solving activities (e.g., worksheets, story problems)	Emphasis on student's active role; problem-solving activities with little or no connection to broad concept or theme (e.g., verification lab from science kit)	Emphasis on student activism and investigation and resolution of issues; authentic hands-on inquiry related to problem under investigation; focus on experiential learning
Teaching Strategies	Expository approach	Facilitator, resource	Colearner or facilitator or both
Evaluation	Traditional evaluation practices including multiple-choice, short-answer, and true-or-false questions questions concept; use of portfolios,	Uses multiple assessment strategies, including performance tasks and open-ended and problem-based open-ended questions, performance	Multiple assessment strategies integrated authentically throughout the unit and linked to problem or tasks, self-analysis, and peer review
Technology	Drill-and-practice computer-based programs (e.g., integrated learning systems) and computer games; little connection between technology use and overall concept or topic searches	Technology integrated into isolated hands-on experiences (e.g., tabulating and graphing data to analyze a survey or experiment; information using the Internet or a CD-ROM)	Expanded view of technology as process, product, and tool to find solutions to authentic problems, communicate results, and retrieve information (e.g., spreadsheets, graphs, probes, databases, CD-ROM-based simulations, Web-page development)

Figure 3 displays the perceptions of the staff toward questions about their personal computer use. Approximately 98% of staff members perceived their ability to use basic software applications or troubleshoot routine computer problems as either not true or somewhat true. Less than 2% selected the very true option regarding their ability to use basic software applications or troubleshoot routine computer problems.

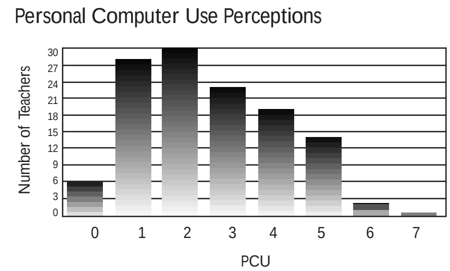


Figure 3.

Figure 4 displays the perceptions of the staff toward questions involving their CIP. Approximately 39% of staff members did not perceive their current instructional practices as aligning with a learner-based design (i.e., "Not True of Me Now"). Approximately 59% of them selected somewhat true about their classroom use of learner-based approaches to instruction and assessment. Fewer than 2% of staff members chose very true to describe their alignment to a learner-based design.

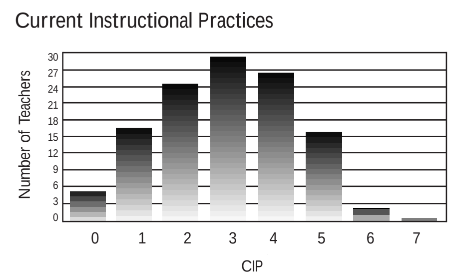


Figure 4.

Findings

A summary of the findings from this technology audit revealed the following:

1. Approximately 49% of staff members chose Level 2 as their highest level of technology implementation.
2. The intensity of the staff's response to the Level 2 implementation of technology was at the lower end of the somewhat true scale.
3. Approximately 30% of staff members recorded their highest level of technology implementation at Level 4A or greater.
4. The intensity of the staff's response to the Level 4A implementation of technology was at the lower end of the somewhat true scale.
5. The intensity of the staff's response to the Level 4B, 5, or 6 implementation of technology was at the upper end of the not true scale.
6. Approximately 98% of staff members rated their ability to use basic software applications or troubleshoot routine computer problems as either not true or somewhat true.
7. The remaining 2% of staff members perceived their ability to use basic software applications or troubleshoot routine computer problems as very true.
8. Approximately 39% of staff members perceived their instructional practices as aligning with a learner-based design as not true.
9. Approximately 59% of staff members perceived their instructional practices as aligning with a learner-based design as somewhat true.
10. The remaining 2% of staff members rated their instructional practices as aligning with a learner-based design as very true.
11. Approximately 11% of the staff does not have access to computers for instructional purposes.

Implications for Staff Development

The findings from the LoTi questionnaire for the school cluster in the LAUSD clearly describe a staff that is functioning at the lower end of the LoTi and PCU domains and at the midrange of the CIP domain. What types of professional development and technology purchases would be needed to advance the staff to higher levels of technology use? Based on the cluster's profile, the following recommendations would be offered for the current school year.

1. Ensure that every classroom teacher has at least one functional computer and printer for instruction. The research showed that the surveyed teachers do not have adequate equipment. Staff members who lack basic computer essentials often become frustrated, resentful, and apathetic about using technology in the classroom.
2. Organize a series of interventions for the lower LoTi-level staff members. The interventions should model specific strategies and techniques for integrating higher-order thinking skills with tool-based ap-

Continued on page 49

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plications on the available classroom computers. For example, techniques that would be consistent with this recommendation include modeling the integration of data analysis with classroom experiments, field investigations, simulations, and surveys using any available spreadsheet and graphing program (e.g., LabQuest, Excel, or AppleWorks—formerly ClarisWorks). This approach has four advantages:

   a. It reinforces important complex thinking skills, including problem solving, decision making, scientific inquiry, and inductive and deductive reasoning.
   b. It is easily accessible and generally user-friendly (most computers already have AppleWorks or Excel installed with a built-in tutorial).
   c. It lends itself to students asking lots of questions
   d. It can be seamlessly integrated into the mathematics, science, social studies, and language arts standards.

3. Provide a series of interventions for lower-level LoTi teachers that model techniques for managing existing classroom computers using the concept of the one-computer classroom. Many teachers place too much emphasis on learning an application than on exploring meaningful and consequential outcomes of the technology's effects on a learner.
4. Provide a series of interventions for higher-level LoTi teachers that model specific strategies and techniques—such as an experiential-based action model—for integrating a system's approach to thinking and reasoning skills with the computers that are available.
5. Let these higher-level teachers (approximately 30% of our respondents) design model technology-integration units that can be shared with others throughout the school cluster. This may improve these teachers' perceptions of their ability to integrate and also move them to a higher level of technology implementation.
6. Make whatever staff-development interventions are needed to increase staff members' confidence in using and troubleshooting personal computers. This might, for example, involve a computer lab instructor designing minicourses to increase each teacher's proficiency with a computer.
7. Perform needed staff interventions to move a greater percentage of teachers to a learner-based curriculum design. Interventions consistent with this recommendation may involve authentic assessment practices and experiential curriculum design. Currently, 2% of staff members perceived that their instructional practices aligned with a learner-based design.

Conclusion

This article shows how the LoTi questionnaire can provide school systems with a data-driven approach to IT decision making and the subsequent effect of the approach on learners. Beyond its utility as an IT "needs assessment," the LoTi questionnaire is also an accountability mechanism for school systems so that they can justify their expenditures for IT—computers, local area networks, and professional development—in light of mounting public concern that tax dollars are being encumbered exclusively for technology. ■

Christopher Moersch,
chris@learning-quest.com

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More information about LoTi can be found at www.iste.org/L&L.

ENHANCING STUDENTS' THINKING SKILLS

Exploring Model Technology-Integration Sites

Many teachers have made technology an essential tool in their classrooms, perhaps putting too much emphasis on computers, in particular, as the best way to get their students to think. In this article, Christopher Moersch not only evaluates some of the more promising ways in which students can be challenged to think but also describes model classrooms in which such learning takes place. Cross-curricular components in particular can be used by teachers to adapt for their own classrooms.

By Christopher Moersch

What should a model technology-integration classroom look like? Does each student have ready access to a computer, modem, CD-ROM player, and the Internet? Not exactly. In fact, the model technology classrooms described in this article have relatively few computers or perhaps none at all, with students using computers only in the school's library or computer lab. So what makes these classrooms unique? It's the manner in which computers are used as tools to support students' thinking and reasoning skills across the curriculum.

CRITERIA FOR SELECTION

Each selected classroom emphasizes students' use of complex thinking strategies such as problem solving, decision making, reasoning, experimental inquiry, and reflective thinking. Students are engaged to identify problems, perform research, analyze data, ask questions, and justify their solutions. This is not entirely new. Thinking-skill strategies have been used before as criteria for identifying model technology-integration classrooms. In a 1995 study of computer-using teachers, for example, Becker defined the exemplary teachers as those who engaged students in computer-based activities that involved higher-order thinking skills.

Computer-efficiency levels were also used to identify model technology-integration classrooms. Such efficiency has been defined as the degree to which computers are used to support more advanced thinking skills, consequential learning, and concept-based instruction (Moersch, 1996–97). Each cited classroom possesses a high level of computer efficiency, and the existing classroom computers support authentic hands-on inquiry related to a problem under investigation. Students might be gathering information from the Internet about their community's crime rates, analyzing data from another classroom's experimental findings on soil deposits in a nearby canyon, or creating a multimedia presentation on traffic safety for younger students. In this context, technology is viewed as a tool for students to discover solutions to authentic problems, communicate results, and retrieve information.

Finally, each teacher discussed in this article consciously or unconsciously employs a constructivist approach to classroom pedagogy. Constructivism represents a philosophical view on how we come to know and learn, and it can be summarized using three fundamental propositions:

1. Understanding is in our interactions with the environment.
2. Cognitive conflict or puzzlement is the stimulus for learning and determines the organization and nature of what is learned.
3. Knowledge evolves through social negotiation and through the evaluation of the viability of individual understandings (Savery & Duffy, 1995).

In a truly constructivist way, teachers used students' ideas, experiences, and interests to drive their lessons. This encouraged student self-analysis and data collection that supported ideas and perhaps reformulated older ideas in light of new information. The students were also prompted to challenge each other's conceptualizations and ideas. Yager (1991) provides the scale shown in Table 1 for analyzing the degree to which constructivist learning occurs in any learning environment. If most of the answers to these questions are "students" or "yes," then a high level of constructivist learning is taking place.

Perhaps the single most defining attribute of Yager's scale—and the one occurring recursively in the classrooms cited—involves the statement, "Concepts and principles emerge because they are needed by students" (p. 54).

Who identifies the issue or topic?	Teacher	▬	Students
Is the issue seen as relevant?	No	▬	Yes
Who asks the questions?	Teacher	▬	Students
Who identifies written and human resources?	Teacher	▬	Students
Who contacts necessary human resources?	Teacher	▬	Students
Who plans investigations and activities?	Teacher	▬	Students
Are varied evaluation techniques used?	No	▬	Yes
Do students practice self-evaluation?	No	▬	Yes
Are concepts and skills applied to new situations?	No	▬	Yes
Do students take action(s)?	No	▬	Yes
Do concepts and principles emerge because they are needed?	No	▬	Yes
Is it evident that students extend learning outside of school?	No	▬	Yes

Table 1

MODEL SITES

What follows are narratives from teachers who have positioned the use of technology as a seamless medium to maximize their students' thinking, reasoning, communication, and problem-solving skills.

Mulholland Middle School, Van Nuys, California

Valerie Sampson, social studies teacher

Mulholland Middle School is part of the Birmingham Complex Family of Schools in Van Nuys, California. The school sits directly on the site of a former Army hospital used extensively during World War II. Although little remains of the hospital, Ms. Sampson used it as the basis of a student-led investigation on the concept of property.

I began by telling my students only that they would be making a presentation on property and nothing more. I wanted to keep a low profile and see what types of questions the students might ask. … I had them walk the entire 120 acres covering our school, Mulholland, and the adjacent property, Birmingham High School. I later shared with my students that the entire property was a former Army hospital. Students' natural curiosity took over and they began asking questions, such as, What was it called? Why did they build it here? What happened to the buildings? Many students went to the library to answer their questions. They conducted most of their searches on the Internet, looking for key words such as "Mulholland" and "Birmingham Hospital." They even found contact information for former hospital staff members.

Some students opted to use HyperStudio to create their presentations. Watching old movies and visiting with representatives of a local film company, the students quickly learned the art of storyboarding and scripting as well as the basic fundamentals of HyperStudio.

As students continued their research, their interests led them in a remarkable and highly unanticipated direction: They began to focus on illnesses and injuries, especially sports injuries. Because many of my students are involved in after-school sports, the concept of leg, knee, and foot injuries was quite alluring. Using our library's Internet connection, students explored sports-related injuries on a variety of Web sites. Using carefully crafted prompts, I was able to channel their enthusiasm toward conducting a schoolwide survey on sports injuries. After collecting this data from their fellow students, they tabulated and graphed the results using Excel. The survey results showed that most students were concerned about sports injuries and mostly about possible spinal injuries. My students then created a brochure in ClarisWorks about spinal injuries that they shared not only with Mulholland Middle School students, but also with Birmingham High School students and community members.

Rosa M. Parks Middle School, Olney, Maryland

Jody Smith, science teacher

Although her classroom has plenty of computers for students to use, Smith stresses that "computers are not the end-all answer; they must be used when it is appropriate." Appropriate use is tied directly to students asking questions and solving authentic problems in their community.

As a teacher, I always start with a question or problem that the students are interested in. In science, my class might generate a list of questions relating to a specific topic such as what scientists do or how scientists solve problems. In consumer science, a research question might address how they could determine whether Coca Cola is an acid. By encouraging student questioning and researching, I help them begin to see links between what they are studying and the real world. As our district requires up to 60 hours of service learning credit, students are able to take what they have learned in science and apply it to something tangible outside the classroom.

We use the computer as a tool with which students can tabulate data, create graphs, make inferences, and draw conclusions. Their conclusions might lead them to further questions and research about an issue or problem (e.g., using a CD-ROM about water pollution or accessing the Internet to find additional information on soft drink beverages) that will eventually culminate with some sort of service learning project (e.g., an environmental clean-up, a community presentation on local biodiversity issues, a recycling campaign, or a multimedia project addressing local pollution using a QuickTake camera and HyperStudio). Regardless of the type of service learning project, we try to get students to use computers whenever they are needed.

Sam Houston Middle School, Amarillo, Texas

Linda Coleman, mathematics teacher; Peggy Smith, language arts teacher; Patsy Richards, science teacher; and Jim Rutledge, social studies teacher

One of Sam Houston Middle School's grade-level teams has integrated mathematics, science, social studies, and language arts, and here provides a provocative account of integrating existing computers into the classroom. According to Linda Coleman,

Our water unit provided a natural way to get students involved in taking action about local problems in the region as well as integrating technology within our existing content areas. In science class, students explored the concept of soil porosity and its relationship to the water cycle. Then they used computers to analyze local soil data in math class and related their findings back to the larger issue of pollutants entering the local aquifers.

Student questioning eventually led to the creation of several outdoor lab activities addressing the pollution problems in the Pala Dura Canyon. In the canyon, students conducted a series of water quality tests and explored the concept of carrying capacity. Students collected water temperature data at different elevations and soil samples and then conducted population estimates of the local fish and wildlife population. Later, they graphed and analyzed the data using LabQuest. Our language arts teacher provided a humanities connection by assigning specific novels relating to water pollution and having students write haiku about canyon wildlife.

Besides using the computer for data analysis, students used the Internet to find additional information about water pollution. They also linked up with a classroom in Yugoslavia and exchanged research data using e-mail. The students' findings about water pollution led them to create a flyer on the computer about how local citizens can minimize pollution of the canyon and local aquifers. We eventually plan for students to create a series of 30-second commercials about water quality using our own video camera and Avid Video Shop software.

Encino Elementary School, Encino, California

LaVerne Potter, fifth-grade teacher

According to Potter, in-school computer use prepares students for the experiences they may encounter in a business setting. At Encino Elementary School, students opened their own store and continue to run it.

Students were continually crossing a busy street to buy food from a local merchant. One of the problems was that our students knew that they were being cheated from a pricing standpoint. From a staff perspective, we were concerned about their safety as well as the incredible trash problem. After brainstorming solutions with our fifth graders, a decision was made to try out our own student store. What started out as a tiny chick transformed into a full-blown rooster.

We secured a donated rolling display rack and commercial-size refrigerator, arranged daily ice cream delivery, and purchased supplies from the local store. Within one week, we had a fully functional store. Our students conducted surveys of the entire student body to determine their food- and candy-buying preferences. Students used the computers to track inventory, determine percentages of profit and loss, and account for any slippage (stolen merchandise). Students spent a great deal of time looking at graphs to determine what products to sell as well as to make projections about future profit margins.

As the store became more popular, more students wanted to get involved. It was very natural. The students controlled the inventory, set policy for the board of directors and for profit sharing, and hired all of the student workers. Later, we even entered into a contractual arrangement with the school to lease property where the student store was located. Students used the computer to figure out the percentage of the leased area based on the total area of the school. Students also used the Internet to contact other schools about our student store. We are even thinking seriously about putting together a Web page about our store, hoping that other schools might want to follow our example.

Kualapuu School, Molakaii, Hawaii
Vicki Newberry, fifth- and sixth-grade teacher

The fifth- and sixth-grade team at Kualapuu School employs an open-ended, research-based process for students to complete their independent projects. Computers are used mostly as tools in the classrooms.

It seems that the computers in our resource center are in use all day long. Students are either using ClarisWorks to write portions of their research projects, conducting Internet searches, or crunching numbers from a survey.

Students spend 90 minutes a day receiving instruction on core information that is essential to their independent study projects. After the 90-minute period, students work in the resource center on a project tailored to their specific interests. Last quarter in social studies, students were asked to create historical time lines using TimeLiner as their independent study project. Using time as a thematic organizer, students searched the Internet for historical information about such geographical areas as Mexico, the United States, the Middle East, and Africa. This approach enabled students to integrate their map-reading and data-analysis skills within a historical context. At the end of the project, students organized a schoolwide international festival highlighting the specific time periods around the world.

Celebration School, Celebration, Florida
Tom Vitale and Heather Krawczwk, Neighborhood 3 teachers

Using computers as a seamless medium to promote student activism in the community is central to the curriculum in Vitale and Krawczwk's classes.

We are not so much concerned with how much time students spend on computers as we are with how students use computers. During the school year, our neighborhood completed a wetlands project. Because the town of Celebration sits literally in a wetland, the topic was very real to our students. Students wanted to explore not only how the wetlands affects their lifestyles, but also how their lifestyles affect the wetlands.

Students conducted several field investigations of the Celebration community and the surrounding wetlands. They used recording sheets to conduct a frequency inventory of all plant and animal life and collected water samples within a one-acre area. Back in the classroom, students tabulated their data and generated a series of graphs on the computer to help them determine the full extent of their impact on the wetlands. They created a series of Venn diagrams to compare the Celebration environment now versus how it was before the town was constructed. Students also used Encarta and Internet search engines daily to find additional information about Florida's wetlands. They used not only the text-based information but also the maps.

From their research, students concluded that water contaminants were much higher than they should be and that too many of the downed trees were being wasted rather than recycled. This discovery prompted students to write letters to the Celebration Town Manager as well as the Town Hall urging that the Celebration Company investigate their environmental practices during construction.

FINAL REMARKS

These teachers have assigned different learning activities and used different teaching strategies to achieve a final product, but their emphasis on student questioning, research, issue resolution, and higher order thinking skills has been consistent. And so has their use of the computer. Each narrative illustrates the use of technology as a tool to advance student's ability to think and reason and solve authentic problems. The technology has become transparent. Most important, these teachers have used existing technology and community resources to transform their classrooms into dynamic centers of purposeful and experiential learning that intuitively move students from awareness to authentic action. ■

Christopher Moersch, National Business Education Alliance, PO Box 61, Corvallis, OR 97339

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BY CHRISTOPHER MOERSCH

Levels of Technology Implementation (LoTi): A Framework for Measuring Classroom Technology Use

Since the introduction of the Apple IIe computer in the early 1980s, the term "technology" has represented a broad range of interests and has been the subject of numerous interpretations. In school systems nationwide, technology has been the focus of curriculum renewal projects and school funding debates. It has been the rallying cry for leading many school districts into the 21st century.

Our fascination with technology stems, in large degree, from its ambiguity within existing paradigms. Does technology represent things, like computers, modems, pencils, microscopes, and televisions; words or ideas, like "progress" and "change"; processes, like animal breeding and voting; or delivery systems, like expert systems and novice systems? Each perspective on technology has its unique attributes and leads the individual to different conclusions and implementation strategies.

Attempts in the early 1980s to bring technology into education involved the creation of computer literacy classes at the elementary and secondary levels. From region to region, these courses were quite similar in their offerings—they taught students about the parts of the computer, keyboarding fundamentals, word processing, drill-and-practice applications, and introductory programming. Even with the exponential advances in electronic technology, their legacy can still be found today in the guise of integrated learning systems and central word processing and remediation labs.

As one observes the current uses of computer technology nationwide, a few distinct patterns emerge.

- Staff development opportunities for teachers to explore the potential of computer technology are oftentimes insufficient and misdirected.
- Most computer technology is used for isolated activities unrelated to a central instructional theme, concept, or topic.
- The use of the computer is often one step removed from the classroom teacher.
- Technology is used to sustain the existing curricula rather than serve as a catalyst for change.
- The majority of district or site technology plans do not establish a significant link between the need for technology and identifiable instructional priorities (e.g., emphasizing higher order thinking skills or restructuring the science and mathematics curriculum). Instead, they emphasize a need to meet a vaguely defined computer/student ratio or establish districtwide local area networks.

At best, the role of technology has complemented the conventional instructional curriculum and its corresponding emphasis on expository teaching, traditional verbal activities, sequential instructional materials, and evaluation practices characterized by multiple-choice, short-answer, and true-or-false responses.

When planning staff development targeting classroom integration of technology (e.g., spreadsheets, graphing, telecommunications), two fundamental assumptions are often made about the educational practitioners attending such sessions:

- Participants are easily able to make connections between the technology they have available and their instructional curricula.
- Participants are ready and willing to initiate changes in their instructional practices.

Oftentimes, neither assumption is valid. These staff development sessions often lead to nonuse or low levels of use of the technology by classroom teachers because the technology-based intervention neither reflects the instructional level of the teacher (Moersch, 1994) nor addresses fundamental self-efficacy issues.

Self-efficacy theory suggests that individuals with a low level of self-efficacy will often choose a level of innovation that they believe they can handle, which may or may not be the best or most effective option. Conversely, those individuals with high levels of self-efficacy are most inclined to accept change and choose the best option. Olivier and Shapiro (1993) identified self-efficacy as a major predictor of adoption of innovation.

Levels of Technology Implementation

We have attempted to create a conceptual framework that measures levels of technology implementation, or LoTi™, so that we can assist school districts in restructuring their staff's curricula to include concept/process-based instruction, authentic uses of technology, and qualitative assessment. LoTi is aligned conceptually with the work of Hall, Loucks, Rutherford, and Newlove (1975); Thomas and Knezek (1991); and Dwyer, Ringstaff, and Sandholtz (1992).

In the LoTi framework, we propose seven discrete implementation levels teachers can demonstrate, ranging from Nonuse (Level 0) to Refinement (Level 6). As a teacher progresses from one level to the next, a series of changes to the instructional curriculum is observed. The instructional focus shifts from being teacher-centered to being learner-centered. Computer technology is employed as a tool that supports and extends students' understanding of the pertinent concepts, processes, and themes involved when using databases, telecommunications, multimedia, spreadsheets, and graphing applications. Traditional verbal activities are gradually replaced by authentic hands-on inquiry related to a problem, issue, or theme. Heavy reliance on textbook and sequential instructional materials is replaced by use of extensive and diversified resources determined by the problem areas under study. Traditional evaluation practices are supplanted by multiple assessment strategies that utilize portfolios, open-ended questions, self-analysis, and peer review. A detailed description of the LoTi framework is given in the Sidebar on page 42.

Implications for District Technology Expansion

As David Dwyer (1992) has noted, "The use of technology does not guarantee fundamental change in the teaching-learning process and consequently in learning outcomes." Other variables, including organizational leadership and structure, the teacher's role in the restructuring process, and the curriculum itself, impact the entire school restructuring process, including instructional uses of technology (Thomas & Knezek, 1991).

As school districts prepare their technology expansion plans, we offer some basic recommendations based on our work with the LoTi framework. District planning for technology should:

- Emphasize staff development because of the incremental and personal nature of innovation adoptions. Existing allocations for staff development are insufficient for districtwide changes in teachers' instructional curricula to maximize the capabilities of the new technologies.
- Emphasize front-end analysis directed at linking proposed technology expansion with long-range instructional priorities.
- Use technology to restructure science and mathematics curricula to reflect *Benchmarks for Science Literacy* and the *NCTM Standards*. The ability for technology to cut across curriculum barriers through the seamless integration of telecommunications, multimedia, and related technology-based tools helps dissolve existing boundaries that define the existing curricula (Thomas & Knezek, 1991).
- Incorporate a variety of measures to justify the money spent on technology from sources such as bond levies, state and federal Eisenhower allocations, and district funds. Such measures might include LoTi, school dropout rates, student attitudes about school, test scores, and student achievement in areas seldom assessed by conventional means. These areas might include computer use, effective communication, social awareness and confidence, independence, problem solving, and civic responsibility (Dwyer, 1992).
- Include inservice opportunities for site administrators to develop annual technology plans consistent with district priorities for technology implementation and student performance standards. Research has documented that the actions and interests of the building principal have made a significant difference between effective and ineffective implementation of program change (Berman & McLaughlin, 1977; McLaughlin & Marsh, 1978).

The LoTi framework is currently being field-tested throughout the United States. In its current form, the framework can provide a fair approximation of teacher behaviors related to technology implementation. Documenting such behaviors can aid in designing future interventions that support the expanded use of technology as well as concept/process-based instruction and qualitative assessment practices. ■

[Christopher Moersch, National Business Education Alliance, PO Box 61, Corvallis, OR 97339]

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The LoTi Framework

Level	Category	Description
0	Nonuse	A perceived lack of access to technology-based tools or a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based (e.g., ditto sheets, chalkboard, overhead projector).
1	Awareness	The use of computers is generally one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pullout programs, computer literacy classes, central word processing labs). Computer-based applications have little or no relevance to the individual teacher's instructional program.
2	Exploration	Technology-based tools serve as a supplement to existing instructional program (e.g., tutorials, educational games, simulations). The electronic technology is employed either as extension activities or as enrichment exercises to the instructional program.
3	Infusion	Technology-based tools, including databases, spreadsheets, graphing packages, probes, calculators, multimedia applications, desktop publishing applications, and telecommunications applications, augment isolated instructional events (e.g., a science-kit experiment using spreadsheets/graphs to analyze results or a telecommunications activity involving data-sharing among schools).
4	Integration	Technology-based tools are integrated in a manner that provides a rich context for students' understanding of the pertinent concepts, themes, and processes. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processors) is perceived as a tool to identify and solve authentic problems relating to an overall theme/concept.
5	Expansion	Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle via the Internet), research institutions, and universities to expand student experiences directed at problem solving, issues resolution, and student activism surrounding a major theme/concept.
6	Refinement	Technology is perceived as a process, product (e.g., invention, patent, new software design), and tool to help students solve authentic problems related to an identified real-world problem or issue. Technology, in this context, provides a seamless medium for information queries, problem solving, and/or product development. Students have ready access to and a complete understanding of a vast array of technology-based tools.

LoTi Survival Kit

Session #2:

LoTi Framework

LoTi Framework

Time Allotment: 20 minutes

Session #2 introduces participants to the Level of Technology Implementation or LoTi Framework. This framework was conceptualized by Dr. Chris Moersch to provide schools with a process by which to assess, quantify, and improve technology use practices in the classroom. It is essential that participants leave Session #2 with a conceptual understanding of each of the eight stages comprising the LoTi Framework so as to reflect on their own instructional computing practices.

Provided below is a suggested outline for implementing Session #2 of the LoTi Project Implementation.

1.0

Ask participants to recall their previous experience with assessing the multimedia presentation, *This Train Revised*. Remind them of the criteria that they offered as criteria for assessing technology-enhanced student projects.

Training Tip: *Distribute copies of the Session #2 handouts prior to showing the LoTi Framework Multimedia Presentation (*LoTi_present.htm*).*

LoTi Framework

2.0

Present to participants the LoTi Framework Multimedia presentation (*LoTi_present.htm*). Use the following captions to help tie the cartoon to each of the LoTi Level descriptions.

Level 0 - Nonuse
"Are cobwebs forming around your classroom computers?"

Level 1 - Awareness
"Who's using the computers? The teacher or the students?"

Level 2 - Exploration
"Is the focus more on computer use or on the critical content?"

Level 3 - Infusion
"Is higher order thinking and problem solving linked to critical content the focus of computer use?"

Level 4a - Integration (Mechanical)
"Do classroom management issues relating to authentic, problem-based learning impede your progress with this type of teaching and learning approach?"

Level 4b - Integration (Routine)
"Is designing and managing student-based learning experiences using the available computers the most rewarding part of your work day?"

Level 5 - Expansion
"Are you ready to advance into uncharted areas of powerful teaching strategies linked to advanced technology use?"

Level 6 - Refinement
"Have you reached the promise land involving the power and potential of instructional computing?"

Training Tip: *To aid participants with their understanding of each of the LoTi Levels, you may want to use the following examples as you review each of the LoTi Levels:*

LoTi Framework

Classroom Observations at Each LoTi Level
Topic: *The Study of Manatees*
Grade Level: *6th Grade*

Level 0 - Nonuse

Computer use is nonexistent. Computers are either missing from the classroom or never in use.

Level 1 - Awareness

The teacher is showing students a teacher-created PowerPoint presentation that describes the current plight of the Florida Manatee as an endangered animal.

Level 2 - Exploration

Students create an elaborate web page dedicated to the exploration of the manatee. The web page contains a great deal of text, pictures, and links about manatees. The links were provided to give the viewer access to more detailed web sites about the manatee.

Level 3 - Infusion

Students created a similar web page about manatees, but this time, the web page reflects student use of higher order thinking skills and/or complex thinking skill processes. The web site provides a summary of student's analysis of real time data gathered from various research sites on the internet. The data displayed as a series of charts shows that increased human population over time has decreased the number of manatee sightings along the Gulf. The web page also provides links to student comparisons between the Florida Manatee and other aquatic life based on the following categories: diet, natural predators, size, range, and gestation period.

LoTi Framework

Level 4a - Integration (Mechanical)

Based on a field trip to SeaWorld in Orlando, Florida, students both got interested and concerned about the plight of the shrinking manatee population along the Gulf. What was causing the manatee population decline? Students conducted their own information searches via the internet and at the school library to find information as to what conditions were accelerating the decline rate of the manatees. Was it illegal hunting, global warming, or pollution? Once the students find sufficient data to support one or more of their hypotheses, they plan on submitting a proposal to the National Science Foundation and the NSTA (National Science Teachers Association) to get funding that addresses one of their proposed solutions to minimize the decline rate of the manatee. Though this project appears to be running smoothly (and is!), the teacher at this LoTi level has daily concerns about the management of the project (e.g., How do I make this project relevant to thirty-four 6th grade students who may not care about endangered species?, What if the students get rejected by NSF and NSTE?, Has someone else already done a unit of study like this before?)

Level 4b - Integration (Routine)

The same type of project done at a Level 4a is the same at 4b, except the teacher does not have any management concerns or cares about hardware availability. His/Her confidence in designing high-quality performance tasks and learning experiences that are relevant, engaging, and authentic to the students supersedes any management concerns. This teacher "knows what to do" and "when to do it" as it relates to the integration of technology into the classroom curriculum.

LoTi Framework

Level 5 - Expansion

Two unique attributes separate this level, Expansion, from Levels 4a/4b, Integration. Students are more directly involved in decision-making relating to their roles as self-directed learners. The teacher introduces a variety of learning prompts, experiences, or "situations" to motivate students to think about and reflect on problems associated with the declining manatee population. The other attribute is that at the Expansion level, the use of technology becomes more "expansive." Collaborations are established via the internet and video-conferencing with institutions and agencies beyond the classroom (e.g., University of Miami) to aid students in their data collection surrounding the manatee. Students have a rich and sophisticated understanding of different technology applications and resources (e.g., multimedia, web-page design, probeware) and apply them in their quest to generate real world solutions to the problem of the declining manatee population.

Level 6 - Refinement

The main difference between a Level 5, Expansion, and a Level 6, Refinement, is access. At the Refinement stage, students and teachers have ready access to a vast array of technology-based tools to aid them in their authentic problem-solving surrounding the manatee population. Technology access is never an issue at Level 6. In fact, technology is viewed as a process, product, and tool to aid students and teachers toward solutions to issues and problems that are viewed as relevant, practical, and urgent.

Training Tip: *In lieu of using the above examples, you may want to ask a few staff members to model one or more of the LoTi levels during a staff meeting and then ask participants which LoTi level was being modeled at that particular time.*

Note: To access additional information and research on the LoTi Framework, access the following URL:

http://lotilounge.com/modules.php?name=About_LoTi

LoTi Survival Kit

Session #2:

Participant Handouts

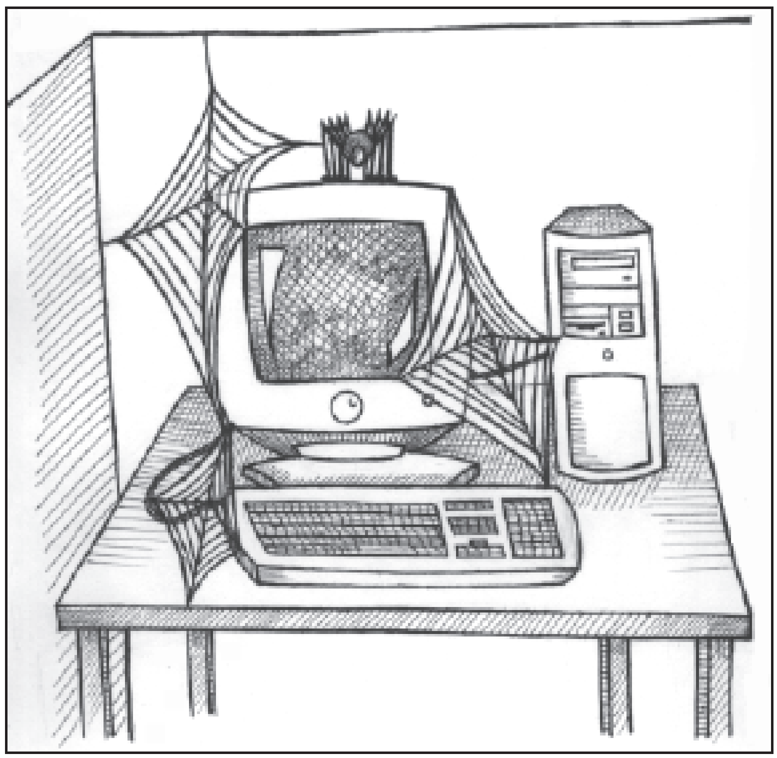
level of technology implementation framework

Level of Technology Implementation (LoTi) Framework

Level 0	*Non-use*
Level 1	*Awareness*
Level 2	*Exploration*
Level 3	*Infusion*
Level 4a	*Integration (Mechanical)*
Level 4b	*Integration (Routine)*
Level 5	*Expansion*
Level 6	*Refinement*

Level 0 - Non-use

A perceived lack of access to technology-based tools or a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based (e.g., ditto sheets, chalkboard, overhead projector).



"Are cobwebs forming around your classroom computers?"

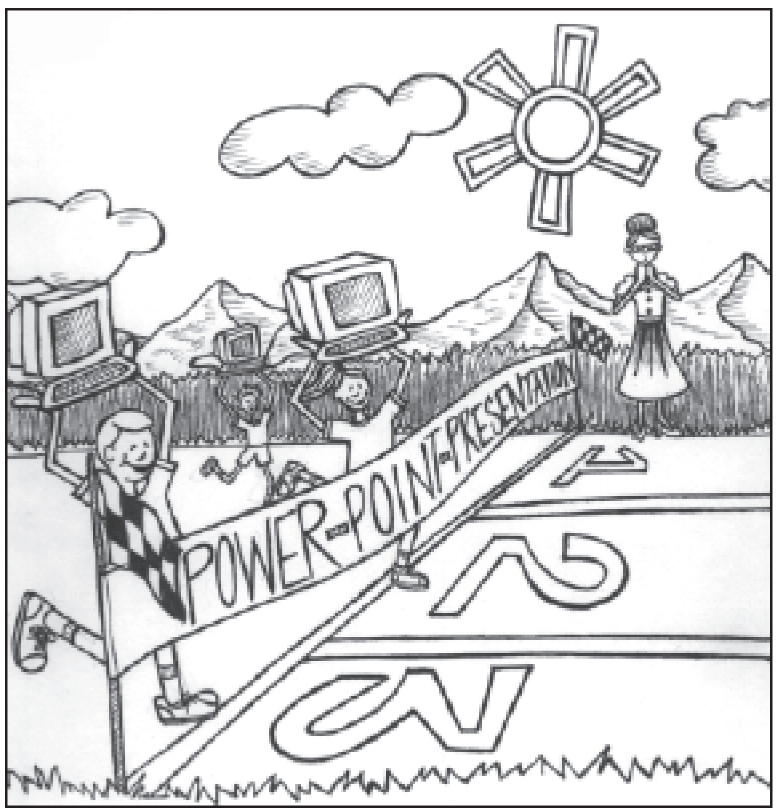
Level 1 - Awareness

The use of computers is generally one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pull-out programs, computer literacy classes, central word processing labs). Computer-based applications have little or no relevance to the individual teacher's operational curriculum.

"Who's using the computers? The teacher or the students?"

Level 2 - Exploration

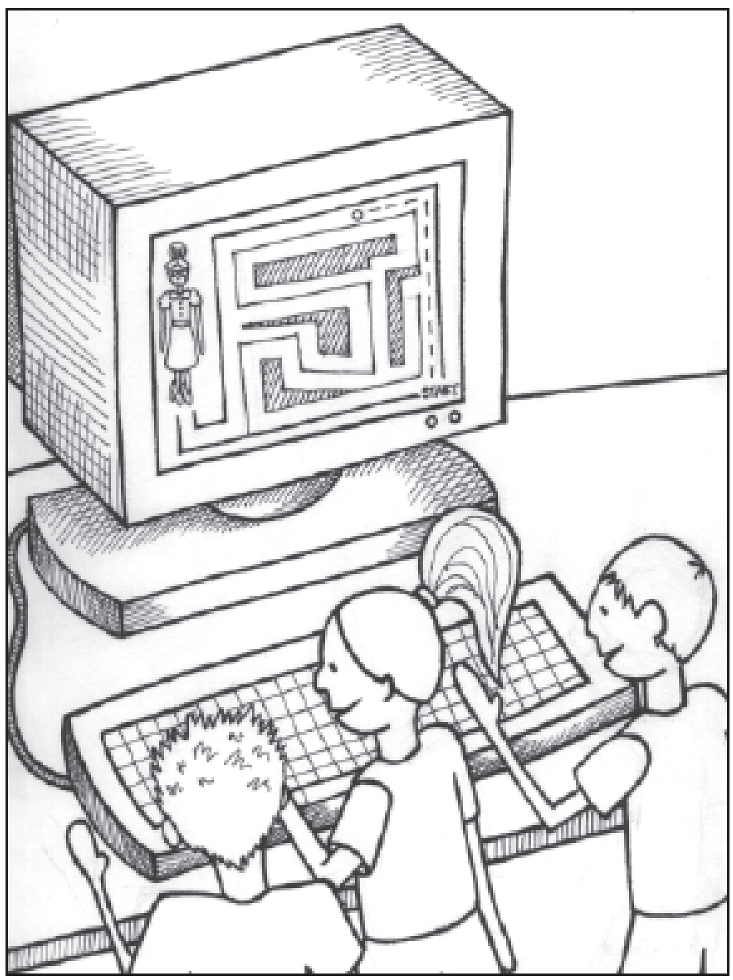
Technology-based tools generally serve as a supplement to the existing instructional program (e.g., tutorials, educational games, simulations). The electronic technology is employed either as extension activities or as enrichment exercises to the instructional program and generally reinforce lower cognitive skill development (e.g., knowledge, comprehension, application).



"Is the focus more on computer use or on the critical content?"

Level 3 - Infusion

Technology-based tools including databases, spreadsheet and graphing packages, multimedia and desktop publishing applications, and Internet use augment selected instructional events (e.g., science kit experiment using spreadsheets/graphs to analyze results, telecommunications activity involving data sharing among schools). Though the learning activity may or may not be perceived as authentic by the student, emphasis is, nonetheless, placed on higher levels of cognitive processing (e.g., analysis, synthesis, evaluation).

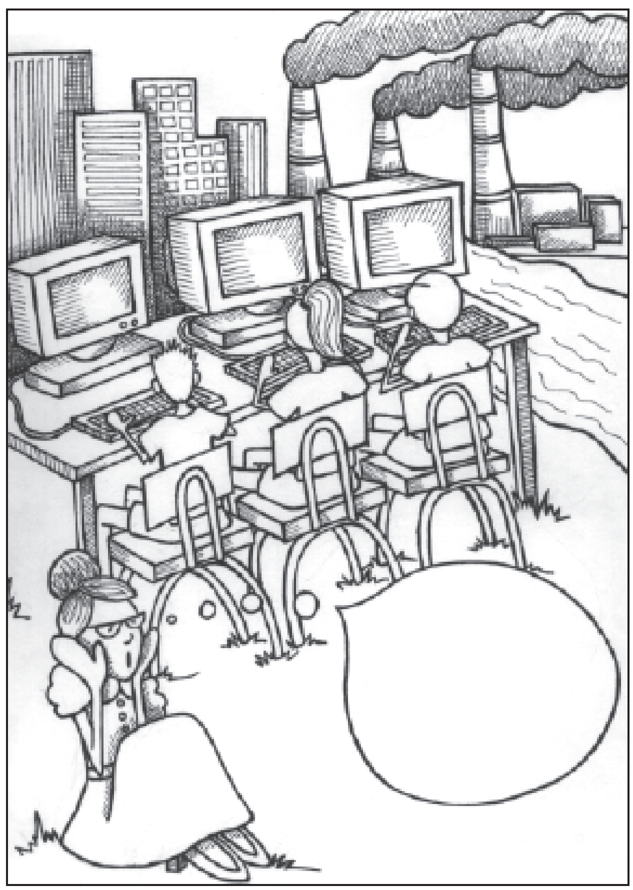


"Is higher order thinking and problem solving linked to critical content the focus of computer use?"

level of technology implementation framework

Level 4a - Integration (Mechanical)

Technology-based tools are integrated in a mechanical manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials and outside interventions that aid the teacher in the daily operation of their instructional curriculum. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems perceived by the students as relating to an overall theme/concept. Emphasis is placed on student action and issues resolution that require higher levels of student cognitive processing.

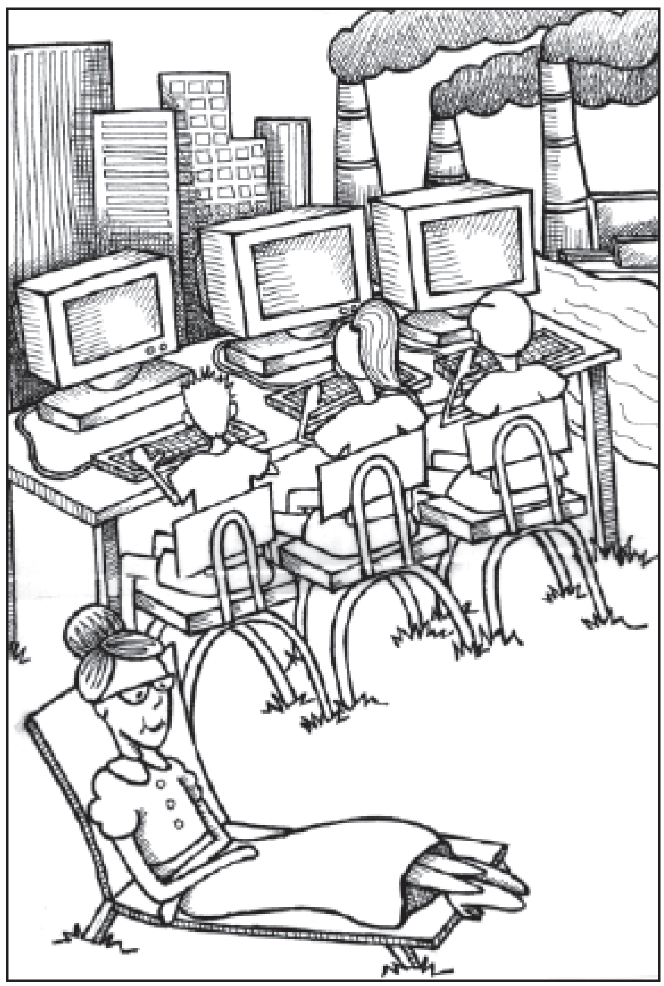


"Do classroom management issues relating to authentic, problem-based learning impede your progress with this type of teaching and learning approach?"

level of technology implementation framework

Level 4b - Integration (Routine)

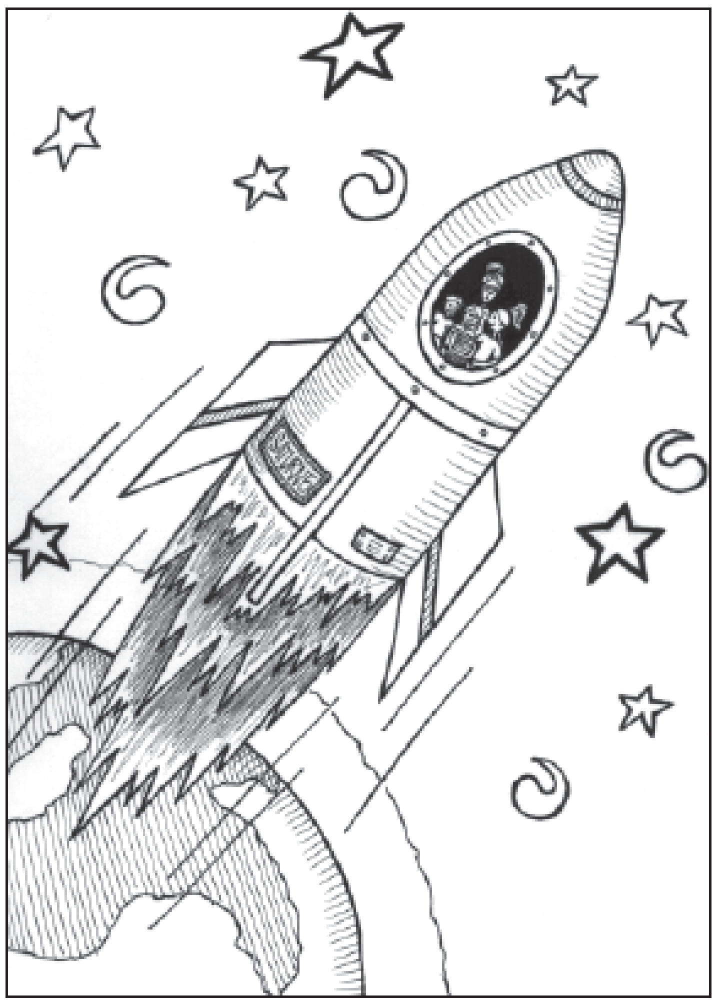
Teachers can readily create Level 4 (Integrated units) with little intervention from outside resources. Technology-based tools are easily integrated in a routine manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems relating to an overall theme/concept.



"Is designing and managing student-based learning experiences using the available computers the most rewarding part of your work day?"

Level 5 - Expansion

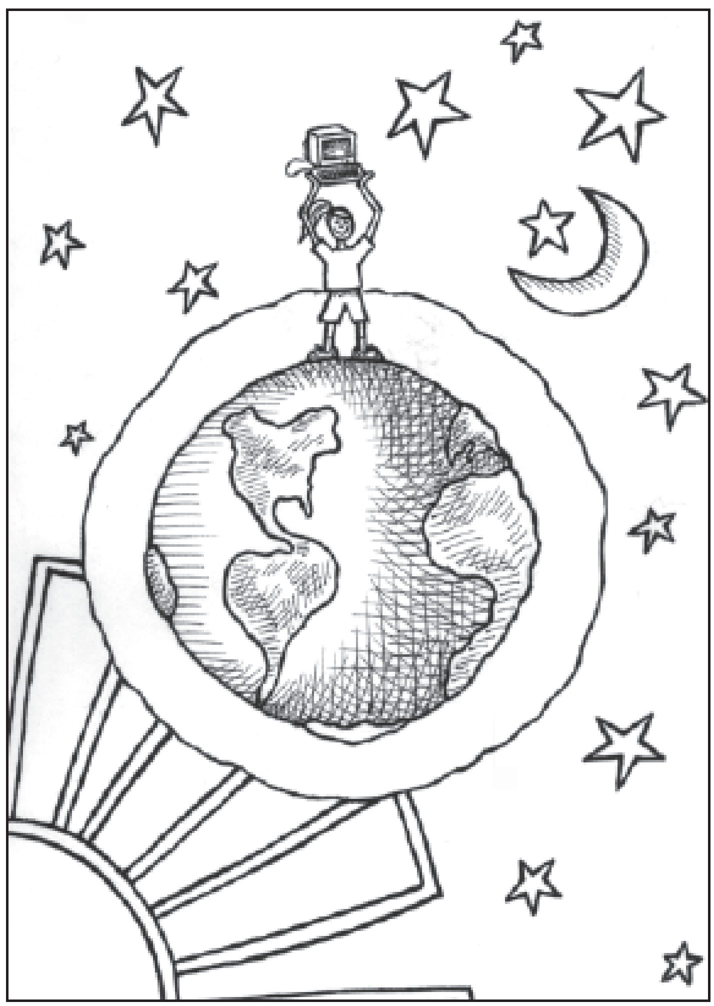
Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle via Internet), research institutions, and universities to expand student experiences directed at problem-solving, issues resolution, and student involvement surrounding a major theme/concept.



"Are you ready to advance into uncharted areas of powerful teaching strategies linked to advanced technology use?"

Level 6 - Refinement

Technology is perceived as a process, product (e.g., invention, patent, new software design), and tool toward students solving authentic problems related to an identified "real-world" problem or issue. Technology, in this context, provides a seamless medium for information queries, problem-solving, and/or product development. Students have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task.



"Have you reached the promise land involving the power and potential of instructional computing?"

Level 0

Category: Non-use

Description: A perceived lack of access to technology-based tools or a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based (e.g., ditto sheets, chalkboard, overhead projector).

Classroom Observations:
* There is no visible evidence of computer access in the classroom.
* Classroom computers sit idle during the instructional day.

Teacher Comments:
* "I really don't have the time to deal with computers anyway."
* "They are still figuring out a way to get me hooked up to the Internet. I can't start using this stuff until I know that I am connected."
* "Using computers is the least of my problems this semester. Have you seen my class enrollment?"
* "Using computers gets in the way of what I am suppose to be doing."
* "My computer crashed and burned on me a few years ago. I am still waiting for someone to fix it."

level of technology implementation framework

Level 1

Category: Awareness

Description: The use of computers is generally one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pull-out programs, computer literacy classes, central word processing labs). Computer-based applications have little or no relevance to the individual teacher's operational curriculum.

Classroom Observations:

* Available classroom computer(s) are used exclusively for teacher productivity (e.g., email, word processing, grading programs).
* Multimedia applications (including web-based) are used to embellish classroom lectures or teacher presentations.
* Curriculum management tools are used extensively to generate standards-driven lesson plans.

Teacher Comments:

* "This grading program is fabulous. I can generate an average for each student or print out any outstanding assignment. Computers are great!"
* "I basically send my kids to the computer lab where they learn how to use it. The kids love it."
* "I designed my own web-page so that students can view their weekly assignments."
* "My students go to the lab each Tuesday. This frees me to catch up on my grades or meet with parents."
* "Our staff attends a bimonthly computer camp with our technology coordinator. This month we are learning how to design a web page. I'm hoping that I can put all of my recipes on this page. That would be great!"

Level 2

Category: Exploration

Description: Technology-based tools generally serve as a supplement to the existing instructional program (e.g., tutorials, educational games, simulations). The electronic technology is employed either as extension activities or as enrichment exercises to the instructional program and generally reinforce lower cognitive skill development (e.g., knowledge, comprehension, application).

Classroom Observations:
* Student projects (e.g., designing web pages, research via the Internet, creating multimedia presentations, creating graphs and charts) focus on lower levels of student cognition (e.g., creating a web page to learn more about whale species).
* There is greater emphasis on the technology rather than on the critical content (e.g., "My students' project was to create a WebQuest using Inspiration and HyperStudio. The topic was the California Gold Rush.")
* Computer use serves as a reward station or as a digital babysitter.
* Students were gathering weather data and keyboarding the information into a wide-area network database (e.g., GLOBE project).

Teacher Comments:
* "My students have built some very sophisticated and impressive multimedia applications during the year. Some of their projects even look professional."
* "When students finish their packets early, they often go back to the computers and practice their computer skills."
* "My students created our school's web page."
* "My kids graphed some data from an AIMS activity last week. They love the way the graphs look on the screen."
* "We are running a school-wide contest on the best HyperStudio presentation this month."

Level 3

Category: Infusion

Description: Technology-based tools including databases, spreadsheet and graphing packages, multimedia and desktop publishing applications, and Internet use augment selected instructional events (e.g., science kit experiment using spreadsheets/graphs to analyze results, telecommunications activity involving data sharing among schools). Though the learning activity may or may not be perceived as authentic by the student, emphasis is, nonetheless, placed on higher levels of cognitive processing (e.g., analysis, synthesis, evaluation).

Classroom Observations:

* Student use of tool-based applications such as spreadsheets/graphing, concept mapping, and databases is used primarily for analyzing data, making inferences, and drawing conclusions from an investigation or related scientific inquiry.
* Students are involved with different forms of "WebQuest" projects that require students to research information, draw conclusions from their research, and either post them to a web page or incorporate them into some form of multimedia presentation.
* Students use the web for research purposes or interact with selected software applications that require them to take a position or role play an issue (e.g., Tom Snyder Productions' "Decisions, Decisions").

Teacher Comments:

* "My students just completed a research project investigating why many middle school students never use the school's drinking fountains."
* "I designed a culminating performance task for my 4th grade students that required them to conduct web-based research and related data gathering to support their predictions for the upcoming Presidential election."
* "My students created a multimedia presentation that analyzed the issue of poverty among 18-25 year old adults."

level of technology implementation framework

Level 4A

Category: Integration (Mechanical)

Description: Technology-based tools are integrated in a mechanical manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials and outside interventions that aid the teacher in the daily operation of their instructional curriculum. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems perceived by the students as relating to an overall theme/ concept. Emphasis is placed on student action and issues resolution that require higher levels of student cognitive processing.

Classroom Observations:

* Students designed a school-based information kiosk to assist their classmates with various "safety" issues including map directions to school based on the time of day, neighborhood watch sites, and "just-say-no" strategies to use with strangers. The information collected for the information kiosk was supplied from student-generated surveys, field investigations, and personal interviews.
* Students organized a school fund-raiser to raise money for one of the international "solar cooker" societies based on their research, experimentation, and data gathering with homemade solar cookers.
* Students created a travel brochure for families traveling within the state of Florida that included: (1) a guide for selecting the best modes of travel based on the time of year, (2) recommended lodging based on information collected from various travel sites, and (3) a listing of the best destination sites based on criteria established by the students.

Teacher Comments:

* "The creation of the information kiosk idea was based on an existing unit that I borrowed from one of the 5th grade teachers."
* "I used an existing unit design published by a software company that provided an easy way to design my culminating performance task and the student experiences leading up to the fund-raiser."
* "The travel brochure which we used as a part of the culminating performance task was developed by a consultant with assistance from the 4th grade teachers."

Level 4B

Category: Integration (Routine)

Description: Teachers can readily create Level 4 (Integrated units) with little intervention from outside resources. Technology-based tools are easily integrated in a routine manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems relating to an overall theme/concept.

Classroom Observations:

* Based on the rise in student violence on campus, students prepared a multimedia presentation highlighting their recommended mediation strategies using data synthesized from school-wide surveys and from the Internet.
* Students created a web site devoted to exploring solutions to the steady increase in solid wastes entering the local landfill.
* Students prepared a multimedia presentation highlighting the misconceptions and omissions in history text books concerning the contributions of their specific ethic group. Presentation was later burned onto a CD for submission to the various textbook publishers for consideration.
* Students investigated options for salvaging the local "fish ponds" as a way of preserving their native Hawaiian culture. Students prepared a community campaign including the creation of a web-page to persuade the voters not to approve a local housing tract proposal that would jeopardize the integrity of these ancient fish ponds.

Level 4B *(cont.)*

Teacher Comments:

* "Our student mediation unit was prompted by the recent rise in fights on campus. Many students expressed concern for their personal safety and the safety of others at school."
* "I first converted several digital images into a Power Point presentation to get my students thinking about the waste disposal issue and asking questions."
* "I presented students with an assignment to read different accounts of a historical event which later lead to a lively discussion on how history is presented in various textbooks."
* "We took the students on a field trip to a local fish pond to investigate the potential impact of the proposed housing development on the preservation of this ancient site."

Level 5

Category: Expansion

Description: Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle via Internet), research institutions, and universities to expand student experiences directed at problem-solving, issues resolution, and student involvement surrounding a major theme/concept.

Classroom Observations:

* Students created an actual online business venture involving cosmetics and jewelry as a culminating performance task in their marketing class.
* Students started their online consumer awareness clearinghouse that provided up-to-date information on "best prices" for travel, goods and merchandise, and services based on data collected from their research and online surveys with other schools.
* Using video cameras, NASA and NOAA images, and related weather and mapping data, students assisted a hiker in his goal to conquer the Continental Divide Trail from Mexico to Canada. Communicating via email, students were able to provide daily information on the best routes based on projected weather reports and various typographic information.

Teacher Comments:

* "Students got the idea for starting a business venture online after they read a series of articles discussing the pros and cons of online businesses and their success rates."
* "It was amazing! Many of the students already knew how to use these Internet tools such as *Any Forms* and writing simple CGI scripts."
* "Assisting their hiker friend was the highlight of the day. Since we were limited on time in class, students did the majority of their research online at home."

Level 6

Category: Refinement

Description: Technology is perceived as a process, product (e.g., invention, patent, new software design), and tool toward students solving authentic problems related to an identified "real-world" problem or issue. Technology, in this context, provides a seamless medium for information queries, problem-solving, and/or product development. Students have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task.

Classroom Observations:

* Students designed an interactive web site for bilingual children to expedite their English language proficiency. The site included options for real-time conversations, tutorial sessions, and bilingual online bulletin boards.
* Students created a new type of housing design using some sophisticated CAD programs to improve the amount of heat transfer in future homes.

Teacher Comments:

* "Every student has access to computers, video cameras, scanners, Internet, and any other technology-based application at any time during the instructional day. Doesn't everyone?"
* "We have computers embedded in every desk and in every classroom on campus. Students can use them at any time."

level of technology implementation framework

Levels of Technology Implementation Notes

LoTi Survival Kit

Session #3:

Assessing LoTi Levels (A)

Assessing LoTi Levels (A)

Time Allotment: 20 minutes

Session #3 focuses on participants using the LoTi Framework to assess the level of technology implementation of different classrooms. The purpose is for participants to gain confidence in articulating the instructional characteristics embedded in each of the LoTi levels as well as discern the unique instructional attributes that separate one level from another. This session will use a series of video clips as the basis for participants to demonstrate their understanding of the LoTi Framework.

Provided below is a suggested outline for implementing Session #3 of the LoTi Project Implementation.

1.0

Provide participants with copies of the Session #3 handouts.

Training Tip: *Have participants work in groups of 2 or 3 to complete this exercise so that they may discuss specific attributes of each video clip relating to the LoTi Framework.*

2.0

Show participants Video Clip #1 (*video_clip_1.mov*). After showing the video clip, have participants work in their groups to estimate a LoTi level for this particular classroom. *Note: Video Clip #1 represents a Level 3 LoTi score based on the combined use of the specific heat computer simulation and the prompted questions from the teacher that enable students to make comparisons between different metals, relate the properties of heat transfer to their physical environment, and arrive at their own conclusions about the properties of heat.*

Training Tip: *As participants share their responses, have them articulate the specific attributes of the video clip that match the respective LoTi level.*

Assessing LoTi Levels (A)

Note: *It is critical that participants not leave the session with the impression that all instructional computing opportunities need to be at the higher LoTi levels. The ideal LoTi level represents the use of technology that addresses student conceptualization of the content at the appropriate level of cognitive processing.*

Therefore, once the group has reached a consensus as to the LoTi level being modeled in the video clip, they should next decide if the LoTi level is appropriate or inappropriate based on the content being addressed and the desired level of student cognitive processing.

3.0

Show participants the remaining video clips requesting that they provide supporting evidence as to the LoTi level being modeled in each clip. The approximated LoTi level for each video clip is presented below.

Video Clip	***Description***	***LoTi Level***
#1	*Simulation*	*Level 3*
#2	*Microscope*	*Level 1*
#3	*Japanese*	*Level 2*
#4	*Animation*	*Level 5*
#5	*Multimedia*	*Level 2*
#6	*Hamburger*	*Level 2/3**
#7	*Mosley's Graphs*	*Level 2/3**
#8	*Light Debate*	*Level 3*
#9	*Taking Measurements*	*Level 2*
#10	*Kindergarten*	*Level 0*
#11	*Feel Temperature*	*Level 3*
#12	*Plan Trip*	*Level 2/3**

* Video Clips 6, 7, and 12 have been debated extensively as to whether they represent a Level 2 or 3 due to the nebulous nature of the thinking skills implied in each clip.

LoTi Survival Kit

Session #3:

Participant Handouts

Level of Technology Implementation (LoTi)
Observation Form

Date: ___________________ **Observer(s):** _______________________________________ **Grade Level:** ________________

Content: ____ **Position:** o teacher o student o parent

Setting: o classroom o computer lab o library media center o other: ______________________

Technology:

computer:
- o writing/word processing
- o slideshow/presentations
- o hypermedia
- o graphing
- o graphics/drawing
- o webbing/outlining
- o database
- o spreadsheet
- o simulations
- o tutorial
- o drill & practice
- o other: ________________

internet:
- o research
- o online course materials
- o electronic field trips
- o web projects
- o web page creation
- o video conferencing
- o presentations
- o email/keypals
- o other: ___________

video:
- o viewing content info
- o creating/editing
- o broadcast TV
- o video reports/original presentations
- o viewing videotape for self-assessment
- o distance learning/electronic field trips
- o school news/announcements
- o other: __________

other: ____

Observation:
Brief description of how technology was used in the learning experience:

The Learner:
Using technology, students:

Demonstrate high degree of knowledge in subject areas.
- o understand or apply a concept
- o develop or apply a skill
- o build greater knowledge of a topic and how a topic relates to other content
- o integrate new ideas with prior knowledge to make sense/meaning

Communicate subject matter clearly.
- o articulate, present, and/or disseminate knowledge (e.g., written or video reports; multimedia projects)

Solve problems using an effective process to reach viable solutions.
- o conduct research (e.g., locate, collect, organize, evaluate information)
- o use higher order thinking skills (e.g., analysis, synthesis, divergent thinking)
- o make decisions
- o use models to test ideas

Apply learning to the world beyond the classroom.
- o tie content learning to authentic/relevant situations outside the classroom
- o exchange information or collaborate with others for purposeful problem-solving/issues resolution

Self-assess work and work process in order to set future goals.
- o plan how to reach learning goals
- o are aware of their progress in reaching learning levels
- o are aware of the quality and quantity of their work

Comments/Evidence

Level of Technology Implementation (LoTi)
Observation Form

Date: ____________________ Interviewer: ____

Content: ____ Grade Level: _________________________

1. Did today's observation represent a typical day of computer use?

2. If not, could you describe a typical day when computers are being used in terms of:
   * The setting:

   * The Technology Applications:

   * Student Use of Technology:

3. How often does this type of use occur?

4. What variables/obstacles restrict how you used computers?

Level of Technology Implementation:

	Category	*Pedagogy*	*Description*
o	**Level 0: Nonuse**	Traditional methods/ materials	o Technology is not in use. (Ask the teacher about actions toward incorporating technology; comment below.) o Materials are traditional and predominately text-based (e.g., blackboard, overhead, textbooks, workbooks).
o	**Level 1: Awareness**	Technology centered; instruction is about or predominately ontrolled by the technology.	o A person other than the regular classroom teacher (e.g., resource person or assistant) delivers instruction using technology or the technology determines the instruction (e.g., through an ILS). o Technology use has no or little relevance to the teacher's overall instructional program or to student mastery of appropriate content. o The primary learning goal of the lesson is to acquire technical skills or technology literacy (e.g., how to use specific software; learning about hardware; keyboarding; technology vocabulary) and is separate from or in addition to (an) academic goal(s). o Technology use is separate from the learning focus (e.g., offered as a reward activity or allowed when "real work" is completed). o Technology use occurs only at scheduled times; access is limited/not available beyond the schedule. o Available classroom computer(s) are used exclusively for teacher productivity (e.g., email, word processing, grading programs). o Multimedia applications (including web-based) are used to embellish classroom lectures or teacher presentations. o Curriculum management tools are used extensively to generate standards-driven lesson plans.
o	**Level 2: Exploration**	Teacher centered; teacher directed instruction; technology use or mastering content is peripheral or dispensable.	o Student activities, discussions, and projects are focused more on the technology than on the academic content. o Student work is produced to develop or practice technology skills rather than having the content learning objective drive the technology use. o Technology supplements the existing instructional program and is used for extension activities or enrichment exercises. o Technology is used for low level cognitive tasks (e.g., content drill and games for skills practice) related to specific, explicit learning goals. o Student work produced using technology requires little analysis or individual creativity and insight. o Technology tasks are simplistic and use a "cookie cutter"/look-alike approach to what is required. o The primary purpose for using technology is to sustain student interest in content and learning or to increase student time on task rather than to develop concepts or content skills. o Technology's role in the learning activity is disjointed, uneven, or uncertain. o The use of technology seems optional and unnecessary to achieve the learning goals; the match between instructional goals and technology use seems forced or superficial.
o	**Level 3: Infusion**	Teacher centered; teacher directed instruction; technology use for mastering content is adapted to fit with traditional goals and tasks.	o Use of productivity tools such as spreadsheets/graphing packages, concept mapping, and databases are used primarily for analyzing information, making inferences, and drawing conclusions from an investigation or related inquiry. o Students are involved with different forms of web-based projects (e.g., WebQuest) that require students to research information, draw conclusions from their research, and post them to either a web page or incorporate them into some form of multimedia presentation. o The web is used for research purposes or to interact with selected software applications (e.g., simulations) that require students to take a position or role play an issue. o Technology is used for higher cognitive tasks (e.g., analyzing data from a survey, creating a decision-making matrix) related to specific, explicit learning goals. o Technology is used to enhance alternative assessment schemes (e.g., performance-based assessment) that demonstrate higher cognitive skill use (e.g., analysis, synthesis, evaluation) and/or provide evidence of complex thinking skill strategies (e.g., problem-solving, decision-making, investigation, scientific inquiry). o Technology provides adaptations in activities, assessments, and materials for special populations.
o	**Level 4a: Integration (Mechanical)**	Student centered, constructivist instruction; technologies are used for collaborative project-based instruction.	o Teachers rely on prepackaged materials, instructional designs (e.g., 4-MAT, EBAM, Understanding by Design, Learning in Overdrive) and/or outside resources to implement student-centered learning experiences using the available classroom technology. o Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is used as a tool to help students identify and solve authentic problems relating to an overall theme/concept; however, the teacher's personal management concerns and/or perceived infrastructure barriers may restrict full implementation. o Emphasis is placed on authentic problem-solving, student action, and/or issues resolution that require higher levels of student cognitive processing and in-depth examination of the content; yet teacher's personal management concerns and/or perceived infrastructure barriers may limit student options. o Technology use encourages and enables student choice and decision-making during instruction; however, personal management concerns and/or perceived infrastructure barriers may limit student options. o Technology use promotes collaboration among students for planning, implementing, and evaluating their work; yet personal management concerns and/or perceived infrastructure barriers on behalf of the teacher still exist. o Students use a variety of technologies in assessment activities to show evidence of understanding (e.g., to analyze information, synthesize or produce new information, evaluate products); yet personal management concerns and/or perceived infrastructure barriers on behalf of the teacher about alternative assessment still exist.

Level of Technology Implementation:

	Category	*Pedagogy*	*Description*
o	**Level 4b: Integration (Routine)**	Student centered, constructivist instruction; technologies are used for collaborative project-based instruction.	o Teacher can readily design and implement learning experiences (e.g., units of instruction) that empower students to identify and solve authentic problems relating to an overall theme/concept using the available technology (e.g., multimedia applications, internet, databases, spreadsheets, word processing) with little or no outside assistance. o Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is used as a tool to help students identify and solve authentic problems relating to an overall theme/concept; the teacher is confident and comfortable with using technology in this context. o Emphasis is placed on authentic problem-solving, student action, and/or on issues resolution that requires higher levels of student cognitive processing and in-depth examination of the content; the teacher has the background and confidence to nurture this type of instructional strategy on an ongoing basis. o Technology use encourages and enables student choice and decision-making during instruction. o Technology use promotes collaboration among students for planning, implementing, and evaluating their work directed at authentic problem-solving, issues resolution, and/or student action. o Students use a variety of technologies in assessment activities to show evidence of understanding (e.g., to analyze information, synthesize or produce new information, evaluate products) relating to an authentic performance task.
o	**Level 5: Expansion**	Constructivist instruction in which students and teachers are facilitators, learners, and researchers; technologies support self-directed, collaborative learning.	o Technology extends the classroom by expanding student experiences and collaboration beyond the school and local community ("classrooms without walls"). o Collaborative learning experiences involving other schools, business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle via internet), research institutions, and/or universities are established to expand student experiences directed at problem-solving, issues resolution, and student activism surrounding a major theme/concept. o Students initiate using technology appropriately for self-directed learning and assessment, including for portfolios. Students select and use technology to investigate topics, to create original products, to communicate knowledge, and to demonstrate mastery of complex skills and concepts (students as creators/ producers, communicators, and assessors of knowledge). o The complexity and sophistication of the technology-based tools used in the learning environment are commensurate with (1) the diversity, inventiveness, and spontaneity of the teacher's experiential-based approach to teaching and learning and (2) the students' level of complex thinking (e.g., analysis, synthesis, evaluation) and in-depth understanding of the content experienced in the classroom.
o	**Level 6: Refinement**	Constructivist instruction in which students and teachers are facilitators, learners, and researchers; technologies support self-directed, collaborative learning.	o Technology is a seamless tool used by students through their own initiative to find solutions related to an identified "real-world" problem or issue of significance to them. Technology provides a seamless medium for information queries, problem-solving, and/or product development. o Students and teachers have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task at school. o The instructional curriculum is entirely learner-based. The content emerges based on the needs of the learner according to his/her interests, needs, and/or aspirations, and is supported by unlimited access to the most current computer applications and infrastructure available. o Students seek innovative ways to incorporate new uses of technology into their learning experiences and develop new technology skills as needed for self-directed, purposeful projects.

Overall LoTi Level: ☐

Comments:

Sources for the Level of Technology Implementation (LoTi) Continuum:

Moersch, C. (1995). Levels of technology implementation (LoTi): A framework for measuring classroom technology use. http://www.learning-quest.com/LoTi/

Arlington Public Schools, VA, Office of Instructional Media & Technology, Instructional Design & Evaluation. http://www.arlington.k12.va.us/departments/IMT/

LoTi Survival Kit

Session #4:

Assessing LoTi Levels (B)

LoTi
survival kit
train-the-trainer

Assessing LoTi Levels (B)

Time Allotment: 20 minutes

Session #4 is a continuation of Session #3 which focuses on participants using the LoTi Framework to assess the level of technology implementation of different classroom situations. In this session, participants will be given a group of narratives describing instructional computing use. Their task will be to approximate the LoTi level for each teacher based on the narrative.

Provided below is a suggested outline for implementing Session #4 of the LoTi Project Implementation.

1.0
Provide participants with copies of the Session #3 handouts.

Training Tip: *Have participants work in groups of 2 or 3 to complete this exercise so that they may discuss specific attributes of each teacher narrative relating to the LoTi Framework.*

2.0
Have participants identify the LoTi level for the even-numbered (e.g., 2, 4, 6) teacher narratives.

3.0
Once the participants have approximated the LoTi level for each even-numbered participant, have the group as a whole examine each one.

Training Tip: *As participants share their responses, have them articulate the specific attributes of the teacher narrative that match the respective LoTi level.*

Note: *It is criticial that participants not leave the session with the impression that all instructional computing opportunities need to be at the higher LoTi levels. The ideal LoTi level represents the use of technology that addresses student conceptualization of the content at the appropriate level of cognitive processing.*

Assessing LoTi Levels (B)

Therefore, once the group has reached a consensus as to the LoTi level being modeled in each teacher narrative, they should next decide if the LoTi level is appropriate or inappropriate based on the content being addressed and the desired level of student cognitive processing.

3.0

The approximated LoTi level for each teacher narrative is presented below.

Narrative	**Grade Level/Content Area**	***LoTi Level***
#1	*7th Grade Social Studies*	*Level 2/3*
#2	*5th Grade*	*Level 2*
#3	*8th Grade Mathematics*	*Level 2*
#4	*4th Grade*	*Level 1*
#5	*Middle School Tech. Ed.*	*Level 2*
#6	*Middle School P.E.*	*Level 2*
#7	*K to 5 Special Ed.*	*Level 1*
#8	*Middle School Science*	*Level 4a/b*
#9	*3rd Grade*	*Level 2*
#10	*6th Grade*	*Level 2/3*
#11	*High School Business*	*Level 2*
#12	*High School Math*	*Level 2*
#13	*High School English*	*Level 2*
#14	*Middle School Lang. Arts/Spanish*	*Level 0*
#15	*High School Resource*	*Level 3*
#16	*Middle School Tech. Ed.*	*Level 2/3*
#17	*1st Grade*	*Level 1*
#18	*High School Accounting*	*Level 2*
#19	*2nd Grade*	*Level 1*
#20	*High School Social Studies*	*Level 2/3*

LoTi Survival Kit

Session #4:

Participant Handouts

assessing loti levels

Assessing LoTi Levels

Teacher #1 - 7th Grade Social Studies

Comments: My class is currently working on a brochure designed to entice travelers to visit various islands in the Caribbean. Student groups will choose an island, then use the internet to find the appropriate text and pictures to use in the brochure. They will put the brochure together in ClarisWorks.

Perceived needs this school year:

* Time & Lab availability
* All the software programs that are available
* Using HyperStudio to present lessons

Teacher #2 - 5th Grade

Comments: My class is using the World Book Encyclopedia to look up information about endangered animals as part of a reading unit. We also use Microsoft Works to word process our stories for writing.

Perceived needs this school year:

* Knowledge of what is out there and appropriate for 5th grade* Time to coordinate the project
* Technical support in the lab

Teacher #3 - 8th Grade Mathematics

Comments: My class is currently working on a statistics unit. In this unit, they used a spreadsheet to graph data.

Perceived needs this school year:

* Knowledge of what software is relevant and available
* Time to learn new software

Teacher #4 - 4th Grade

Comments: My class has completed a keyboarding program.

Perceived needs this school year:

* Time to share ideas
* Time for inservice training on new resources

Teacher #5 - Middle School Technology Ed

Comments: My class is using Elements of Industry software to complete a technology activity using the "game show" format.

Perceived needs this school year:

* Time away from students
* Available resources for subject area
* Examples from fellow educators in Tech Ed

Teacher #6 - Middle School P. E.

Comments: My students have used the computer to do a physical education research paper. They chose their favorite sport then used the internet to find information on the history, rules, equipment, and field/play diagrams related to that sport. They used ClarisWorks to type up their report.

Perceived needs this school year:

* Students should go to lab to do their papers

Teacher #7 - K to 5 Special Education

Comments: Computer tasks in my room are very individualized. One student surfed the internet. She especially enjoyed the Disney and White House web sites.

Perceived needs this school year:

* Microsoft Word

Teacher #8 - Middle School Science

Comments: My students have been given a culminating task of building the most efficient greenhouse and maximizing growth of food in that greenhouse in an effort to explore sustainable food sources. In their quest to build the most energy efficient greenhouse, students used the internet to do surveys, spreadsheets to analyze their data, word processing programs to write letters requesting donations from professional community members, multimedia authoring tools to create presentations for the community about greenhouse building, and page layout software to create brochures and flyers to promote their cause.

Perceived needs this school year:

* Time to create new integrated units
* Staff development on developing quality experiential units

Teacher #9 - 3rd Grade

Comments: My class was doing a unit on caves, so we got online and looked up some local caves in our area.

Perceived needs this school year:

* More professional development
* Change grade level to 1st Grade

Teacher #10 - 6th Grade

Comments: My students used the World Book Encyclopedia and the internet to create childrens books about wolves. These books had to be written for the Kindergarten grade level with lots of pictures. Some students scanned in pictures that they drew and others found pictures online to use in their books. Students used page layout software to put the books together.

Perceived needs this school year:

* HyperStudio training
* Web page creation training

Teacher #11 - High School Business

Comments: My students used MicrosoftWord to complete a "mail merge" exercise. They merged a letter with a database of people to send the letter to.

Perceived needs this school year:

* Microsoft Access training
* Gradebook program training

Teacher #12 - High School Math

Comments: My students used Microsoft Excel to collect data and display their information as a pie chart.

Perceived needs this school year:

* Inservice training on new math activity ideas
* More computer lab time
* Move away from using the textbook

Teacher #13 - High School English

Comments: My students used Microsoft Word to write/create stories. Students then read each others stories, made suggestions, then edited and added graphics.

Perceived needs this school year:

* Time to learn computers better

Teacher #14 - Middle School Language Arts/Spanish

Comments: My class created their own society and had a community party to introduce their society to the world in an effort to increase cultural tolerance among varying communities. We began by reading Lord of the Flies to get students focused on the idea of creating a society from the ground up. Students then broke into student groups that researched (historically) different facets of society and decided what the new society's rules/practices would be. Student groups included: governmental rules and leadership hierarchy; food and recipes; clothing and styles; traditions; pastimes and sports; religions and values; art, dance, and music; and employment and community roles. At the party, students presented information about their culture, gave performances of their new dances and music, and served their new recipes to members of the community.

Perceived needs this school year:

* More time for research
* Staff development sessions to share units with others

Teacher #15 - High School Resource Teacher

Comments: My created a "Vacation Packages by Internet" website. They were each assigned a destination resort in Wisconsin/Minnesota and were required to research that resort then plan meals, activities, and travel plans so that community members could purchase travel in one integrated package according to their budget.

Perceived needs this school year:

* Experience with E-bay vs. regular buying
* Software to twist, turn, shrink, and stretch tessellations

Teacher #16 - Middle School Technology Ed

Comments: My students search through various web pages on the school web site and determine how well the site serves its intended purpose as an informational, marketing, news, persuasive, or personal site using Microsoft Internet Explorer

Perceived needs this school year:

* Training on more Windows-based applications
* FrontPage training
* Advanced Microsoft Access training

Teacher #17 - 1st Grade

Comments: My class is allowed to play computer games on our classroom computers during free time.

Perceived needs this school year:

* Knowledge of how to use a laptop
* Knowledge of using the new Gateway computers
* Become familiar with programs for 1st graders

Teacher #18 - High School Accounting

Comments: My students are currently creating financial statements in Microsoft Excel. They will soon be comparing how much time and work was saved compared to preparing financials manually.

Perceived needs this school year:

* Time to work with internet

Teacher #19 - 2nd Grade

Comments: In class, we read a story called “Rechenka’s Eggs”, then students used the classroom computers to watch the making of Bavarian Easter Eggs on the egg maker’s web site.

Perceived needs this school year:

* More integration of computer skills in the regular curriculum
* Assist other teachers in technology use

Teacher #20 - High School Social Studies

Comments: My students used the internet to research a key person or event from the 1900’s. Students used ClarisWorks to write a report that included pictures on why their person or event was important.

Perceived needs this school year:

* Students need to use HyperStudio for their presentations
* Develop a social studies newsletter for parents

Assessing LoTi Levels Notes

Level of Technology Implementation (LoTi)
Observation Form

Date: ___________________ **Observer(s):** _______________________________________ **Grade Level:** ________________

Content: ____ **Position:** o teacher o student o parent

Setting: o classroom o computer lab o library media center o other: ______________________

Technology:

computer:
- o writing/word processing
- o slideshow/presentations
- o hypermedia
- o graphing
- o graphics/drawing
- o webbing/outlining
- o database
- o spreadsheet
- o simulations
- o tutorial
- o drill & practice
- o other: ________________

internet:
- o research
- o online course materials
- o electronic field trips
- o web projects
- o web page creation
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video:
- o viewing content info
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- o video reports/original presentations
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other: ____

Observation:
Brief description of how technology was used in the learning experience:

The Learner:
Using technology, students:

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- o understand or apply a concept
- o develop or apply a skill
- o build greater knowledge of a topic and how a topic relates to other content
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Communicate subject matter clearly.
- o articulate, present, and/or disseminate knowledge (e.g., written or video reports; multimedia projects)

Solve problems using an effective process to reach viable solutions.
- o conduct research (e.g., locate, collect, organize, evaluate information)
- o use higher order thinking skills (e.g., analysis, synthesis, divergent thinking)
- o make decisions
- o use models to test ideas

Apply learning to the world beyond the classroom.
- o tie content learning to authentic/relevant situations outside the classroom
- o exchange information or collaborate with others for purposeful problem-solving/issues resolution

Self-assess work and work process in order to set future goals.
- o plan how to reach learning goals
- o are aware of their progress in reaching learning levels
- o are aware of the quality and quantity of their work

Comments/Evidence

Level of Technology Implementation (LoTi)
Observation Form

Date: ____________________ Interviewer: ____

Content: ____ Grade Level: ______________________

1. Did today's observation represent a typical day of computer use?

2. If not, could you describe a typical day when computers are being used in terms of:
   * The setting:

   * The Technology Applications:

   * Student Use of Technology:

3. How often does this type of use occur?

4. What variables/obstacles restrict how you used computers?

Level of Technology Implementation:

	Category	*Pedagogy*	*Description*
o	**Level 0: Nonuse**	Traditional methods/ materials	o Technology is not in use. (Ask the teacher about actions toward incorporating technology; comment below.) o Materials are traditional and predominately text-based (e.g., blackboard, overhead, textbooks, workbooks).
o	**Level 1: Awareness**	Technology centered; instruction is about or predominately ontrolled by the technology.	o A person other than the regular classroom teacher (e.g., resource person or assistant) delivers instruction using technology or the technology determines the instruction (e.g., through an ILS). o Technology use has no or little relevance to the teacher's overall instructional program or to student mastery of appropriate content. o The primary learning goal of the lesson is to acquire technical skills or technology literacy (e.g., how to use specific software; learning about hardware; keyboarding; technology vocabulary) and is separate from or in addition to (an) academic goal(s). o Technology use is separate from the learning focus (e.g., offered as a reward activity or allowed when "real work" is completed). o Technology use occurs only at scheduled times; access is limited/not available beyond the schedule. o Available classroom computer(s) are used exclusively for teacher productivity (e.g., email, word processing, grading programs). o Multimedia applications (including web-based) are used to embellish classroom lectures or teacher presentations. o Curriculum management tools are used extensively to generate standards-driven lesson plans.
o	**Level 2: Exploration**	Teacher centered; teacher directed instruction; technology use or mastering content is peripheral or dispensable.	o Student activities, discussions, and projects are focused more on the technology than on the academic content. o Student work is produced to develop or practice technology skills rather than having the content learning objective drive the technology use. o Technology supplements the existing instructional program and is used for extension activities or enrichment exercises. o Technology is used for low level cognitive tasks (e.g., content drill and games for skills practice) related to specific, explicit learning goals. o Student work produced using technology requires little analysis or individual creativity and insight. o Technology tasks are simplistic and use a "cookie cutter"/look-alike approach to what is required. o The primary purpose for using technology is to sustain student interest in content and learning or to increase student time on task rather than to develop concepts or content skills. o Technology's role in the learning activity is disjointed, uneven, or uncertain. o The use of technology seems optional and unnecessary to achieve the learning goals; the match between instructional goals and technology use seems forced or superficial.
o	**Level 3: Infusion**	Teacher centered; teacher directed instruction; technology use for mastering content is adapted to fit with traditional goals and tasks.	o Use of productivity tools such as spreadsheets/graphing packages, concept mapping, and databases are used primarily for analyzing information, making inferences, and drawing conclusions from an investigation or related inquiry. o Students are involved with different forms of web-based projects (e.g., WebQuest) that require students to research information, draw conclusions from their research, and post them to either a web page or incorporate them into some form of multimedia presentation. o The web is used for research purposes or to interact with selected software applications (e.g., simulations) that require students to take a position or role play an issue. o Technology is used for higher cognitive tasks (e.g., analyzing data from a survey, creating a decision-making matrix) related to specific, explicit learning goals. o Technology is used to enhance alternative assessment schemes (e.g., performance-based assessment) that demonstrate higher cognitive skill use (e.g., analysis, synthesis, evaluation) and/or provide evidence of complex thinking skill strategies (e.g., problem-solving, decision-making, investigation, scientific inquiry). o Technology provides adaptations in activities, assessments, and materials for special populations.
o	**Level 4a: Integration (Mechanical)**	Student centered, constructivist instruction; technologies are used for collaborative project-based instruction.	o Teachers rely on prepackaged materials, instructional designs (e.g., 4-MAT, EBAM, Understanding by Design, Learning in Overdrive) and/or outside resources to implement student-centered learning experiences using the available classroom technology. o Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is used as a tool to help students identify and solve authentic problems relating to an overall theme/concept; however, the teacher's personal management concerns and/or perceived infrastructure barriers may restrict full implementation. o Emphasis is placed on authentic problem-solving, student action, and/or issues resolution that require higher levels of student cognitive processing and in-depth examination of the content; yet teacher's personal management concerns and/or perceived infrastructure barriers may limit student options. o Technology use encourages and enables student choice and decision-making during instruction; however, personal management concerns and/or perceived infrastructure barriers may limit student options. o Technology use promotes collaboration among students for planning, implementing, and evaluating their work; yet personal management concerns and/or perceived infrastructure barriers on behalf of the teacher still exist. o Students use a variety of technologies in assessment activities to show evidence of understanding (e.g., to analyze information, synthesize or produce new information, evaluate products); yet personal management concerns and/or perceived infrastructure barriers on behalf of the teacher about alternative assessment still exist.

Level of Technology Implementation:

	Category	*Pedagogy*	*Description*
o	**Level 4b: Integration (Routine)**	Student centered, constructivist instruction; technologies are used for collaborative project-based instruction.	o Teacher can readily design and implement learning experiences (e.g., units of instruction) that empower students to identify and solve authentic problems relating to an overall theme/concept using the available technology (e.g., multimedia applications, internet, databases, spreadsheets, word processing) with little or no outside assistance. o Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is used as a tool to help students identify and solve authentic problems relating to an overall theme/concept; the teacher is confident and comfortable with using technology in this context. o Emphasis is placed on authentic problem-solving, student action, and/or on issues resolution that requires higher levels of student cognitive processing and in-depth examination of the content; the teacher has the background and confidence to nurture this type of instructional strategy on an ongoing basis. o Technology use encourages and enables student choice and decision-making during instruction. o Technology use promotes collaboration among students for planning, implementing, and evaluating their work directed at authentic problem-solving, issues resolution, and/or student action. o Students use a variety of technologies in assessment activities to show evidence of understanding (e.g., to analyze information, synthesize or produce new information, evaluate products) relating to an authentic performance task.
o	**Level 5: Expansion**	Constructivist instruction in which students and teachers are facilitators, learners, and researchers; technologies support self-directed, collaborative learning.	o Technology extends the classroom by expanding student experiences and collaboration beyond the school and local community ("classrooms without walls"). o Collaborative learning experiences involving other schools, business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle via internet), research institutions, and/or universities are established to expand student experiences directed at problem-solving, issues resolution, and student activism surrounding a major theme/concept. o Students initiate using technology appropriately for self-directed learning and assessment, including for portfolios. Students select and use technology to investigate topics, to create original products, to communicate knowledge, and to demonstrate mastery of complex skills and concepts (students as creators/ producers, communicators, and assessors of knowledge). o The complexity and sophistication of the technology-based tools used in the learning environment are commensurate with (1) the diversity, inventiveness, and spontaneity of the teacher's experiential-based approach to teaching and learning and (2) the students' level of complex thinking (e.g., analysis, synthesis, evaluation) and in-depth understanding of the content experienced in the classroom.
o	**Level 6: Refinement**	Constructivist instruction in which students and teachers are facilitators, learners, and researchers; technologies support self-directed, collaborative learning.	o Technology is a seamless tool used by students through their own initiative to find solutions related to an identified "real-world" problem or issue of significance to them. Technology provides a seamless medium for information queries, problem-solving, and/or product development. o Students and teachers have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task at school. o The instructional curriculum is entirely learner-based. The content emerges based on the needs of the learner according to his/her interests, needs, and/or aspirations, and is supported by unlimited access to the most current computer applications and infrastructure available. o Students seek innovative ways to incorporate new uses of technology into their learning experiences and develop new technology skills as needed for self-directed, purposeful projects.

Overall LoTi Level: ☐

Comments:

Sources for the Level of Technology Implementation (LoTi) Continuum:

Moersch, C. (1995). Levels of technology implementation (LoTi): A framework for measuring classroom technology use. http://www.learning-quest.com/LoTi/

Arlington Public Schools, VA, Office of Instructional Media & Technology, Instructional Design & Evaluation. http://www.arlington.k12.va.us/departments/IMT/

LoTi Survival Kit

Session #5:

LoTi Technology Use Questionnaire

LoTi Technology Use Questionnaire

Time Allotment: 20 minutes

Session #5 prepares participants to take the online LoTi Technology Use Questionnaire. The goal is for participants to reflect candidly and honestly about their instructional computing practices so as to create a personal needs assessment profile -- a profile that can be used for individualized professional development planning.

Provided below is a suggested outline for implementing Session #5 of the LoTi Project Implementation.

1.0

Prior to beginning the online LoTi Technology Use Survey, share with participants the following background information on the online survey:

> *The Technology Use Profile was designed to explore the current role of technology use in the classroom by measuring three key areas: (1) Level of Technology Implementation (LoTi), (2) Personal Computer Use (PCU), and (3) Current Instructional Practices (CIP). The LoTi Profile portion assesses participants' current Level of Technology Implementation based on the Level of Technology Implementation (LoTi) Framework developed by Dr. Christopher Moersch; the PCU Profile portion assesses participants' comfort and skill level with using a personal computer; and the CIP Profile portion assesses participants' current instructional practices relating to a subject-matter versus a learner-based curriculum approach.*

Note: *Make sure that each participant selects the appropriate LoTi survey to complete based on their position on campus (e.g., classroom teacher, media specialist, resource teacher).*

Training Tip: *Remind participants that the online LoTi Questionnaire takes approximately 20 to 25 minutes to complete. Emphasize the importance of your staff being as candid as possible when completing the assessment.*

LoTi survival kit train-the-trainer

LoTi Technology Use Questionnaire

2.0
Remind participants that as a staff, the aggregate LoTi data will be presented in a building level report with recommendations and goals for the school building relating to how the staff can elevate the level of technology implementation in their respective classrooms.

3.0
The LoTi Technology Use Profile Report provides a summary of your school's LoTi profile in three key areas: Level of Technology Implementation (LoTi), Personal Computer Use (PCU), and Current Instructional Practices (CIP). Provided below are items to keep in mind as you peruse your LoTi Technology Use Profile document.

Page 1:
* Includes the publishing date and name of your school building

Page 2:
* Identifies the number of participants who completed the LoTi Survey
* Provides an overview of each of the eight stages comprising the LoTi Framework

Page 3:
* Provides a graphic profile (bar graph) for each of the three indicators
* Highlights the predominate level (mode) for each indicator. *Note: LoTi levels are based on a 0 to 6 scale whereas PCU and CIP are based on intensity levels ranging from 0 (Not Applicable) to 7 (Very True of Me Now).*

Page 4:
* Provides a percentage breakdown of staff members at each of the eight LoTi levels as well as reports the percentage of staff members who have access to computers for instructional purposes.

Page 5:
* Provides goal statements for your school building based on findings from the LoTi data. *Note: These goal statements can be incorporated into site plans, grant applications, or end-of-the-year evaluations.*

LoTi Technology Use Questionnaire

Page 6:

* Includes sample recommendations consistent with the goal statements and findings from the LoTi data. *Note: The recommendations represent only a starting point; specific recommendations based on instructional priorities and statewide assessment data for your school should drive the final recommendations and culminate in a schoolwide action plan.*

LoTi Survival Kit

Session #5:

Participant Handouts

Feature

Measurers of Success

Six Instruments to Assess Teachers' Use of Technology

By Christopher Moersch

Subject: Assessing teachers' level of technology use/integration

Audience: Teachers, technology coordinators

Grade Level: K–12 (Ages 5–18)

Technology: Internet/Web

Standards: *NETS•T* I–III (www.iste.org/standards)

Supplement: www.iste.org/L&L

During the past few years, a major trend throughout the United States has been to assess teachers' technology usage in the classroom. The motivation behind the movement to assess teachers, students, parents, and administrators has varied. Some stakeholders use the data to satisfy federal grant requirements or state mandates; others use the data to plan staff development classes and workshops for their colleagues. Teachers sometimes want to self-assess their technology skills or level of technology integration to create meaningful and targeted action plans for their own professional development.

However, major revisions in the Elementary and Secondary Education Act (ESEA) and the No Child Left Behind (NCLB) legislation are mandating stringent measures for accountability and evaluation of federally funded programs. Specifically, Title II, Part D of NCLB, Enhancing Education through Technology (EETT), provides both formula-based and competitive grants that require research-based evidence of effectiveness of instructional interventions to ensure they meet technology standards. (*Editor's note:* See Resources on p. 24 for the Web addresses of the NCLB text and other sites.)

What instruments exist to measure teachers' use of technology in the classroom? Several years ago, I introduced the Level of Technology Implementation (LoTi) Framework and its eight stages of developmental growth with technology use in an attempt to quantify instructional computing practices in the classroom (Moersch, 1995). I later formed these stages into a teacher technology survey known as the LoTi Questionnaire or "LoTiQ" (Moersch, 1997). The intent of this survey instrument was to provide stakeholders with specific needs assessment data to help shape future decision making around professional development options, budgeting priorities, and instruction and assessment issues.

I was not alone in my quest to monitor or assess technology use practices. Many organizations have developed technology assessment tools, each with unique attributes and idiosyncrasies. These instruments include:

- Profiler, from the High Plains Regional Technology in Education Consortium (HPR*TEC)
- iAssessment
- Mankato Survey of Professional Technology Use, Ability, and Accessibility
- enGauge, from the North Central Regional Educational Laboratory
- SEIR*TEC Faculty Technology Survey, from the SouthEast Initiatives Regional Technology in Education Consortium
- TAGLIT (Taking a Good Look at Instructional Technology)

Beyond putting together questions to form a technology survey, what is the philosophical basis that separates each of these technology assessment tools? In the case of LoTiQ, I wanted a survey that would align with the existing LoTi framework, focus attention more on instruction and assessment practices rather than technology, and provide a tool that could be used in research studies and dissertations as well as by school systems worldwide. However, others have included other aspects of technology implementation in their assessment instruments, such as computer skills (California Technology Assistance Program [CTAP, using iAssessment], Mankato Survey), system-wide use (enGauge), technology plans (enGauge, TAGLIT), higher-order thinking skills (enGauge), and professional development (CTAP).

Comparing the Assessment Tools

This article compares these technology assessment instruments, which are currently in use in the United States. Categories used in the comparison include:

- Item Analysis
- Feedback
- Summary Reports
- Survey Versions
- Standards Alignment
- Prescriptive Use
- Customization

Though some of these instruments include multiple versions for teachers, students, and administrators, the actual comparisons are based exclusively on the teacher survey.

The following sections define the seven categories and provide examples of which surveys are strong in certain criteria. Table 1 shows what each survey focuses on and what design features they include. The online supplement at www.iste.org/L&L provides a complete breakdown of each survey instrument, including a summary, advantages, and disadvantages.

Item Analysis. The Item Analysis section breaks down each survey according to the number of questions embedded in the primary survey instrument, as well as by the following question types:

- technology integration
- instructional approach
- computer skills
- other

The CTAP survey, Indiana's MyTarget (using iAssessment), and Arizona's MyCompass (using iAssessment) all place a significant focus on teacher's computer skills, while enGauge and LoTiQ place primary emphasis on the

Higher-level use statements include those that made reference to higher-order cognitive processes, alternative assessment schemes, interdisciplinary/integrated instruction, and/or the changing role of the teacher in the classroom.

teacher's technology integration and instructional practices.

Technology integration items focus on those statements involved with the use of computers in a classroom setting ranging from how computers are used to complement students' understanding of the content to the manner in which computers are used to promote higher-order thinking processes. For purposes of this report, I further parceled these items based on their association with lower levels of technology implementation versus higher levels of technology use. Lower-level use statements include those that either addressed technology use as a supplemental or complementary tool in the classroom (e.g., enhanced instruction) or contained ambiguous terminology (e.g., "powerful ways"). Higher-level use statements include those that made reference to higher-order cognitive processes, alternative assessment schemes, interdisciplinary/integrated instruction, and/or the changing role of the teacher in the classroom.

The *computer skills* statements relate to personal computer skills outside of the classroom environment such as the ability to create a Web page, prepare a multimedia presentation, or manipulate a spreadsheet program.

The *instructional practices* items focus on statements devoted exclusively to teaching styles, learning activities, and assessment practices.

The *other* section takes into account those statements beyond the classroom walls, such as professional development needs, administrative support for technology, and the use of the school's technology plan.

Approximately 80% of the LoTiQ and the Kentucky Implementation of Technology Survey (using Profiler) comprise questions/statements involving technology integration compared to the Mankato (3%) and CTAP surveys (16%). enGauge and LoTiQ address teacher's instructional practices, while TAGLIT and SEIR*TEC include survey items extending beyond the classroom (e.g., technology planning, infrastructure needs, administrative support). The Mankato survey (97%) and CTAP (84%) focus heavily on teacher's computer skills, compared to LoTiQ (10%) and enGauge (5%), which focus extensively on technology integration issues.

Feedback. The Feedback section addresses the type of feedback provided to the individual as well as to the group (e.g., school building, school district, state department of education). All of the technology survey instruments provide their clients aggregate feedback either in the form of a database file (Mankato, SEIR*TEC); charts and graphs (CTAP, Kentucky survey, TAGLIT); or detailed reports including data analysis, summaries, and recommendations (enGauge, LoTiQ). enGauge and LoTiQ provide prescriptive feedback to the end user, and enGauge, LoTiQ, Profiler, and TAGLIT include multiple versions based on the clientele, such as building administrators, support staff, and teachers.

Lower-level use statements include those that either addressed technology use as a supplemental or complementary tool in the classroom (e.g., enhanced instruction) or contained ambiguous terminology (e.g., "powerful ways").

Table 1. Survey Focus and Design.

Item Analysis	iAssessment (CTAP)	Profiler (Kentucky survey)	TAGLIT
Primary Focus	Computer Skills	Technology Integration	Technology Support/Integration
Number of Survey Questions	298	16	70
Technology Integration	16%	81%	32%
• Higher Level	0%	19%	23%
• Lower Level	100%	81%	77%
Instructional Practices	0%	0%	0%
Computer Skills	84%	19%	21%
Other	0%	0%	47%
Survey Design			
Individual Feedback	Yes	Yes	No
Group Feedback	Yes	Yes	Yes
Survey Reports	5	No	1
Multiple Versions	No	Yes	Yes
Standards Based	Yes	Yes	Yes
Prescriptive	Yes	No	No
Customization	Yes	Yes	No

Survey Reports. These compare the number of formative/summative reports available to the school system based on the aggregate data generated from each survey.

Multiple Versions. These track the number of versions of each survey available for different audiences. enGauge, LoTiQ, and TAGLIT include multiple versions for different stakeholders—such as building administrators, teachers, instructional specialists, students, and board members—as well as survey reports that show current trends for the entire school system based on the assessment data collected.

Standards Alignment. This category assesses the degree to which the assessment instrument is aligned to either state and/or national technology standards. A cursory scan of the surveys reveals that all instruments are standards-based within the context that each is based on ISTE's National Educational Technology Standards for Teachers (NETS•T) and/or a specific set of state/regional technology standards. For example, the Profiler tool used in Kentucky is specifically aligned to their state's Teacher Technology Standard

If your intent is to assess teachers' skill and comfort with using a personal computer and related peripherals, then ample instruments are available to meet your needs.

Continuum, whereas the enGauge, LoTiQ, and TAGLIT instruments are based on ISTE's NETS•T.

Prescriptive Use. This category explores the ability of the assessment instrument to deliver to the end user prescriptive feedback that could be used for future teacher professional development. Both LoTiQ and the iAssessment authoring tool, which is used in California, Indiana, and Arizona, provide prescriptive feedback to individual teachers in the form of recommended interventions to assist the teacher in elevating their level of technology use. The LoTiQ instrument also includes an online Professional Development Planner so teachers can sign up for courses, track their continuing education credits, and archive work samples electronically to demonstrate their technology integration skills through an ePortfolio.

Customization. This final category compares the ability of the instrument to be customized for different audiences and purposes. Profiler and iAssessment enable the school entity (e.g., state department of education) to completely customize the survey according to the type of information they are attempting to gather.

Choosing the Appropriate Survey

When selecting a technology use survey, it is important to first determine your purpose in conducting the assessment. Is your purpose to generate a needs assessment for individual teachers, satisfy the mandate of a grant, or possibly research variables that may affect academic achievement in the classroom? Many of these survey instruments (e.g., enGauge, Profiler) provide individualized needs assessment data. Some others (e.g., LoTiQ, TAGLIT) provide adequate feedback for evaluating the success of a grant.

Another critical question involves the scope of the assessment. Will the scope of the technology survey examine

Surveys continued on page 24.

LoTiQ	enGauge	Mankato	SEIR*TEC
Technology Integration	TechnologySupport/Integration	Computer Skills	Technology Integration
50	98	60	58
80%	31%	3%	47%
63%	30%	0%	7%
37%	70%	100%	93%
10%	20%	0%	0%
10%	5%	97%	21%
0%	44%	0%	32%
Yes	Yes	No	No
Yes	Yes	Yes	Yes
13	3	No	No
Yes	Yes	No	No
Yes	Yes	Yes	Yes
Yes	Yes	No	No
Limited	No	No	No

Surveys continued from page 13.

all components affecting instructional computing practices ranging from the district technology plan to the computer skill level of the building administrator? Or, will the scope isolate a specific dimension such as computer skills or level of technology integration? The enGauge survey provides a comprehensive look at the perceptions, actions, and beliefs of all stakeholders involved with instructional computing. LoTiQ focuses almost exclusively on technology integration, instruction, and assessment practices at the classroom level. Other tools, including CTAP and the Mankato survey, place primary attention on the computer skill level of the teacher.

A third question to consider when selecting a technology use survey is the duration of the instrument. Teachers are extremely busy professionals with endless demands on their time from all stakeholders, including students, parents, community members, and administrators. "How long is the survey?" is a typical question expressed by most classroom practitioners. Some surveys may take a few minutes, and others may take an extraordinary amount of time based on the scope of the assessment.

The tool you finally select should fit your purpose, be worthy of the time needed to complete it, and provide adequate breadth of coverage to address the most critical areas affecting instructional computing. If your intent is to assess a teacher's skill and comfort with using a personal computer and related peripherals, then ample instruments are available to meet your needs.

However, if your purpose is to gauge a teacher's perception about using technology to pique student interest and academic performance in the classroom, then the pool of technology assessment instruments grows smaller. I highly recommend that you first conduct your own review of the available technology assessment instruments, field test them with a sampling of your constituency, and then decide on one that best fits your overall goals.

Resources

CTAP2: www.iassessment.com/ctap.html
enGauge Assessment: www.ncrel.org/engauge/assess/assess1.htm
iAssessment: www.iassessment.com
Kentucky Implementation of Technology Survey: http://profiler.hprtec.org/smf/survey.jsp?survey_id=174
LoTiQ: http://lotilounge.com
Mankato Teacher Technology Survey: www.isd77.k12.mn.us/resources/surveydatabase.html
MyCompass: http://mycompass.iassessment.org
MyTarget: http://mytarget.iassessment.org
No Child Left Behind: www.nochildleftbehind.org
No Child Left Behind legislation: www.ed.gov/legislation/ESEA02
Profiler: http://profiler.hprtec.org
SEIR*TEC Technology Survey: www.serve.org/seir-tec/surveys/
TAGLIT: www.taglit.org/taglit/default.asp

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Christopher Moersch is the director of the National Education Alliance in Corvallis, Oregon, and author of numerous publications articulating the LoTi framework. School districts and state departments of education across the United States have used his materials for instructional technology assessment and professional development planning and implementation. His work with educational technology began in 1981 when Apple donated one Apple IIe to every California public school. Based, in part, on that excitement, he helped create a software product called Willy Byte in the Digital Dimension. It sold a total of nine copies worldwide!

The tool you finally select should fit your purpose, be worthy of the time needed to complete it, and provide adequate breadth of coverage to address the most critical areas affecting instructional computing.

How do you assess technology use?

Is there an instrument you've used successfully? An instrument you've created?

How do you use the results of these assessments in planning your professional development?

Share your best practices with *L&L* readers. Send a letter to letters@iste.org.

Technology Use Surveys

enGauge
Web site: **www.ncrel.org/engauge/assess/assess1.htm**
Notable Users: North Central Regional Education Laboratory (NCREL)
Description: The enGauge program represents a partnership between NCREL, the North Central Regional Technology in Education Consortium (NCR*TEC), and the Metiri Group. The enGauge framework consists of six Essential Conditions for assessing a school system's overall technology implementation status:

1. Vision
2. Practice
3. Proficiency
4. Equity
5. Access
6. Systems

Of the 98 items contained in the enGauge educator user survey, 41% is devoted to issues extending beyond the classroom (e.g., how the vision for technology may guide decisions about technology and curriculum.), while 34% addresses technology integration (e.g., Do students regularly use technology to consult with experts or consult with students in other schools?) The enGauge educator user survey represents just one of eight assessment surveys available to educational stakeholders. The others are targeted for district administrators, building administrators, building technology coordinators, district technology coordinators, board members, community members, and students. Reports are automatically compiled for educators, special projects, or for an entire school.

The intent behind the enGauge series of assessments is to enable school systems as well as individuals make data-driven decisions about the status of teaching and learning on campus. The thoroughness of the descriptors for each of the Six Essential Conditions enables schools to readily augment the survey portion with structured interviews and clinical observations.

Advantages:

- Thoroughness in assessing all dimensions of technology use on campus
- Detailed feedback provided to individual educators and schools
- Consistency in using the enGauge framework throughout all aspects of the surveys

Disadvantages:

- Voluminous graphs, charts, and tables require some type of prior interventions for stakeholders to interpret and use in their technology planning

iAssessment
Web site: **www.iassessment.com**
Notable Users: California, Arizona, Indiana, Utah
Description: iAssessment is a Web-based service that enables school systems to create custom surveys to determine the end user's proficiency. Users can enter their own question sets and weigh the possible answers against predefined rubrics. The iAssessment service enables school systems to enter their own training and professional development resources, which, in turn, can be aligned to a specific rubric. The iAssessment service also provides limited feedback to individual users (e.g., teachers) and groups (e.g., school buildings, regions, and states) in the form of bar graphs based on the aggregate data from the survey. Most large-scale users of iAssessment have used the service primarily to track teachers' basic computer skills. In Arizona, California, and Indiana, the majority of the questions (85%–90%) are directed at a skills inventory.

The California version of the iAssessment service, called the California Technology Assistance Program (CTAP), includes 298 questions divided into the following categories: General Computer Knowledge and Skills, Internet, E-mail, Word Processing, Publishing, Databases, Spreadsheets, Presentation Software, and Instructional Technology. Approximately 84% of the questions relate to computer skills (e.g., I know how to create and use an address book. I know how to find and replace text within a document. I know how to sort, match, and go to specific records.), while the remaining 16% address instructional uses of technology mostly at a low level of implementation (e.g., I regularly create appropriate charts for a content lesson.) Throughout the CTAP survey, only vague reference is made to the use of technology application with traits resembling any of the target technology goals (e.g., I select and implement appropriate e-mail tools to effectively support the teaching and learning process. I design curricular lessons that utilize databases to enhance learning outcomes. I know how to analyze best practices and research findings on the use of computer-based technology and design lessons accordingly.)

As mentioned earlier, one of the viable features of the iAssessment package is the ability to match professional development opportunities to individual results. In California, a teacher can investigate a variety of courses based on an identified need such as CTAP Personal Proficiency Courses for those individuals seeking additional assistance with e-mailing as well as their general computer knowledge and skill.

Advantages:
- Customized surveys to match local/state standards
- Provides individual and group feedback
- Allows users to explore professional development opportunities

Disadvantages:
- No uniform standard for defining *technology integration*

LoTiQ (Level of Technology Implementation Questionnaire)
Web site: **http://lotilounge.com**
Notable Users: Wisconsin, New Jersey, New Hampshire, Hawaii, Georgia, Delaware
Description: The LoTiQ was first conceptualized in 1995 in an effort to create a consistent set of measures that accurately reflected the progressive nature of teaching with technology. Based partially on the Concerns-Based Adoption Model (Hall, Wallace, & Dossett, 1973; Hall, George, & Rutherford, 1977; Hall & Loucks, 1979) and findings from Apple Classrooms of Tomorrow research (Apple, 1995), the LoTi instrument measures eight specific stages of technology implementation: Awareness, Exploration, Infusion, Mechanical Integration, Routine Integration, Expansion, and Refinement. The LoTi instrument provides an assessment of three critical attributes affecting technology use in the classroom: Current Instructional Practices (CIP), Personal Computer Use (CIP), and Level of Technology Implementation (LoTi).

Eighty percent of the LoTi instrument focuses exclusively on technology integration issues in the classroom (e.g., I have experienced past success with designing and implementing Web-based projects with my students that emphasize complex thinking skill strategies such as problem solving, scientific inquiry, and decision making), while 10% focuses on personal computer use competencies (e.g., I am proficient with basic software applications such as word processing tools, Internet browsers, spreadsheet programs, and/or multimedia applications). The remaining 10% of the LoTi questionnaire addresses strictly instructional practices (e.g., Students' questions dictate both the context and content of my instruction) without a computer. The LoTi instrument has been used equally as a technology integration assessment tool at the local, district, and state levels as well as an empirically tested research tool to isolate variables associated with successful technology use practices.

Recently, the LoTi instrument has been folded into a larger, more expansive Web-based portal that enables teachers to create professional development plans, enroll in courses, and track their continuing education credits based on the results of their LoTi data profile.

Advantages:
- Formally evaluated for validity and reliability
- Feedback provided for individuals, schools, districts, and states
- Offers extensive professional development planner as part of the survey process
- Using multiple indices to arrive at an overall score for each individual

Disadvantages:
Primary focus is on behaviors and attitudes affecting teaching and learning practices in the classroom; less on computer skills

Mankato Teacher Technology Survey
Web site: **www.isd77.k12.mn.us/resources/surveydatabase.html**
Description: The Mankato Teacher Technology Survey is comprised of 60 items that focus on applications, frequency of use, location (where computers are being used), attitude about computers, inservice times for technology inservice, and support for technology use. Approximately 97% of the items have little to do with technology integration in the classroom, but focus primarily on personal use and comfort level as well as frequency of use. The two items in the Mankato survey that do address "integration" do not specify or quantify any attributes describing what technology integration means (e.g., "I would like to integrate more technology into my classroom").

Advantages:
- Provides extensive measure of teacher's computer skills
- Allows for future data manipulation and analysis using FileMaker Pro

Disadvantages:
- No individual feedback
- No uniform standard for defining *technology integration*

Profiler (HPR*TEC)
Web site: **http://profiler.hprtec.org**
Notable Users: Kentucky, Nebraska, Massachusetts
Description: Profiler is an online survey-authoring tool funded by the U.S. Department of Education and provided by the High Plains Regional Technology Education Consortium. It was designed to be a collaborative tool to improve skills around a general topic (e.g., technology skills). To date, more than 800 school entities (state departments of education, school districts, school buildings), professional organizations, and special project leaders have used the capabilities of the Profiler to create custom assessments. Participants who complete the Profiler survey are given both individual and group feedback in the form of "Profiler badges" based on criteria established by the user.

The Kentucky version of the Profiler survey, comprising 16 questions, is designed to assist existing teachers and administrators in meeting the technology-related criteria for the state (16 different criteria). In the Kentucky version, 56% of the questions/criteria address instruction and assessment issues while approximately 25% of the questions/criteria relate to non-instructional uses of technology. Of the questions addressing the instructional curriculum, 19% of the questions relate to higher level technology implementation statements associated with the Target Technology criteria (e.g., I integrate the impact of technology on society into my students' learning. I use research-based instructional practices that include technology, whenever appropriate.), while the remaining 81% align with lower level technology use statements (e.g., I use self-made multimedia presentations on a regular basis to enhance my teaching). Using the Profiler tool to create assessments for states such as Kentucky or for small projects is relatively painless; the developer just needs to input the questions, and the Profiler assessment tool takes care of the rest.

Advantages:
- Easy-to-create surveys
- Built-in tutorial mechanism
- Provides individual and group feedback

Disadvantages:
- Profiler badges sometimes difficult to analyze for either individuals or groups
- No uniform standard for defining *technology integration*

SEIR*TEC Technology Survey
Web site: **www.serve.org/seir-tec/surveys/**
Notable Users: Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina
The SouthEast Inititatives Regional Technology in Education Consortium (SEIR*TEC) teacher survey is one of seven surveys designed to assess the technology access, experience, attitudes, and needs of key stakeholders including teachers, students, parents, administrators, technology coordinators, and community members. Of the 58 items contained in the SEIR*TEC teacher survey, 33% are devoted to teacher's impressions about the impact of technology on the school environment (e.g., student attendance, teacher communication, student achievement, time on task.) while 20% addresses teacher's expertise with various software applications and peripherals. The remaining 47% of the survey addresses teachers use of and perceptions about technology in an educational setting. Approximately 93% of these statements encompassing technology use address either lower levels of technology implementation or represent ambiguous terminology (e.g., Design and deliver instructions using technology. I would like to excite my students about technology integration.). The remaining 7% (two statements) potentially address higher levels of implementation based on how one might interpret them (e.g., Have students use technology to create products for critical review by authentic audiences. I am ready to develop an entire new learning environment to utilize technology.).

Advantages:
- Provides extensive measure of teacher's computer skills
- Allows for future data manipulation and analysis using FileMaker Pro

Disadvantages:
- No individual feedback
- No uniform standard for defining *technology integration*

TAGLIT (Taking a Good Look at Instructional Technology)
Web site: **www.taglit.org**
Notable Users: Bill and Melinda Gates Foundation
Description: TAGLIT is a suite of assessment tools designed to help principals and other school leaders gather, analyze, and report information about how technology is used for teaching and learning in their schools. It was developed at University of North Carolina for a professional development program. The teacher instrument comprising 70 items is divided into nine sections:

- Your Technology Skills, Your Technology Use in Teaching and Learning
- Technology and the Way Your Classroom Works
- Your School's Technology Resources—Hardware
- Your School's Technology Resources—Software and Electronic /Online References
- Your School's Technology Resources—Technical and Instructional Support
- Your Technology Professional Development
- Your School's Technology Plan
- Open-ended Feedback Section
- Non-instructional Issues

Approximately 33 questions (47% of TAGLIT) address non-instructional issues ranging from professional development priorities to the level of instructional support given to the teacher.

Twenty-two of the TAGLIT assessment questions (31%) address some form of technology deployment in the classroom; 23% of these focus on higher-order technology implementation (e.g., As a result of your use of technology in teaching and learning, are you more inclined to involve students in activities that require higher-level thinking skills? As a result of your use of technology in teaching and learning, are you more inclined to assess student achievement based on products, progress, and effort?). The remaining 77% of the technology implementation questions are primarily lower-level questions relating to technology use (e.g., How far along are you in enhancing teaching and learning using e-mail? Overall, how far along are you in using technology to enhance teaching and learning?). The remaining 22% of the TAGLIT questions fall in the personal computer skills category (e.g., How far along are you in learning to use presentation software to create a presentation?).

TAGLIT includes six different versions (elementary teacher, student, administrator, middle and high school teacher, student, and administrator) and one summative report. This report is created through a two-step process. First, schools receive a Data Summary with tables, graphs, and all responses to open-ended questions on teacher and student surveys. Next, school leaders analyze the data from the Data Summary and customize their TAGLIT Reports by adding their comments in a series of text entry boxes. The TAGLIT Report includes five sections:

1. Technology Plan
2. Teachers
3. Students
4. Community
5. "Stuff"

It includes data tables, graphs, and comments by the principal or other school leader.

Advantages:
- Generates program evaluation data for national comparison
- Multiple versions available for different constituents
- Prompts administrators to take an active interest in data collection and professional development planning

Disadvantages:
- No individual feedback for users
- No uniform standard for defining *technology integration*

References

Hall, Wallace, & Dossett. (1973).
Hall, George, & Rutherford. (1977).
Hall & Loucks. (1979).

www.iste.org/L&L

Prepared by the
National Business
Education Alliance
on 10/15/00

LoTi℠ Technology Use Profile

Roosevelt Middle School

Recently, 86 participants from Roosevelt Middle School completed the Level of Technology Implementation (LoTi) Questionnaire. This questionnaire measures three critical components affecting instructional computing practices in the classroom: LoTi (Levels of Technology Implementation), PCU (Personal Computer Use), and CIP (Current Instructional Practices). A description of each of the stages comprising the LoTi Framework is provided below:

Level 0 - Nonuse
A perceived lack of access to technology-based tools (e.g., computers) or a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based (e.g., ditto sheets, chalkboard, overhead projector).

Level 1 - Awareness
The use of technology-based tools is either (1) one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pull-out programs, computer literacy classes, central word processing labs), (2) used almost exclusively by the classroom teacher for classroom and/or curriculum management tasks (e.g., taking attendance, using grade book programs, accessing email, retrieving lesson plans from a curriculum management system or the internet) and/or (3) used to embellish or enhance teacher-directed lessons or lectures (e.g., multimedia presentations).

Level 2 - Exploration
Technology-based tools supplement the existing instructional program (e.g., tutorials, educational games, basic skill applications) or complement selected multimedia and/or web-based projects (e.g., internet-based research papers, informational multimedia presentations) at the knowledge/comprehension level. The electronic technology is employed either as extension activities, enrichment exercises, or technology-based tools and generally reinforces lower cognitive skill development relating to the content under investigation.

Level 3 - Infusion
Technology-based tools including databases, spreadsheet and graphing packages, multimedia and desktop publishing applications, and internet use complement selected instructional events (e.g., field investigation using spreadsheets/graphs to analyze results from local water quality samples) or multimedia/web-based projects at the analysis, synthesis, and evaluation levels. Though the learning activity may or may not be perceived as authentic by the student, emphasis is, nonetheless, placed on higher levels of cognitive processing and in-depth treatment of the content using a variety of thinking skill strategies (e.g., problem-solving, decision-making, reflective thinking, experimentation, scientific inquiry).

Level 4a - Integration (Mechanical)
Technology-based tools are integrated in a mechanical manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials and/or outside resources (e.g., assistance from other colleagues), and/or interventions (e.g., professional development workshops) that aid the teacher in the daily management of their operational curriculum. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems as perceived by the students relating to an overall theme/concept. Emphasis is placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.

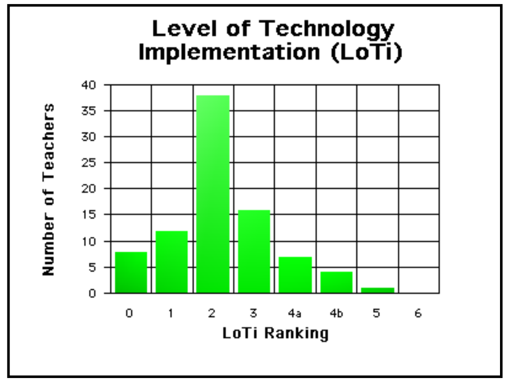
Level 4b - Integration (Routine)
Technology-based tools are integrated in a routine manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. At this level, teachers can readily design and implement learning experiences (e.g., units of instruction) that empower students to identify and solve authentic problems relating to an overall theme/concept using the available technology (e.g., multimedia applications, internet, databases, spreadsheets, word processing) with little or no outside assistance. Emphasis is again placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.

Level 5 - Expansion
Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from other schools, business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle via internet), research institutions, and universities to expand student experiences directed at problem-solving, issues resolution, and student activism surrounding a major theme/concept. The complexity and sophistication of the technology-based tools used in the learning environment are now commensurate with (1) the diversity, inventiveness, and spontaneity of the teacher's experiential-based approach to teaching and learning and (2) the students' level of complex thinking (e.g., analysis, synthesis, evaluation) and in-depth understanding of the content experienced in the classroom.

Level 6 - Refinement
Technology is perceived as a process, product (e.g., invention, patent, new software design), and/or tool for students to find solutions related to an indentified "real-world" problem or issue of significance to them. At this level, there is no longer a division between instruction and technology use in the classroom. Technology provides a seamless medium for information queries, problem-solving, and/or product development. Students have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task at school. The instructional curriculum is entirely learner-based. The content emerges based on the needs of the learner according to his/her interests, needs, and/or aspirations and is supported by unlimited access to the most current computer applications and infrastructure available.

Level Of Technology Implementation (LoTi) Profile

The LoTi profile approximates the degree to which each staff member is implementing computers into the curriculum. Based on the 86 participating staff members at your school, approximately 44% indicated that their implementation of technology in the classroom was at a Level 2, Exploration. Level 2 implies technology-based tools supplement the existing instructional program (e.g., tutorials, educational games, basic skill applications) or complement selected multimedia and/or web-based projects (e.g., internet-based research papers, informational multimedia presentations) at the knowledge/ comprehension level. The electronic technology is employed either as extension activities, enrichment exercises, or technology-based tools and generally reinforces lower cognitive skill development relating to the content under investigation.

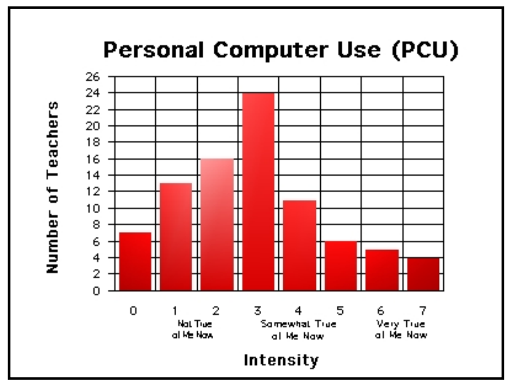


Median LoTi Ranking

2

Personal Computer Use (PCU) Profile

The PCU profile addresses each classroom teacher's comfort and proficiency level with using computers (e.g., troubleshooting simple hardware problems, using multimedia applications). Approximately 48% of the 86 participating staff members at your school (41 teachers) perceived their ability to use basic software applications or troubleshoot routine computer problems as "Somewhat True of Me Now." Approximately 42% of the staff (36 teachers) perceived their ability to use basic software applications or troubleshoot routine computer problems as "Not True of Me Now." At Roosevelt Middle School, 9 staff member(s) perceived their ability to use basic software applications or troubleshoot routine computer problems as "Very True of Me Now."

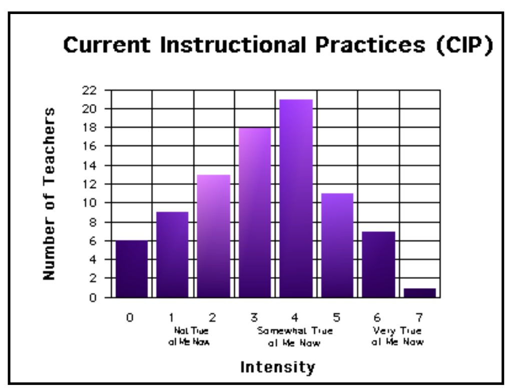


Median PCU Intensity Level

3

Current Instructional Practices (CIP) Profile

The CIP profile reveals the classroom teacher's inclination toward instructional practices consistent with a learner-based curriculum design (e.g., learning materials determined by the problem areas under investigation, multiple assessment strategies integrated authentically throughout the curriculum, teacher as co-learner/ facilitator, focus on learner-based questions). Based on the 86 participating staff members at your school, approximately 58% (50 teachers) perceived their instructional practices as aligning with a learner-based design as "Somewhat True of Me Now" while 9% of the staff (8 teachers) perceived their use of a learner-based curriculum as "Very True of Me Now." At Roosevelt Middle School, 28 teachers perceived their instructional practices as aligning with a learner-based design as "Not True of Me Now". These teachers employ consistently a subject-matter based approach in the classroom.



Median PCU Intensity Level

4

LoTi Findings

Percent of staff at LoTi Level 0 There is no visible evidence of computer access in the classroom.	9%
Percent of staff at LoTi Level 1 Available classroom computer(s) are used primarily for teacher productivity (e.g., email, word processing, grading programs).	14%
Percent of staff at LoTi Level 2 Student technology projects (e.g., designing web pages, research via the internet, creating multimedia presentations) focus on lower levels of student cognition.	44%
Percent of staff at LoTi Level 3 Tool-based applications (e.g., spreadsheets/graphing, databases) are primarily used by students for analyzing data, making inferences, and drawing conclusions.	19%
Percent of staff at LoTi Level 4a The use of outside resources and/or interventions aid the teacher in developing challenging learning experiences using available classroom computers.	8%
Percent of staff at LoTi Level 4b (Target Technology Level) Teachers can readily design learning experiences with no outside assistance that empower students to identify and solve authentic problems using technology.	5%
Percent of staff at LoTi Level 5 Teachers actively elicit technology from outside entities to expand student experiences directed at problem-solving, issues resolution, and student action.	1%
Percent of staff at LoTi Level 6 Computers provide a seamless and almost transparent medium for information queries, problem-solving, and/or product development.	0%
Percent of staff indicating NO access to computers for instructional purposes	2%

Goals for the Current School Year

Percent of staff member(s) positioned at a Level 4a implementation of technology that should target a Level 4b during the current school year. This recommendation is consistent with these staff members' current scores for Current Instructional Practices (CIP) and Personal Computer Use (PCU).	100%
Percent of staff member(s) positioned at a Level 2 implementation of technology that should target a Level 4a during the current school year. This recommendation is based on the relatively high Current Instructional Practices (CIP) scores of these staff members toward a learner-based approach in the classroom and their relatively high Personal Computer Use (PCU) scores.	44%
Percent of staff member(s) positioned at a Level 2 implementation of technology that should target a Level 3 during the current school year. This recommendation is consistent with these staff members current scores for Current Instructional Practices (CIP) and Personal Computer Use (PCU).	56%
Percent of staff member(s) positioned at a Level 0 implementation of technology that should target a Level 3 during the current school year. This recommendation is based on the relatively moderate Current Instructional Practices (CIP) scores of these staff members toward a learner-based approach in the classroom and their relatively high Personal Computer Use (PCU) scores.	25%
Percent of staff member(s) positioned at a Level 0 implementation of technology that should target a Level 2 during the current school year. This recommendation is consistent with these staff members current scores for Current Instructional Practices (CIP) and Personal Computer Use (PCU).	75%

Recommendations for the Current School Year

Provide staff development that models specific strategies and techniques for integrating higher-order thinking skills with the available classroom computers using tool-based applications (e.g., spreadsheets, graphs, multimedia, databases, concept-mapping, internet tools). This recommendation is targeted at moving teachers from Level 2 to Level 3 relating to their level of technology implementation.

Provide staff development to increase the confidence level of staff relating to their use and troubleshooting of personal computers. This recommendation could be accomplished by (1) the school's technology liaison organizing after-school "brush-up" sessions relating to personal computer basics, (2) the school establishing a technology mentoring program, and (3) the school's technology liaison modeling simple computer applications that complement existing classroom activities.

Additional recommendations consistent with your staff's LoTi, PCU, and CIP levels are located at the following web site: "www.learning-quest.com/LoTirecommendations.html". If you have any questions, please contact the National Business Education Alliance at P.O. Box 61, Corvallis, OR 97339, or at (541)753-3011.

LoTi Survival Kit

Session #6:

Professional Development Intervention (Level 3: Infusion)

Professional Development Intervention (Level 3: Infusion)

Time Allotment: 20 minutes

Once participants have completed the LoTi Technology Use Questionnaire, Session #6 models a professional development intervention at a LoTi Level 3 involving complex thinking skills in the one computer classroom. The goal of Session #6 is for participants to apply the strategies embedded in this intervention to their respective classrooms.

Provided below is a suggested outline for implementing Session #6 of the LoTi Project Implementation.

1.0

Provide participants with a copy of the Session #6 handouts.

Training Tip: *The "Complex Thinking Skills and Classroom Computers" handout provides a synthesis of a large volume of thinking skills research that is easy to use in the classroom. It distinguishes between discrete thinking operations (Bloom) and the broader, more all-encompassing complex thinking strategies that depend on a series of steps to reach a conclusion. The handout also provides detailed descriptions of different types of learning activities (e.g., simulations, surveys, experimentation) that lend themselves to higher order thinking skills using the "one-computer classroom" paradigm.*

2.0

Use the following scenario with the participants to illustrate the "one-computer classroom" at a LoTi Level 3 using experimentation:

Training Tip: *This activity will require the following materials: a metric ruler for every two participants, a computer connected to a projection unit, and a spreadsheet and graphing application (e.g., LabQuest, Excel, ClarisWorks).*

2.1

LoTi
survival kit
train-the-trainer

Professional Development Intervention (Level 3: Infusion)

Share with participants that a friend's teenage son was recently involved in a fender bender when he accidentally rear-ended a car in front of him that was being operated by a young lady. Your friend's son claimed that her slow reaction time in responding to a tire in the middle of the road caused the accident; not the fact that he may have been following her too closely.

2.2

Elicit from participants how they might test this young man's hypothesis about differences in reaction time between the genders.

Training Tip: *You may get multiple suggestions from participants about how best to test this hypothesis related to reaction time (the more, the better). If you are lucky, one of the suggestions may happen to fit the activity that you have planned for them involving metric rulers.*

2.3

Share with participants that one past participant suggested the hypothesis be tested with the aid of a metric ruler. Demonstrate this experiment by having a participant hold out his or her arm with thumb and index finger separated by approximately 2 centimeters. Hold the ruler above the participant's hand. Tell the participant that you are going to release the ruler through his or her thumb and index finger and that he or she is to catch it as soon as he or she sees it drop. Drop the ruler and after the participant catches it, measure how many centimeters it took him or her to grab on to the ruler. Measure from the bottom of his or her thumb and index finger.

2.4

After the demonstration, have every two participants conduct the same experiment to determine reaction time. Make sure that opposite genders are teamed together so as to avoid any bias in the data collection. Have each team write down their measurements (in centimeters) and pass their data to the person running the computer.

Training Tip: *Make sure that everyone submits their measurements so that the group can analyze the aggregate data.*

Professional Development Intervention (Level 3: Infusion)

Figure 1 provides an illustration of a sample spreadsheet containing data from 26 participants (13 male and 13 female).

Figure 1

A1 Trial

Home	A	B	C
1	Trial	Male	Female
2	1	6	2
3	2	17	13
4	3	13	5
5	4	14	5
6	5	20	13
7	6	8	14
8	7	17	7
9	8	20	5
10	9	24	8
11	10	8	2
12	11	17	3
13	12	9	2
14	13	4	3

2.5

Have participants determine the best way to analyze the data based on the teenage male's hypothesis that females react more slowly than males.

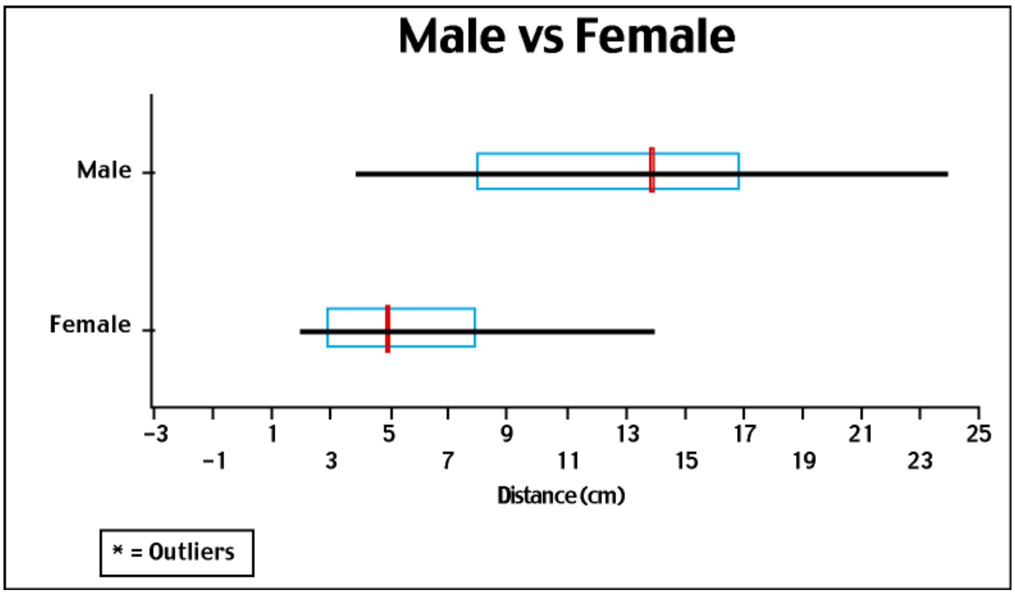
Training Tip: *Wait for someone from the audience to suggest graphing the data prior to taking the next step.*

Professional Development Intervention (Level 3: Infusion)

2.6

Graph the data, but first allow participants to suggest which type of graph they think would be most appropriate to draw conclusions from their data. *Provided below are sample graphs: Figure 2 displays the data as a box and whisker plot. The vertical line represents the median for male and female while the long black line represents the ranges for both genders.*

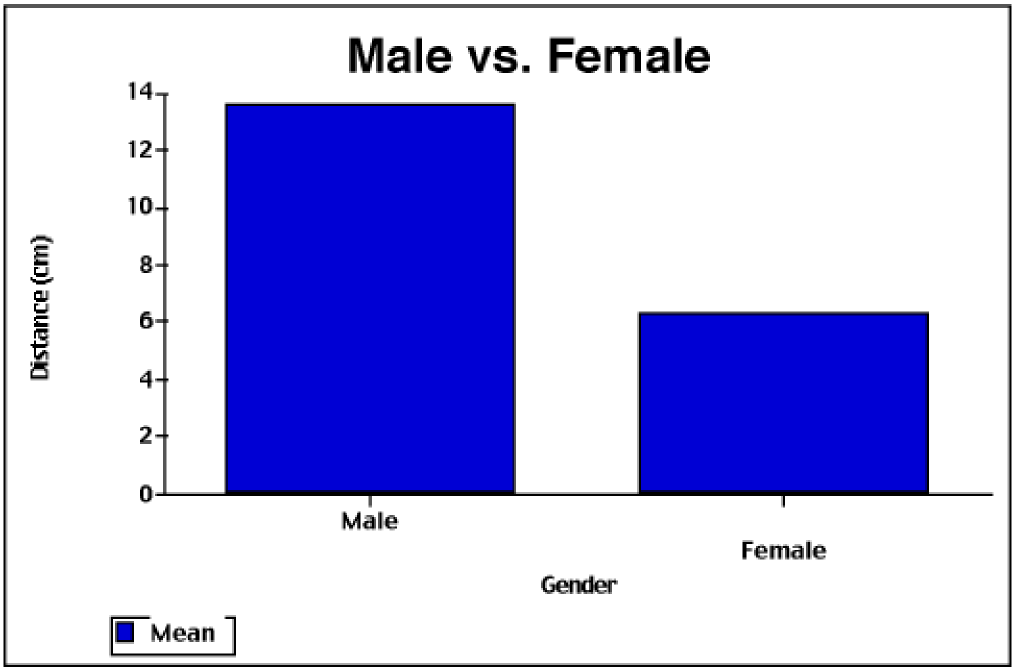
Figure 2



Professional Development Intervention (Level 3: Infusion)

Figure 3 displays the data as a bar graph comparing the mean reaction distances for males versus females.

Figure 3



2.7

Have participants interpret the graphs and determine if the young man's hypothesis should be accepted or rejected. Based on the sample graphs above, it appears that the hypothesis that females have slower reaction time than males appears to be rejected!

3.0

Have participants determine if the above activity illustrated a LoTi Level 3 based on their collective understanding of the attributes associated with the Infusion level of technology implementation.

Training Tip: *In lieu of or in addition to the above activity, you can select any one of the types of learning activities in the Session #6 handouts to model for your staff.*

LoTi Survival Kit

Session #6:

Participant Handouts

Thinking Skills Overview

The task of defining and classifying thinking skills has challenged experts for decades—and longer. Bloom's system was developed over forty years ago and is still widely used to classify objectives. The classification system below synthesizes a large volume of thinking skills research into a simple framework that is easy to use in the classroom. It distinguishes between discrete thinking operations (Bloom) and the broader, more all-encompassing complex thinking strategies that depend on a series of steps to reach a conclusion.

Thinking Skills Classification

Discrete Thinking Operations

Bloom's Taxonomy	***Related Thinking Skills (Basic)***
Knowing	- Recalling information
Understanding	- Translating/interpreting information
	Related Thinking Skills (Complex)
Applying	- Demonstrating knowledge and skills
Analyzing	- Examining component parts or elements (e.g., of structures, systems, different perspectives, errors) - Comparing/contrasting - Classifying
Synthesizing	- Recombining elements and parts into a new whole
Evaluating	- Making judgments about value - refuting/supporting claims/arguments

Complex Thinking Strategies

PROBLEM SOLVING

1. Identify the goal and obstacle
2. Identify/research alternative ways to solve the problem
3. Select an alternative based on evaluation criteria
4. Try out the alternative
5. Evaluate results

CREATIVE PROBLEM SOLVING

1. Identify the goal and obstacle
2. Brainstorm alternative ways to solve the problem (invent new ideas or extend known patterns to new situations)
3. Choose an alternative (using insight from previous activity)
4. Try out the alternative
5. Evaluate results

DECISION-MAKING

1. Prioritize outcomes desired
2. Identify alternative actions
3. Make decision (choose alternative action based on established criteria)
4. Carry out decision
5. Evaluate decision

INVESTIGATION

1. Identify type of investigation (e.g., concept; past event- "how/why", hypothetical event - "what if")
2. Identify previous knowledge
3. Determine confusions/contradictions
4. Research new information
5. Provide and justify clarifications

REASONING

1. Inductive inference - predict a likely conclusion by using important unstated facts or observations
2. Deductive inference - predict a likely conclusion by using important principles/generalizations

EXPERIMENTAL INQUIRY

1. Observe/measure phenomenon (collect data)
2. Analyze data
3. Draw conclusions/develop hypothesis
4. Test conclusions/hypothesis
5. Summarize/evaluate outcome in terms of original conclusions or hypothesis

REFLECTIVE THINKING

1. Identify thinking strategies
2. Assess strengths and weaknesses of strategies applied in various situations
3. Select strategies most likely to be helpful in accomplishing purpose
4. Assess results/appropriateness of strategy selected

Why Thinking Skills are Important

Students must be able to utilize a variety of thought processes in the complex and dynamic environment of the 21st century. Higher level thinking skills are necessary to adjust to rapid technological change and to become productive members of the workforce. Workforce needs for the 21st century were identified by several commissioned reports of the 1990's. These reports recommended a curriculum that focuses on problem solving, the application and integration of knowledge and higher level thinking skills, opportunities for active learning, and learning measured in terms of a student's ability to perform.

From another perspective, it is important to identify and use thinking skills in planning instruction and assessment. Students learn more of what is expected of them from tests than any other single factor. If teachers test and instruct for recall, students learn facts; if teachers test and instruct at higher levels, students prepare themselves to use information in meaningful ways. Current reform efforts emphasize higher level thinking skills and an action-based curriculum with performance assessments based on quality standards.

Simulations

Simulations allow students to encounter realistic conditions and explore realistic solutions. These elements of the real world are often simplified and presented in a format that can be managed inside the classroom. For example, in the "Oh Deer" simulation, students assume the role of either a deer or the habitat. Though the concept of habitat relating to biodiversity is quite complex, it is simplified in the simulation. Students representing habitat can either "become" water, food, or shelter during any given round of the deer simulation so as to help them see the connection between a wildlife population and its available habitat.

Most simulations follow a four phase sequence: orientation, participant training, the simulation itself, and debriefing. In the orientation phase, students are presented with an overview that often includes the broad topic and the concepts to be incorporated into the simulation activity itself. The participant training phase allows the teacher and students to assign roles, set up the scenario (if necessary) and perhaps hold an abbreviated practice session. The simulation itself involves the actual administration of the activity. Students are busy collecting data from the activity and/or witnessing first-hand the effect of their decisions or performance.

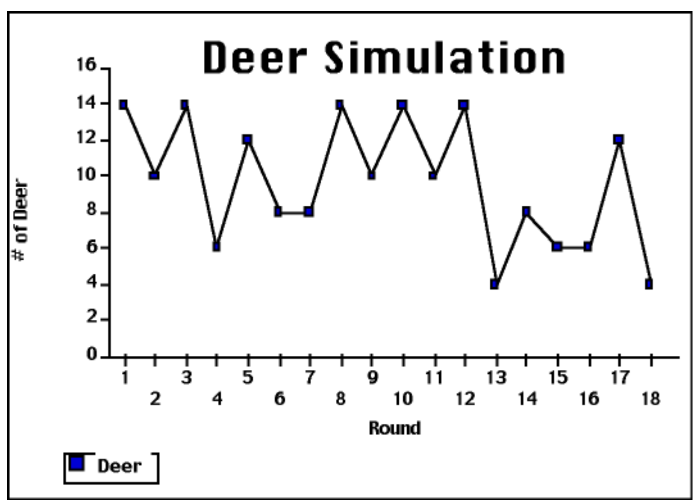
The debriefing stage places heavy emphasis on student reflection and thinking processes. Students are summarizing events, difficulties, and insights; analyzing process; making predictions; comparing the simulation to the real world; and perhaps appraising and redesigning the simulation itself.

In the one-computer classroom, the debriefing stage is critical. The data collected by students is placed in an in-basket for the "designated" computer operators (e.g., teacher assistants, volunteers, computer geniuses, randomly selected students) to input into the computer. The computer operators either print out the completed spreadsheet and/or prepare a graphic presentation of the simulated data (e.g., line graph, bar graph, box plot). Afterwards, copies of the spreadsheet and/or graphs are distributed to all students for data analysis purposes. At this juncture, it is critical that students be given the opportunity to reflect on their data, prepare a summary incorporating their findings based on the data and graphs, and make projections or predictions. In this manner, simulations serve as an excellent medium for students to exercise and sharpen their complex thinking skills involving problem-solving, inductive/deductive reasoning, scientific inquiry, and decision-making.

Provided below are examples of the data analysis completed for different simulations.

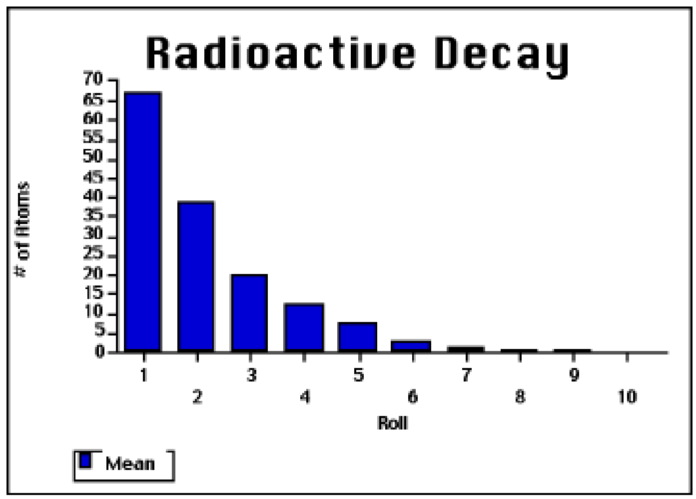
Simulation: Where are all the deer?
Author: Labs for Learning
Summary: In the simulation, students explore the dynamic relationship between habitat and a wildlife population. Students are divided into two groups: deer and habitat. Each round, the deer population tries to survive by locating habitat that matches their particular need (i.e., food, water, or shelter). If a deer matches its need by tagging another student representing the desired habitat for that round, both the deer and the "tagged" habitat become deer for the next round; thus, increasing the deer population. If a deer does not match its habitat need, then it dies and becomes part of the habitat.

"The line graph shows the actual simulation data for Rounds 1-9 and our projections for Rounds 10-18 based on the variables presented. We projected a significant decrease for the deer population in Rounds 13 and 14 due to the fore-casted drought and again in Round 18 due to the completion of the new housing development."



Simulation: How are radon and radioactivity related?
Author: Labs for Learning
Summary: In the simulation, students "simulate" the breakdown of radioactive isotopes using M&M's. Students begin the simulation by rolling all of the 100 M&M's. Each M&M represents a radioactive atom. After each roll, any atom with its side showing "m" is removed from the pile, thus illustrating the radioactive disintegration process. Students continue rolling all active atoms until all of them have decayed.

"The bar graph displays the remaining atoms after each roll. It took approximately two rolls for half of the atoms to decay into the next isotope in the series."



Surveys

Surveys provide useful and current information about people, businesses, and governments. Surveys also provide a very practical and meaningful way of introducing students to data gathering and analysis techniques. Surveys have played an important role in our society from politics (e.g., determining the voting preferences for different geographical regions in the country) to economics (e.g., determining the buying patterns of youths under 15 years of age).

Most surveys are set up to either retrieve information (e.g., census, energy audit) or ascertain people's perceptions or opinion about an issue (i.e., opinion survey). Opinion surveys often elicit respondent information via a forced-choice (e.g., Yes/No, Agree, Disagree), a modified multiple-choice (e.g., Agree/Don't Know/Disagree), or an extended multiple-choice survey (e.g., Strongly Agree/Agree/Don't Know/Disagree/Strongly Disagree).

Regardless of the type of survey, it is critical that students (1) determine the entire group of people or population from which to select respondents to the survey and (2) select an appropriate sampling strategy (e.g., random sampling). For example, your students may want to determine the fast food restaurant preferences for the entire 9th grade class at Baldwin High School. In this case, the entire 9th grade class would represent the population for the survey.

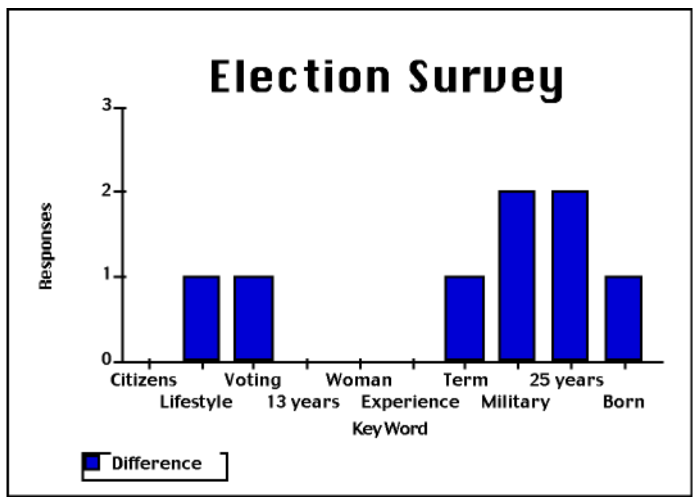
There exists several techniques for sampling a particular population including probability sampling, convenience sampling, cluster sampling, stratified random sampling, systematic sampling, and simple random sampling. A simple random sampling of 9th grade students at Baldwin High School could be achieved by writing the names of all 9th grade student on separate cards, placing the cards in a box, mixing them up, and then drawing out a fixed number (e.g., 50 students). To determine if the sampling was indeed random, you should consider the following questions:

* Did every 9th grade student have the same chance of being chosen?
* Were the names of the 9th grade students drawn independently of each other?

Once the surveys have been distributed to the selected respondents and returned, the data must, in turn, be analyzed. The collected data is placed in an in-basket for the "designated" computer operators (e.g., teacher assistants, volunteers, computer geniuses, randomly selected students) to input into the computer. The computer operators either print out the completed spreadsheet and/or prepare a graphic presentation of the survey data (e.g., bar graph, stacked bar). Afterwards, copies of the spreadsheet and/or graphs are distributed to all students for data analysis purposes. At this juncture, it is critical that students be given the opportunity to reflect on their data, prepare a summary incorporating their findings based on the data and graphs, and draw conclusions. Similar to the other learning activities, surveys serve as an excellent medium for students to exercise and sharpen their complex thinking skills involving problem-solving, inductive/deductive reasoning, scientific inquiry, and decision-making.

Provided below are examples of the data analysis completed for an opinion survey and an environmental lifestyle survey.

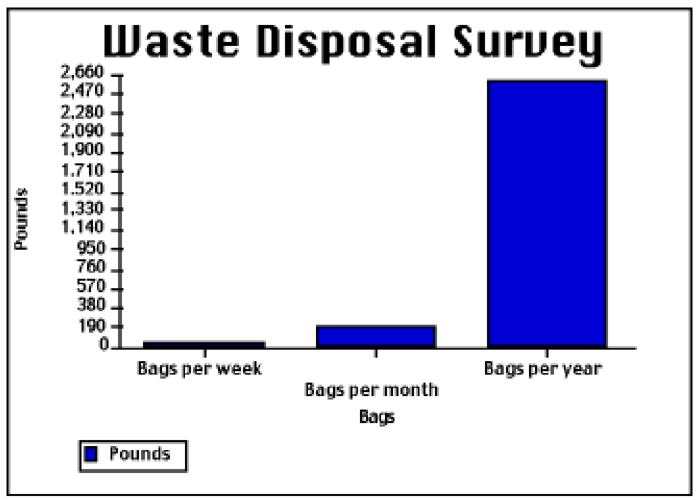
Simulation: What do you think about elections?
Author: Labs for Learning
Summary: In the survey, students determine people's opinions about the voting process in the United States. Students distribute their opinion survey to a randomly selected group of students and community members. Afterwards, the survey data is collected and analyzed comparing the responses of students versus community members.



"The bar graph displays the differences between the mean responses of students and community members. The graph shows that the greatest difference occurred in the areas of military experience and age for the Presidency. Community members, as opposed to students, felt strongly that the minimum age for the U.S. Presidency should not be lowered to 25 years of age. On the other hand, students felt strongly that presidential candidates need not have previous military experience as a qualifying condition for the job."

Simulation: Is there life within the cycles?
Author: Labs for Learning
Summary: In this activity, students conduct a survey of their waste recycling practices at home as a means of determining a pattern to their "environmental lifestyle practices." Once students complete their survey, the data is placed in a special LabQuest file called AFE7 which automatically computes (1) a waste recycling efficiency rating for the student, (2) an estimation of their total garbage consumption for the year, and (3) an annual estimate on the amount of garbage either recycled or composted.

"The bar graph shows that based on a two bag disposal rate each week, the above home could expect to produce over 2500 pounds of trash each year. By reducing trash consumption by one-half, homeowners could significantly reduce their annual trash yield which would subsequently reduce the strain on the nation's landfills."



Sampling

Sampling strategies provide a convenient and efficient way to generalize about an entire population based on questioning, interviewing, polling, or surveying only a sample from that population. Ensuring for a random sampling of the population is essential if one is to make generalizations or inferences about the population. For example, sampling an inadequate size of a population or sampling a discrete group within the population (e.g., male students at the 12 grade level) could seriously jeopardize or bias the resulting data.

A sample is random if it is selected so that: (1) each member of the population is equally likely to be chosen and (2) the members of the sample are chosen independently of one another. It is important to note that obtaining a randomly chosen sample depends on the way in which the sample is drawn, not on the specific members of the population that happen to end up in the sample.

Samples can be generated in a number of ways. As mentioned in the Survey section of this manual, a simple random sampling of 9th grade students at Baldwin High School could be achieved by writing the names of all 9th grade students on separate cards, placing the cards in a box, mixing them up, and then drawing out a fixed number of cards (e.g., 50 students).

Another way to select a random sample of 50 students from a class of 450 is to use a random number table or the random number generator in LabQuest. Each student would be assigned a different number from 1 to 450. Using LabQuest, you could block out an area in the spreadsheet representing 1000 cells (e.g., 20 columns by 50 rows), select the random number generator, use 1 as your minimum number and 1000 as your maximum, and then press OK. If a value from 1 to 450 arises, you would put the corresponding student in the sample. You would discard any number from 451 to 1000 or repeating numbers. This process would be continued until a total of 50 randomly selected students were identified.

Systematic sampling of the population at Baldwin High School could have been achieved by selecting every fifteenth student who walked into the cafeteria. To use systematic sampling, you must follow these steps: (1) order the members of the population in some way, and (2) decide how to sample (e.g., 1 out of every 15). For a 1-and-15 systematic sample, you would randomly choose one of the first 15 members of the population, and then every 15th member from then on.

Cluster sampling is another popular type of sampling technique. In a cluster sampling, you would choose the grade level (e.g., 11th grade students), select some classrooms of 11th grade students, and then survey everyone in these selected classrooms. Please note that cluster sampling is not a true random sampling because every member of the school population (e.g., 9th and 10th grade students) was not chosen independently of one another.

Another common sample technique is stratified random sampling. Using this strategy, the entire population of Baldwin High School students would be divided into separate strata, or subgroups (e.g., boys versus girls). Next, a random sampling of students would be taken from each subgroup using either simple random sampling or a random number generator. The benefit of stratified random sampling is that it allows you to compare the opinions of two different groups rather than the entire school, For example, are more boys in favor of block scheduling then girls?

The above sampling techniques assumed that the entire population was known prior to implementing the sampling strategy. By knowing the exact population size, we were able to determine an appropriate sampling size that would eventually enable us to make generalizations or inferences about the population. How would you conduct a sampling study if you did not know the population size such as a fish species population? Researchers and scientists use a technique called capture-recapture.

In this process, the researcher would first capture a specific number of the fish species (e.g., 50 o'opu fish), put a mark on their fins, and return the fish to the bay. Several days later, another sampling of 50 o'opu fish would be captured. Of this second sample, 5 of the o'opu fish may have marks on their fins. To compute the estimated population of o'opu fish, you would follow these steps:

Let N represent the total number of o'opu fish in the bay. Because the proportion of marked fish in the population should be approximately equal to the proportion of marked fish in the sample, the proportional equation should be as follows:

$$\frac{\text{number of marked o'opu fish in the population}}{\text{estimated number of o'opu fish in the population (N)}} = \frac{\text{number of marked o'opu fish in the sample}}{\text{total number of o'opu fish in the sample}}$$

The estimated o'opu population could be calculated by solving this proportional equation.

50/N = 5/30
5N = (50)(30)
5N = 1500
N = 1500/5
N = 300

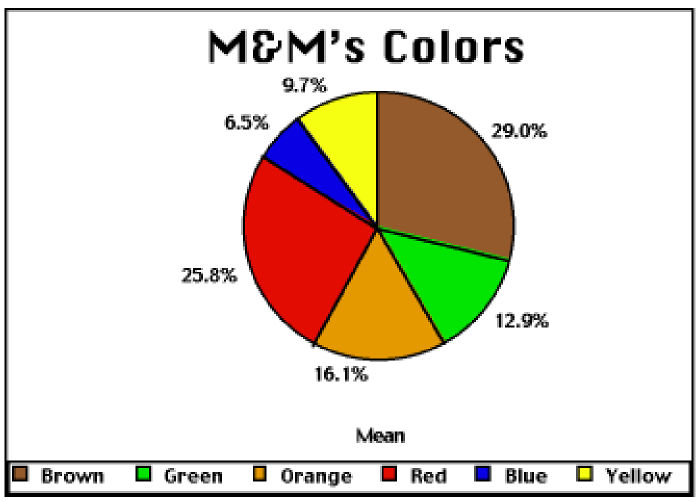
The estimated number of o'opu fish in the bay would be 300.

Once the sampling data has been collected, the data must, in turn, be analyzed. Similar to the other learning activities, the collected data is placed in an in-basket for the "designated" computer operators (e.g., teacher assistants, volunteers, computer geniuses, randomly selected students) to input into the computer. The computer operators either print out the completed spreadsheet and/or prepare a graphic presentation of the survey data (e.g., bar graph, stacked bar). Afterwards, copies of the spreadsheet and/or graphs are distributed to all students for data analysis purposes. At this juncture, it is critical that students be given the opportunity to reflect on their data, prepare a summary incorporating their findings based on the data and graphs, and draw conclusions.

Provided below are examples of the data analysis completed for a known population and an unknown population.

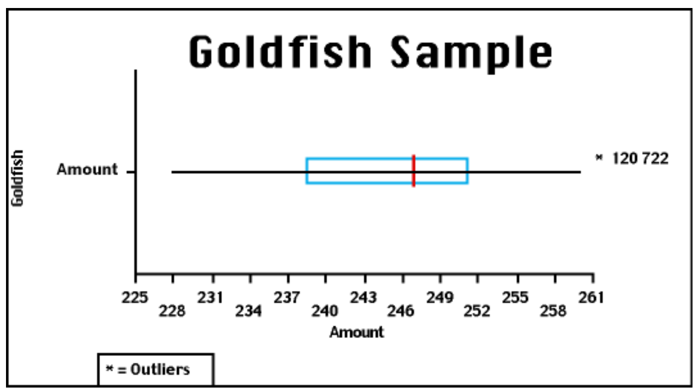
Activity: What's in the bag?
Author: Labs for Learning
Summary: In this sampling activity, students determine the most dominant color in a large bag of M&M's containing 20 individual fun packs. Students separate and count the M&M's by color and then poll everyone's data together so as to increase their sample size for making inferences about the entire large bag of M&M's. After their analysis, students are given a reference table that shows the recommended sample size for any population from 1 to 1,000,000.

"The pie graph shows that the red M&M's were the most dominant color based on a sample size of 15 fun pack bags. According to the graph, the red M&M's consumed 25.8% of the total population of M&M's in the entire large bag based on our sampling; the yellow M&M's accounted for only 9.7% of the total population of M&M's."

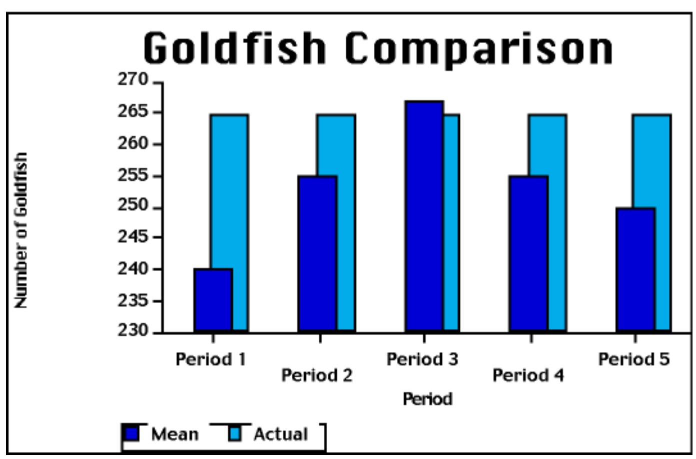


Activity: What's in the bay?
Author: Labs for Learning
Summary: In this sampling activity, students attempt to determine the number of goldfish in a bag of goldfish crackers. Prior to starting the activity, the teacher takes 50 goldfish from the bag and marks their tail with a black marker and then places the "marked" fish back into the bag. Afterwards, each student takes a handful of goldfish and records the total number of marked goldfish as well as the total sample size of goldfish. Students poll everyone's data together so as to increase their sampling base for making an estimate of the entire population of goldfish in the bag.

"The box plot shows each student's estimate of the population of goldfish in the bag. The box plot shows that two of the estimates were, in fact, outliers (i.e., 722 and 120). The outliers probably were the result of students not adequately shaking the bag after each turn. The median number of estimated goldfish in the bag was 247."



"The bar graph compares the mean estimated goldfish populations for the five science classes that completed the activity. Please note that Period 3 was the closest to the actual population of goldfish."



Experimentation

Science as Inquiry

Experimentation springs from the idea of science as inquiry. For students to effectively develop the abilities that characterize science as inquiry, they must actively participate in scientific investigations, and actually use the cognitive and manipulative skills associated with the formulation of scientific explanations. Experiential-based units help students develop sophistication in their abilities and understanding of scientific inquiry. Using the experiential approach, students understand that experiments are guided by concepts and performed to test ideas.

Investigations should derive from real-world questions and issues that have meaning for students, rather than questions that seem important to teachers or administrators. Scientific topics that have been highlighted by current events provide one source for meaningful investigations, whereas actual science- and technology-related problems provide another. It should be remembered that some experiences begin with little meaning for students but develop meaning throughout active involvement, continued exposure, and growing skill and understanding.

A critical component for successful scientific experimentation includes having students reflect on the concepts that guide the inquiry. Also important is the prior establishment of an adequate knowledge base to support the investigation and help develop scientific explanations. Real-world concepts that students bring to school will shape the way they engage in scientific investigations and serve as filters for their explanations of scientific phenomena. Left unexplained, the limited nature of students' beliefs will interfere with their ability to develop a deeper understanding of science.

Students need to learn how to analyze evidence and data at the experiential level. The evidence they analyze may be from their investigations, other students' investigations, or databases. Data manipulation and analysis activities need to be modeled and practiced by teachers and students of science. Determining the range, the mean and mode values, plotting, developing mathematical functions, and looking for anomalous traits of the data are all examples of analyses students can perform. Students can address questions, such as "What explanation did you expect to develop from the data?" "Were there any surprises in the data?" "How confident do you feel about the accuracy of the data?" Students should answer questions such as these during full and partial experiential inquiries.

Public discussions of the explanations proposed by students are a form of peer review of investigations, and peer review is an important aspect of science. Talking with peers about science experiences helps students to develop meaning and understanding. Their conversations clarify the concepts and processes of science, helping students make sense of the content of science. Students should be engaged in conversations that focus on questions, such as "How do we know?" "How certain are you of those results?" "Is there a better way to do the investigation?" "If you had to explain this to someone who knew nothing about the project, how would you do it?" "Is there an alternative scientific explanation for the one we proposed?" "Should we do the investigation over?" "Do we need more evidence?" "What are our sources of experimental error?" "How do you account for an explanation that is different from ours?"

Questions like these make it possible for students to analyze data, develop a richer knowledge base, reason using science concepts, make connections between evidence and explanations, and recognize alternative explanations. Ideas examined and discussed in class will allow students to benefit from other's feedback.

Abilities necessary to do scientific inquiry

Identify questions and concepts that guide scientific investigations.
Students should 1) formulate a testable hypothesis and demonstrate the logical connections between the scientific concepts guiding the hypothesis and the design of an experiment and 2) demonstrate appropriate procedures, a knowledge base, and conceptual understanding of scientific investigations.

Design and conduct scientific investigations.
Designing and conducting a scientific investigation requires introduction to the major concepts in the area being investigated, proper equipment, safety precautions, assistance with methodological problems, recommendations for use of technologies, clarification of ideas that guide the inquiry, and scientific knowledge obtained from sources other

than the actual investigation. The investigation may also require student 1) clarification of the question, method, controls, and variables; 2) organization and display of data; 3) revision of methods and explanations, and a public presentation of the results with a critical response from peers; and 4) use of evidence, application of logic, and construction of arguments for their proposed explanations.

Use technology and mathematics to improve investigations and communications.
A variety of technologies (e.g., hand tools; measuring instruments; calculators; computers for the collection, analysis, and display of data) should be an integral component of scientific investigations. Measurement is used for posing questions, formulas are used for developing explanations, and charts and graphs are used for communicating results.

Formulate and revise scientific explanations and models using logic and evidence.
Student inquiries should be followed with a culminating activity (e.g., forming an explanation, model, or simulation of an actual event). Models should be physical, conceptual, and mathematical. In the process of answering questions, students should engage in discussions and arguments that result in the revision of their explanations. These discussions should be based on scientific knowledge, the use of logic, and evidence from their investigation.

Recognize and analyze alternative explanations and models.
Students should be able to emphasize the critical abilities of analyzing an argument by reviewing the current scientific understanding, weighing the evidence, and examining the current logic so as to decide which explanations and models are best. Although there may be several plausible explanations, they do not all have equal weight. Students should be able to use scientific criteria to find the preferred explanations.

Communicate and defend a scientific argument.
Students should develop the abilities associated with accurate and effective communication. These include writing and following procedures, expressing concepts, reviewing information, summarizing data, using language appropriately, developing diagrams and charts, explaining statistical analysis, speaking clearly and logically, constructing a reasoned argument, and responding appropriately to critical comments.

Understandings about scientific inquiry.
Scientific inquiries about how physical, living, or designed systems function are guided by conceptual principles and knowledge. Historical and current scientific knowledge influence the design and interpretation of investigations, and the evaluation of proposed explanations.

Investigations are conducted for a wide variety of reasons. For example, they may be used to discover new aspects of the natural world, explain recently observed phenomena, or test the conclusions of prior investigations or the predictions of current theories.

Technology enhances the gathering and manipulation of data. New techniques and tools provide new evidence to guide inquiry and new methods to gather data. The accuracy and precision of the data, and therefore the quality of the exploration depends on the technology used.

Mathematics is essential in scientific inquiry. Mathematical tools and models guide and improve the posing of questions, gathering data, constructing explanations, and communicating results.

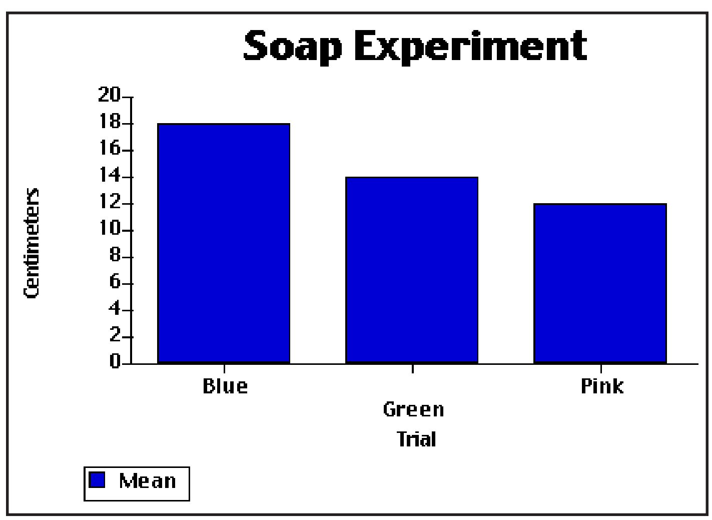
Scientific explanations must adhere to criteria such as: a proposed explanation must be logically consistent; it must abide by the rules of evidence; it must be open to questions and possible modification; and it must be based on historical and current scientific knowledge.

Results of scientific inquiry—new knowledge and methods—emerge from different types of investigations and public communication. In communicating and defending the results of scientific inquiry, arguments must be logical and demonstrate connections between natural phenomena, investigations, and the historical body of scientific knowledge. In addition, the methods and procedures used to obtain evidence must be clearly reported to enhance opportunities for further investigation.

Provided below is an example of the data analysis completed for an experiment involving soap bubbles.

Activity: Which soap brand is best?
Author: Labs for Learning
Summary: In this experiment, students conduct a test of three different soap brands to determine which soap brand is the best cleaner. For the purposes of this experiment, cleaning ability is determined by which soap brand can produce the largest bubble. A soap's ability to reduce surface tension is a primary indicator of its cleaning ability. In the experiment, students will observe this phenomenon as the blow bubbles on a desktop. The reduction in surface tension will allow them to blow larger bubbles depending on the particular soap brand.

The bar graph compares the mean bubble size for each soap brand. According to the graph, the blue soap brand produced the largest bubble based on 26 trials. The blue soap's mean was 18.5 with a range of 6. Based on our criteria for establishing cleaning ability, the blue soap brand was the best cleaner.



complex thinking skills and classroom computers

Complex Thinking Skills and Classroom Computers Notes

LoTi Survival Kit

Session #7:

Professional Development Intervention (Level 3: Infusion)

Professional Development Intervention (Level 3: Infusion)

Time Allotment: 20 minutes

Session #7 is devoted to modeling a professional development intervention at a LoTi Level 3 involving performance-based assessment. The goal of Session #7 is for participants to apply the strategies embedded in this intervention to their respective classrooms.

Provided below is a suggested outline for implementing Session #7 of the LoTi Project Implementation.

1.0

Provide participants with a copy of the Session #7 handouts.

Training Tip: *The "Performance-based Assessment" handout provides a crisp, succinct summary of how to design valid and reliable scoring guides and high quality, standards-driven performance tasks. The concepts and procedures introduced in this handout require far more than 20 minutes to complete; therefore, the focus for this session on performance-based assessment covers just the criteria for evaluating the quality of a performance task (page 8 of the Performance-based Assessment handout).*

2.0

Review with participants the criteria for creating a high quality performance task (i.e., validity, reliability, authenticity, challenge, clarity of task and assessment criteria, important content, feasibility, and complex processes) from Page 8 of the Performance-based Assessment handout. Keep in mind that the first two criteria (i.e., validity and reliability) relate more to the actual assessment of the task rather than the design of the task itself.

3.0

Tell participants that they will need to create a high quality task that represents the use of technology at a LoTi Level 3 based on the criteria found on page 8 of the Performance-based Assessment handout.

Professional Development Intervention (Level 3: Infusion)

3.1

Begin by asking participants to identify a grade level or content area for the proposed performance task. Use a computer projection device or chart paper to identify additional parameters for the performance task including content, complex thinking skills, computer applications to be used, and duration of task. Figures 4 and 5 provide examples of these parameters for a high school performance task and a K-1 performance task.

Figure 4

High School Performance Task
Grade Level: *10th grade*
Content Areas: *Health/Biology*

Content:
Mathematical Computations
Data analysis
Cell Structure
Enzymes

Thinking Skill Strategies:
Problem-solving
Decision-making

Technology Applications:
Spreadsheet/graphing package
PowerPoint

Professional Development Intervention (Level 3: Infusion)

Figure 5

Early Childhood Performance Task
Grade Level: *K-1 Grade*
Content Area:

Reading:
Letter Recognition
Reading Strategies
Phonemic Awareness

Mathematics:
Number Recognition
Counting
Skip Counting
Beginning Additions/Subtractions
Measurements

Thinking Skill Strategies:
Creative Problem solving
Investigation

Computer Applications:
Spreadsheet
Kidpix

3.2

Have participants spend 8 to 10 minutes designing a culminating performance task for the parameters they identified for a particular grade level. Figures 6 and 7 outline a performance task for the parameters identified in Figures 4 and 5, respectively.

Professional Development Intervention (Level 3: Infusion)

Figure 6 - High School Health/Biology

Body Beautiful?

Background:
In this body conscious age exemplified by fitness centers, diet supplements, and surgically modified or enhanced body parts, it is difficult for our students to escape the temptation of always wanting to look "great." Several diet supplements are currently on the market that claim to increase muscle mass and endurance when combined with a normal daily workout.

Task:
Your task will be to conduct an analysis of each of these major diet supplements (including natural foods) to determine which one, if any, you would advise someone to consume. You will need to create a decision matrix based on your own self-selected categories (e.g., health hazard, cost, effect on the enzymatic action of body cells, impact on respiration). Your final product must also contain the following elements:

Data Analysis:
Evidence of any statistical measures and graphical analysis used to arrive at your conclusions relating to the "best" diet supplement.

Mathematical Computations:
Inclusion of any and all computations used to select your final product.

Persuasiveness:
Ability to convince your audience that your selected product is the best.

Presentation:
Medium used to present your findings is most suitable based on your audience; e.g., PowerPoint presentation, web page, oral presentation.

Professional Development Intervention (Level 3: Infusion)

Figure 7 - K-1 Grade Classroom

Young Entrepreneurs

Students will participate in a K-1 "Sell Lemonade" enterprise at school. Students will help create the display for the business using KidPix and track daily income using a spreadsheet program. Students will also be involved with the following activities:

- *PRODUCT - preparing the solution (i.e., lemonade)*
- *LOCATION - determining where the lemonade stand should be placed on campus to attract the most students.*
- *PROFITS - counting the money each day*
- *PROFILE - tracking the profits each day of the week*

Requirement: *Plenty of parent volunteers!!*

3.3

Have each group share their tentative performance task and specifically how the use of technology aids in extending the learning.

4.0

Have participants justify why their tentative performance task meets the criteria of a LoTi Level 3 (key indicators: presence of higher order thinking processes and/or complex thinking skill strategies embedded in the performance task).

LoTi Survival Kit

Session #7:

Participant Handouts

performance-
based
assessment

Performance-based Assessment

The nation's renewed commitment to state standards, and its provision for performance-based assessment as a means of assessing students' "can do" performance have created a growing demand for dynamic assessment strategies and instruments that measure multiple dimensions of a students' academic progress. Extending beyond a paper-and-pencil format, this new breed of assessment strategies embraces a wide variety of media (e.g., pictures, sound, video, computer-based multimedia presentations) to document student success across the curriculum.

Performance-based Assessment encompasses three primary components: Content, Process, and Product.

Content:
Content is the subject matter of information in a learning activity. It should include not only simple facts and ideas but more complex issues, problems, or themes. Content is determined by reviewing national and state standards and district curriculum guides.

Process:
Processes represent the level of thinking desired in the cognitive domain. Basic processes include simple recall, basic understanding and application of information; complex processes involve creative thinking skills, critical thinking skills, and problem-solving.

Product:
Products for the basis for assessment. Offering students a choice of products helps them operate in their preferred learning style.

performance-based assessment

Product List:

Verbal - Written	Journal, Learning Log, Reading Response, Letters, Webbing, Editorials, I-Search papers, Essay, Pamphlet, Diagrams, Survey/Questionnaire, Summary, Articles, Book Reports, Case Studies, Test, Creative Writing
Verbal - Spoken	Debate, Speech, Book Review, Radio/TV Commentary, Oral Report, Interview, Group Discussion, Panel Discussion
Visual/Media	Inventions, Graphs, Tables, Cartoon, Illustration, Mobile, Poster, Bulletin Board, Collage, Collection, Advertisement, Charts, Mural, Model, Map, Display, Video Production, Web page, Multimedia Presentation, Diorama
Action - Kinesthetic/ Performing Arts	Role Play, Commercial, Experiment, Demonstration, Skit/ Play, Dramatization, Music, Field Investigation

Overview of Performance-Based Assessment

Performance-based assessments are very similar to performance tasks. Performance tasks become performance-based assessments when scoring criteria is developed and shared with students. The goal is for students to internalize the criteria, establish milestones and be able to monitor their own progress.

Challenges of Performance-Based Assessments

* Difficulty in developing good tasks
* Difficulty in meeting standards of reliability and validity
* Time necessary for assessment
* Restriction of content coverage on assessment (performance assessments should only be used if they are the best way to measure an important outcome of the instructional program)
* Necessity for in-depth teacher training

performance-based assessment

Benefits of Performance-Based Assessments

For teachers it

* Clarifies the complex concepts and processes necessary for further student learning
* Improves instruction by comparing student performance to established standards
* Promotes higher motivation levels as students complete challenging and meaningful tasks
* Increases student responsibility for their own learning
* Improves teacher communication

For students it

* Involves them in challenging and meaningful tasks that are essential for future learning development
* Improves their assessment skills as they monitor own progress through clarification of standards and useful feedback
* Gives them a chance to show personal strengths on essential performances

Standards and Benchmarks

Standards identify the "what" and the "how much" of assessment. In doing so, they clarify educational goals and help teachers and students see more clearly what they are trying to accomplish.

Benchmarks indicate the status of a trait or event at a given point in time.

performance-based assessment

Content Standards

Content standards are best defined as the "what" of assessment—what students should know and be able to do. For example, state and/or district standards are usually divided into specific categories such as Science, Mathematics, Social Studies, and Language Arts. Each category (e.g., Science) often includes specific content standards as well as corresponding benchmarks for different grade levels. In Science, a common content standard would be as follows: "Students will understand the physical world through the concepts of change, equilibrium, and measurement." A common corresponding benchmark related to this content standard would be as follows: " will use elementary scientific devices to measure objects and simple phenomena."

Performance Standards

Performance standards are the "how much and what level" of achievement is necessary to prove proficiency. For example, a grade 5 - 8 performance relating to the above content standard and corresponding benchmark might be judged on four performance levels: Distinguished, Proficient, Apprentice, and Novice. In this example, Distinguished might designate exemplary work (e.g., Work is exceptional and memorable. It shows a sophisticated application of knowledge and skills.) whereas Novice might show Beginning work (e.g., Work shows little or no application of knowledge and skills. It contains major errors or omissions.). In your state, there may or may not be statewide performance levels for any content standards. It may be assumed that individual schools, districts, and grade levels will develop their own performance levels so as to provide students with a specific target in which to gauge and track their academic performance.

performance-based assessment

Scoring Guides (Rubrics)

Scoring Guides or rubrics are sets of criteria that describe levels of student performance for each important dimension of a given task. Teachers have always had their own criteria for evaluating student work, but sometimes it has not been as clearly articulated as desired. Scoring guides require more precise written descriptors. Increasingly, educators are developing common scoring guides to be used in many classrooms and schools and as official scoring guides for statewide assessment. Teachers have developed simple scoring guides (humorous or practical) to illustrate the concept. For example:

The Ultimate Rubric - Judging Job Performance

OUTSTANDING (Far Exceeds Job Requirements)
- Leaps tall buildings with a single bound
- Is faster than a speeding bullet
- Is more swift than a diesel train

COMPETENT (Consistently Above Job Requirement)
- Must take a running start to leap over tall buildings
- Is just as fast as a speeding bullet
- Is more swift than a choo-choo train

AVERAGE (Meets Job Requirements)
- Can only leap over short buildings
- Not quite as fast as a speeding bullet
- Holds on to train while running along side

IMPROVEMENT NEEDED (Below Standard Requirements)
- Crashes into buildings when attempting to jump over them
- Can shoot bullets
- Must ride on train

SUPERVISOR ABILITY
- Cannot recognize buildings
- Self-inflicts bullet wounds
- Is afraid of trains

performance-based assessment

Developing effective scoring guides or rubrics is no easy task. It is a time consuming process that takes many meetings for teachers and others to decide on criteria. An effective procedure is to:

* review standards within the discipline and gather sample rubrics and examples of student work.
* discuss what distinguishes characteristics of good and poor work.
* write descriptors for the most important characteristics at various levels of achievement.
* use the draft criteria to judge additional student work. Use and revise until the rubric can capture the quality of the work at its various levels.

Criteria for Evaluating the Quality of a Scoring Guide

Dimensions	Criteria
Validity	The scoring guide measures the most important products, skills and behaviors called for in the task. The scoring guide is directly connected to the task and standard.
Reliability Across Performance Levels	The language of the scoring guide is descriptive and specific. There is a high level of agreement between raters.
Dimensions of the Scoring Guide	The major dimensions (traits or categories) of the scoring guide are parallel and covered in each level of performance.
Criteria for Scoring	The difference between performance levels is clear.
Teacher User Friendly	The criteria are so clear between levels that it aids the teacher in scoring.
Student User Friendly	The scoring guide can be rewritten in student language to give a clearer picture of what a good performance looks like. The student scoring guide lends itself to self-monitoring.

Overview of Developing Performance-Based Tasks and Assessments

Performance-based assessments should culminate several instructional activities that precede them (tasks), allow multiple solutions, relate to students' prior knowledge, have personal meaning and be challenging. Those that foster problem solving provide students the opportunity to (1) revisit the problem from several perspectives, (2) conduct investigations (sometimes students design their own), (3) interpret data, and (4) plan courses of action. The final goal is for students to identify expected standards, internalize the necessary criteria for reaching them, and be able to monitor their own progress.

Turning Standards into Performance-Based Assessments

Steps	*Questions to Ask*
1. Review standards - Determine which classroom(s) could address each standard.	Does the standard relate to important content taught in the classroom? Is the standard realistic in time demands for this classroom?
2. Write basic ideas for performance task - Clarify what the students should knowj and be able to do.	What is the specific content to be assessed in this standard? What specific actions (processes/thinking skills) are students to use? Do they fit the level of the standard? What specific products will students provide to show proficiency? Do possibilities exist for students to choose products? Can several standards be included in the task?
3. Identify criteria for scoring the task - Describe basic, proficient, and advanced work.	What are the descriptions of achievement levels (basic, proficient, and advanced)? Do you have (or can you collect) student work for each achievement level to improve consistency?
4. Write learning strategies - List what students might do to master the standard(s).	What activity might initiate the task? What might the student do next? How can different learning styles be acommodated? If collaboration occurs and collaboration is not the main focus of the task, how can you be sure you are assessing individual student work?
5. List resources - Provide resources necessary for students to master the standard(s).	Are resources appropriate to the task--materials, equipment, and facilities?

performance-based assessment

Criteria for Evaluating the Quality of Performance-Based Tasks and Assessments

Dimensions	Criteria
Validity	The assessment measures what is intended to be measured in the content standard. Students could pass this task by truly knowing and being able to do what is asked for in the content standard.
Reliability	The assessment is likely to elicit consistent scores over time. The scores on the task will reflect true achievement of the content standard not variance in testing conditions.
Authenticity	The task reflects what people might actually do in the real world - real life issues, themes, problems.
Challenge	The task asks students to show their "know how" on something important and challenging, not just their knowledge.
Clarity of Task and Assessment Criteria	It is clear from reading the task that the student will know exactly what they are to do to complete it, including required products and scoring criteria.
Important Content	The task incorporates the content standard and the big ideas and essential concepts of the discipline.
Feasibility	The task is worthy of the time and effort required to complete it.
Complex Processes	The task requires complex thinking skills (critical/ creative thinking, decision-making, problem solving)

Sample Performance Tasks

http://www.stjohns.k12.fl.us/cl/equestweb.html

http://edweb.sdsu.edu/webquest/webquest.html

http://www.arlingtonschools.org/Curriculum/Assessment/mathassess.html

http://idea.exnet.iastate.edu/idea/marketplace/yucatan/performance.html

Scoring Guide Example

The following page contains a sample scoring guide that models what a scoring guide should look like. This scoring guide on the following pages are currently being used in a classroom. The example is a problem-solving scoring guide used to measure problem-solving skills among elementary school students.

Cross-Curricular Rubric for Assessing Problem Solving Skills

	Pre-Emergent Problem Solver	Emergent Problem Solver	Developing Problem Solver	Competent Problem Solver	Master Problem Solver
Work Habits	Unable to define task	Has difficulty understanding task and focus of work; needs more explanation	Requires direct assistance at each step to ensure focus	Able to stay focused on task; requires little or no supervision	Requires no supervision; able to work independently
Issue Analysis	Unable to identify problems, issues, players, beliefs, or values; limited to own point of view	Has difficulty identifying players; has difficulty differentiating between problem/issue; has strong bias to own point of view	Recognizes beliefs/ values and major players; has difficulty analyzing positions, beliefs, and values; strives for objectivity	Specifies problem/issue; identifies all players; analyzes players' positions, values, and beliefs; demonstrates objectivity	Clearly specifies problem/ issue; identifies all players; objectively analyzes players' positions, beliefs, and values; recognizes a player's multiple beliefs/values
Communication/ Presentation	Unable to communicate to others the ideas learned from the unit	Attempts to share concepts, but presentation is vague	Presentation is clear, but position is not effectively defended	Presentation is clear, creative, concise and position is effectively defended	Presentation is unique, well developed, and uses a variety of resources
Data Collection and Analysis	Unable to collect data	Data collected is unsuitable, incorrect, and/or unorganized	Data collected is suitable, but incorrectly or poorly organized	Raw data is collected, organized, and interpreted	Relevant data is properly collected, clearly organized and accurately interpreted
Citizenship Action	Offers no solutions	Solutions offered are superficial and/or irrelevant to data	Solutions offered are, in part, based on collected data	A relevant, practical, data-driven solution is developed	Alternate, relevant, practical, data-driven solutions are developed

Balancing the "Basics"

SIMPLE:
* facts
* rules
* details
* concepts

COMPLEX:
* issues
* problems
* themes
* generalizations

CONTENT

BASIC:
* *memorizing*
* *understanding*
* *applying*

ABSTRACT:
* *analyzing*
* *adapting*
* *judging*

PROCESS

FUNDAMENTAL:
* *common forms*
* *simple forms*
* *outside evaluation*

SOPHISTICATED:
* *diverse forms*
* *complex forms*
* *self-evaluation*

PRODUCT

Peer Review of Performance Tasks

Performance Task Title: ____

Reviewer(s): ____

Dimensions:	***Effect of Performance Task Given the Intent:***	***Suggestions for Improvement/ Reasons:***
Valid	6 5 4 3 2 1 Comments: ____________ ____________ ____________	____________ ____________ ____________ ____________
Reliable	6 5 4 3 2 1 Comments: ____________ ____________ ____________	____________ ____________ ____________ ____________
Authentic	6 5 4 3 2 1 Comments: ____________ ____________ ____________	____________ ____________ ____________ ____________
Engaging and Challenging	6 5 4 3 2 1 Comments: ____________ ____________ ____________	____________ ____________ ____________ ____________
Clarity of Task and Assessment Criteria	6 5 4 3 2 1 Comments: ____________ ____________ ____________	____________ ____________ ____________ ____________
Important Content	6 5 4 3 2 1 Comments: ____________ ____________ ____________	____________ ____________ ____________ ____________
Feasibility	6 5 4 3 2 1 Comments: ____________ ____________ ____________	____________ ____________ ____________ ____________
High Level Processes	6 5 4 3 2 1 Comments: ____________ ____________ ____________	____________ ____________ ____________ ____________

performance-based assessment

Peer Review of Scoring Guides

Scoring Guide Title: ____________________

Reviewer(s): ____________________

Dimensions:	***Effect of Scoring Guide Given the Intent:***	***Suggestions for Improvement/ Reasons:***
Validity	6 5 4 3 2 1 Comments: ____	____
Reliability Across Performance Levels	6 5 4 3 2 1 Comments: ____	____
Dimensions of the Scoring Guide	6 5 4 3 2 1 Comments: ____	____
Criteria for Scoring	6 5 4 3 2 1 Comments: ____	____
Teacher User Friendly	6 5 4 3 2 1 Comments: ____	____
Student User Friendly	6 5 4 3 2 1 Comments: ____	____

LoTi Survival Kit

Session #8:

Professional Development Intervention (Level 3: Infusion)

Professional Development Intervention (Level 3: Infusion)

Time Allotment: 20 minutes

Session #8 is devoted to modeling a professional development intervention at a LoTi Level 3 involving the analysis of different web-based projects referred to as "WebQuests." The goal of Session #8 is for participants to evaluate different WebQuests available to classroom teachers worldwide for possible use in their respective classrooms.

Provided below is a suggested outline for implementing Session #8 of the LoTi Project Implementation.

1.0

Provide participants with a copy of the Session #8 handouts.

2.0

Review with participants the Criteria for Evaluating the Quality of a Performance Task (i.e., validity, reliability, authenticity, challenge, clarity of task and assessment criteria, important content, feasibility, and complex processes) from Page 8 of the Performance-based Assessment handout as well as the Peer Review of Performance Tasks form on Page 16 of the handout. This form will be used by participants to evaluate the quality of different web-based projects referred to as WebQuests.

3.0

Have participants work in groups to access the URL for the WebQuest home page. The URL is as follows:

http://webquest.sdsu.edu/webquest.html

4.0

Have participants review the WebQuest examples for their particular grade level/content area and use the Peer Review of Performance Tasks form to evaluate one of these web-based projects.

Training Tip: *It is recommended that you spend some time with participants reviewing the steps for designing a WebQuest. The criteria and process are also found at the same URL.*

Professional Development Intervention (Level 3: Infusion)

5.0

Have participants share the results of the evaluation as well as delineate which LoTi level their reviewed WebQuest would fit (e.g., LoTi Level 2).

LoTi Survival Kit

Session #8:

Participant Handouts

performance-based assessment

Performance-based Assessment

The nation's renewed commitment to state standards, and its provision for performance-based assessment as a means of assessing students' "can do" performance have created a growing demand for dynamic assessment strategies and instruments that measure multiple dimensions of a students' academic progress. Extending beyond a paper-and-pencil format, this new breed of assessment strategies embraces a wide variety of media (e.g., pictures, sound, video, computer-based multimedia presentations) to document student success across the curriculum.

Performance-based Assessment encompasses three primary components: Content, Process, and Product.

Content:
Content is the subject matter of information in a learning activity. It should include not only simple facts and ideas but more complex issues, problems, or themes. Content is determined by reviewing national and state standards and district curriculum guides.

Process:
Processes represent the level of thinking desired in the cognitive domain. Basic processes include simple recall, basic understanding and application of information; complex processes involve creative thinking skills, critical thinking skills, and problem-solving.

Product:
Products for the basis for assessment. Offering students a choice of products helps them operate in their preferred learning style.

performance-based assessment

Product List:

Verbal - Written	Journal, Learning Log, Reading Response, Letters, Webbing, Editorials, I-Search papers, Essay, Pamphlet, Diagrams, Survey/Questionnaire, Summary, Articles, Book Reports, Case Studies, Test, Creative Writing
Verbal - Spoken	Debate, Speech, Book Review, Radio/TV Commentary, Oral Report, Interview, Group Discussion, Panel Discussion
Visual/Media	Inventions, Graphs, Tables, Cartoon, Illustration, Mobile, Poster, Bulletin Board, Collage, Collection, Advertisement, Charts, Mural, Model, Map, Display, Video Production, Web page, Multimedia Presentation, Diorama
Action - Kinesthetic/ Performing Arts	Role Play, Commercial, Experiment, Demonstration, Skit/ Play, Dramatization, Music, Field Investigation

Overview of Performance-Based Assessment

Performance-based assessments are very similar to performance tasks. Performance tasks become performance-based assessments when scoring criteria is developed and shared with students. The goal is for students to internalize the criteria, establish milestones and be able to monitor their own progress.

Challenges of Performance-Based Assessments

* Difficulty in developing good tasks
* Difficulty in meeting standards of reliability and validity
* Time necessary for assessment
* Restriction of content coverage on assessment (performance assessments should only be used if they are the best way to measure an important outcome of the instructional program)
* Necessity for in-depth teacher training

performance-based assessment

Benefits of Performance-Based Assessments

For teachers it

* Clarifies the complex concepts and processes necessary for further student learning
* Improves instruction by comparing student performance to established standards
* Promotes higher motivation levels as students complete challenging and meaningful tasks
* Increases student responsibility for their own learning
* Improves teacher communication

For students it

* Involves them in challenging and meaningful tasks that are essential for future learning development
* Improves their assessment skills as they monitor own progress through clarification of standards and useful feedback
* Gives them a chance to show personal strengths on essential performances

Standards and Benchmarks

Standards identify the "what" and the "how much" of assessment. In doing so, they clarify educational goals and help teachers and students see more clearly what they are trying to accomplish.

Benchmarks indicate the status of a trait or event at a given point in time.

Content Standards

Content standards are best defined as the "what" of assessment—what students should know and be able to do. For example, state and/or district standards are usually divided into specific categories such as Science, Mathematics, Social Studies, and Language Arts. Each category (e.g., Science) often includes specific content standards as well as corresponding benchmarks for different grade levels. In Science, a common content standard would be as follows: "Students will understand the physical world through the concepts of change, equilibrium, and measurement." A common corresponding benchmark related to this content standard would be as follows: " will use elementary scientific devices to measure objects and simple phenomena."

Performance Standards

Performance standards are the "how much and what level" of achievement is necessary to prove proficiency. For example, a grade 5 - 8 performance relating to the above content standard and corresponding benchmark might be judged on four performance levels: Distinguished, Proficient, Apprentice, and Novice. In this example, Distinguished might designate exemplary work (e.g., Work is exceptional and memorable. It shows a sophisticated application of knowledge and skills.) whereas Novice might show Beginning work (e.g., Work shows little or no application of knowledge and skills. It contains major errors or omissions.). In your state, there may or may not be statewide performance levels for any content standards. It may be assumed that individual schools, districts, and grade levels will develop their own performance levels so as to provide students with a specific target in which to gauge and track their academic performance.

Scoring Guides (Rubrics)

Scoring Guides or rubrics are sets of criteria that describe levels of student performance for each important dimension of a given task. Teachers have always had their own criteria for evaluating student work, but sometimes it has not been as clearly articulated as desired. Scoring guides require more precise written descriptors. Increasingly, educators are developing common scoring guides to be used in many classrooms and schools and as official scoring guides for statewide assessment. Teachers have developed simple scoring guides (humorous or practical) to illustrate the concept. For example:

The Ultimate Rubric - Judging Job Performance

OUTSTANDING (Far Exceeds Job Requirements)
- * Leaps tall buildings with a single bound
- * Is faster than a speeding bullet
- * Is more swift than a diesel train

COMPETENT (Consistently Above Job Requirement)
- * Must take a running start to leap over tall buildings
- * Is just as fast as a speeding bullet
- * Is more swift than a choo-choo train

AVERAGE (Meets Job Requirements)
- * Can only leap over short buildings
- * Not quite as fast as a speeding bullet
- * Holds on to train while running along side

IMPROVEMENT NEEDED (Below Standard Requirements)
- * Crashes into buildings when attempting to jump over them
- * Can shoot bullets
- * Must ride on train

SUPERVISOR ABILITY
- * Cannot recognize buildings
- * Self-inflicts bullet wounds
- * Is afraid of trains

performance-based assessment

Developing effective scoring guides or rubrics is no easy task. It is a time consuming process that takes many meetings for teachers and others to decide on criteria. An effective procedure is to:

* review standards within the discipline and gather sample rubrics and examples of student work.
* discuss what distinguishes characteristics of good and poor work.
* write descriptors for the most important characteristics at various levels of achievement.
* use the draft criteria to judge additional student work. Use and revise until the rubric can capture the quality of the work at its various levels.

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Dimensions	Criteria
Validity	The scoring guide measures the most important products, skills and behaviors called for in the task. The scoring guide is directly connected to the task and standard.
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Dimensions of the Scoring Guide	The major dimensions (traits or categories) of the scoring guide are parallel and covered in each level of performance.
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Turning Standards into Performance-Based Assessments

Steps	*Questions to Ask*
1. Review standards - Determine which classroom(s) could address each standard.	Does the standard relate to important content taught in the classroom? Is the standard realistic in time demands for this classroom?
2. Write basic ideas for performance task - Clarify what the students should knowj and be able to do.	What is the specific content to be assessed in this standard? What specific actions (processes/thinking skills) are students to use? Do they fit the level of the standard? What specific products will students provide to show proficiency? Do possibilities exist for students to choose products? Can several standards be included in the task?
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5. List resources - Provide resources necessary for students to master the standard(s).	Are resources appropriate to the task--materials, equipment, and facilities?

performance-based assessment

Criteria for Evaluating the Quality of Performance-Based Tasks and Assessments

Dimensions	Criteria
Validity	The assessment measures what is intended to be measured in the content standard. Students could pass this task by truly knowing and being able to do what is asked for in the content standard.
Reliability	The assessment is likely to elicit consistent scores over time. The scores on the task will reflect true achievement of the content standard not variance in testing conditions.
Authenticity	The task reflects what people might actually do in the real world - real life issues, themes, problems.
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Feasibility	The task is worthy of the time and effort required to complete it.
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Sample Performance Tasks

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Balancing the "Basics"

SIMPLE:
* facts
* rules
* details
* concepts

COMPLEX:
* issues
* problems
* themes
* generalizations

← ***CONTENT*** →

BASIC:
* *memorizing*
* *understanding*
* *applying*

ABSTRACT:
* *analyzing*
* *adapting*
* *judging*

← ***PROCESS*** →

FUNDAMENTAL:
* *common forms*
* *simple forms*
* *outside evaluation*

SOPHISTICATED:
* *diverse forms*
* *complex forms*
* *self-evaluation*

← ***PRODUCT*** →

performance-based assessment

Peer Review of Performance Tasks

Performance Task Title: ______________________________

Reviewer(s): ______________________________

Dimensions:	***Effect of Performance Task Given the Intent:***	***Suggestions for Improvement/ Reasons:***
Valid	6 5 4 3 2 1 Comments: ______________	______________
Reliable	6 5 4 3 2 1 Comments: ______________	______________
Authentic	6 5 4 3 2 1 Comments: ______________	______________
Engaging and Challenging	6 5 4 3 2 1 Comments: ______________	______________
Clarity of Task and Assessment Criteria	6 5 4 3 2 1 Comments: ______________	______________
Important Content	6 5 4 3 2 1 Comments: ______________	______________
Feasibility	6 5 4 3 2 1 Comments: ______________	______________
High Level Processes	6 5 4 3 2 1 Comments: ______________	______________

performance-based assessment

Peer Review of Scoring Guides

Scoring Guide Title: ______________________________

Reviewer(s): ______________________________

Dimensions:	***Effect of Scoring Guide Given the Intent:***	***Suggestions for Improvement/ Reasons:***
Validity	6 5 4 3 2 1 Comments: ____________	____________
Reliability Across Performance Levels	6 5 4 3 2 1 Comments: ____________	____________
Dimensions of the Scoring Guide	6 5 4 3 2 1 Comments: ____________	____________
Criteria for Scoring	6 5 4 3 2 1 Comments: ____________	____________
Teacher User Friendly	6 5 4 3 2 1 Comments: ____________	____________
Student User Friendly	6 5 4 3 2 1 Comments: ____________	____________

performance-based assessment

Performance-based Assessment Notes

LoTi Survival Kit

Session #9:

Professional Development Intervention (Level 3: Infusion)

Professional Development Intervention (Level 3: Infusion)

Time Allotment: 20 minutes

Session #9 is a continuation of Session #8 involving the implementation of an actual WebQuest in the participant's classrooms.

Provided below is a suggested outline for implementing Session #9 of the LoTi Project Implementation.

1.0

Have participants work in groups to access the URL for the WebQuest home page. The URL is as follows:

http://webquest.sdsu.edu/webquest.html

2.0

Have participants select a WebQuest that they would like to implement in their respective classrooms. The goal would be twofold: (1) implement an existing WebQuest without having to design one from scratch and (2) critique the overall implementation in terms of student products, reaction from students, alignment to the curriculum, etc.

3.0

After selecting their WebQuest for implementation, have participants identify the LoTi Level of the WebQuest based on the characteristics of a Level 3 implementation of technology.

4.0

Have participants submit a timeline for implementation so as to periodically review and share their progress during staff meetings.

LoTi Survival Kit

Session #10:

Professional Development Intervention

(Level 4a/4b: Integration)

Professional Development Intervention (Level 4a/4b: Integration)

Time Allotment: 20 minutes

Session #10 is devoted to modeling a professional development intervention at a LoTi Level 4a/4b involving an instructional design called the Experiential-based Action Model or EBAM. The goal of Session #10 is for participants to reflect on their current instructional practices using a simulation called "The Great American Apple Pie."

Provided below is a suggested outline for implementing Session #10 of the LoTi Project Implementation.

1.0

Share with participants that they will be creating a one week unit of instruction that focuses on the following performance task: creating the most scrumptious apple pie!

Training Tip: *The purpose of this exercise is for participants to discern the difference between what they talk about should be happening in the classroom versus what they actually plan on doing. For example, as it relates to technology integration, participants (e.g., teachers) talk about the importance of establishing relevant and authentic learning experiences based on the needs of the learner (i.e., learner-centered curriculum); however, in actual practice, many participants tend to favor a subject matter orientation with little consideration to the audience (e.g., high school students) or strategies that promote a constructivist approach to learning.*

2.0

Share with participants that their unit of instruction must: (1) last only one week, (2) be targeted for high school students, (3) be technology-rich, and (4) culminate in the creation of a "high quality" apple pie.

Training Tip: *Though the focus of this activity is on the creation of a one-week unit of instruction, spend a few minutes with participants identifying the major criteria or dimensions for assessing the students' final product such as Taste, Crust Texture, Smell, Appearance, Apple Selection, etc.*

Professional Development Intervention (Level 4a/4b: Integration)

3.0
Have participants work in teams to create their unit outline by first arranging their apple unit according to the days of the week (i.e., Monday through Friday).

4.0
Give participants between 8 to 10 minutes to complete their apple units.

5.0
Have participants share their apple units with the other participants. Having used this simulation in several hundred professional development sessions, many contain the same attributes--start out with a field trip on Monday for students to study the content of different apples; on Tuesday students access the internet to find recipes used by master chefs to prepare a flaky crust, and so on. THE KEY TO THIS SIMULATION IS NOT JUDGING THE QUALITY OF THE ACTIVITIES SELECTED OR EVEN HOW THE TECHNOLOGY WAS USED (e.g., internet, spreadsheets), BUT RATHER ASSESSING HOW THE UNIT WAS ORGANIZED TO PROMOTE PEAK PERFORMANCE FROM THE STUDENTS. IN THIS CASE, HIGH SCHOOL STUDENTS. In only a handful of situations have participants actually taken into consideration that the audience for this apple unit is high school students and therefore, should focus on their needs, aspirations, or desires (e.g., money, romance, prestige).

6.0
After listening to the unit outlines from three or four groups, offer an alternative approach that would address the target audience and maximize peak performance. One scenario might be as follows: A male high school student was walking downtown and his eyes fell upon a young lady who was extremely attractive. He introduced himself to her and with his heart pounding soon discovered that her favorite dessert is apple pie. DO WE HAVE A MOTIVATED YOUNG MAN? YES! DO WE HAVE A STUDENT THAT WANTS TO PERFORM OPTIMALLY WITH THIS APPLE UNIT? YES! Share with students that providing an authentic context, nurturing experiential learning, and promoting intrinsic motivation, are the keys to a Level 4 implementation of technology (e.g., Integration).

Professional Development Intervention (Level 4a/4b: Integration)

7.0

Share with participants that the purpose of this exercise was to reflect on our own curriculum development practices; where sometimes we talk and say one thing, but ultimately do something else as it relates to curriculum development.

Training Tip: *You might want to share with participants that the next session will be devoted to a curriculum design model that promotes purposeful problem solving called the Experiential-based Action Model or EBAM.*

Note: It is recommended that you distribute a copy of the Session #10 handouts prior to the next session.

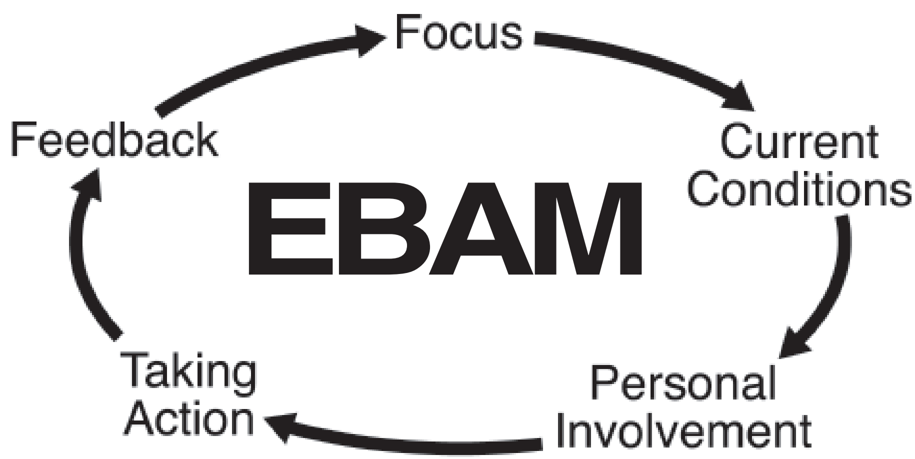
LoTi Survival Kit

Session #10:

Participant Handouts

The Experiential-based Action Model

The Experiential-based Action Model is a five-step process designed to pique student academic performance while addressing critical content standards and promoting experiential learning, constructivist teaching, and authentic technology integration.



Designing Experiential-based Action Model Units

The challenges confronting today's classroom teachers are unprecedented. Teaching to major themes, motivating reluctant learners, integrating technology-based tools (e.g., spreadsheets, databases, multimedia authoring tools, Internet), supporting standards-based instruction, and employing alternative assessment strategies have signaled both opportunities and concerns for educational practitioners nationwide. Exactly how can one expect to do all of these things in a manner that is consistent with a constructivist theory of learning and maximizes student understanding of the pertinent academic standards?

The Experiential-based Action Model (EBAM) is designed to assist classroom teachers with organizing their instructional curriculum based on the experiential needs of the learner and national and state academic standards. The model encompasses those instructional practices that rely on real life experiences as the basis for learning. According to philosopher, John Dewey, the educator's task is to ensure the continuity of present experiences upon future experiences. In this context, quality learning experiences: (1) provide the learner with a sense of direction and purpose, (2) are encased in a well-defined context, and (3) include linkage between past and future experiences. The Experiential-based Action Model consists of five key stages: Focus, Current Conditions, Personal Involvement, Taking Action, and Feedback.

Several preliminary steps should be taken before developing Standards-driven EBAM units.

* Review National and State Content and/or Performance Standards and local curriculum guidelines for important topics (content) and themes (concepts).
* Brainstorm with colleagues and students to identify specific content and concepts (what students should know and understand), processes (what students should be able to do), and products (what students should produce to demonstrate knowledge and skills).
* Make sure the products or culminating performance tasks are:
    - standards-driven: tasks relate to national and state academic standards and local curriculum guidelines

- challenging: tasks ask students to show their "know how" on something important and challenging, not just their knowledge.
- authentic: tasks allow students to pursue authentic solutions to a relevant problem, challenge, or issue
- feasible: tasks are worthy of the time and effort required to complete it
- thought-provoking: tasks require students to use complex thinking skills (e.g., critical/creative thinking, decision-making, problem-solving)
- experiential-based: tasks provide a constructivist outlet for students to explore and resolve a problem, issue, or challenge under investigation.

* Defining the culminating performance task for the EBAM unit is **not** a casual activity. Everything students perform in a standards-driven EBAM unit is directed toward successfully completing the culminating performance task, which encapsulates the academic standards. Student-based questions derived from the culminating performance task should inspire and energize the learner to want to learn and perform at the highest possible level. It is, therefore, essential that the culminating performance task as well as the learning experiences linked to this task be developed, selected, or refined based on the experiential needs of the learner.
* Once the culminating performance task has been defined, select/design student experiences for each stage of the Experiential-based Action Model (EBAM) that will authentically move students from Awareness to Action relating to the pertinent problem, challenge, or issue embedded in the culminating performance task.

  For the purposes of this Standards-driven, EBAM unit on recycling, the culminating performance task will be as follows:

  Students will plan, organize, and carry out an action plan that addresses the issue of waste disposal practices at home, at school, and throughout the community. This task will be designed to answer the essential question: Can the amount of trash destined for the landfill be significantly reduced?

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Focus

Purpose

Focus activities develop awareness of an overall topic or theme and motivate students to learn more about related issues that are also current and relevant.

Key Components - Questions for Students to Ask

* Does a problem exist?
* What is the problem?
* How important is the problem?
* Does the problem affect me personally?
* Why should I be studying this topic?

Learning Process Skills

* Observing
* Recognizing
* Responding

Types of Activities/Products

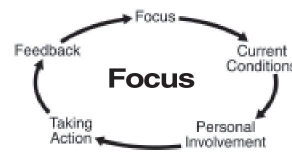
* Experiments
* Graphic Organizers
* Discrepant Events Investigations
* Demonstrations
* Literature Interpretations
* Surveys
* Field Trips
* Newspaper, Music, Cartoon Reviews

Questions to Consider Before Adding a Focus Activity

* Does the activity help students elicit challenging and thoughtful questions related to the problem or theme?
* Does the activity integrate technology purposefully and authentically?
* Does the activity establish linkage or connection between the student and the problem?
* Does the activity move students from Awareness to Action?
* Does the activity address the pertinent concepts, processes, and theme(s)?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

Focus

(Synonym: Awareness - Vigilance in observing or alertness in drawing inferences from what one experiences.)



The focus section motivates students to learn more about current, relevant issues and/or problems embedded in the culminating performance task. Focus activities are powerful events that unlock students' natural fascination and intrinsic motivation. Generating student questions and arriving at a problem definition are essential components of this stage.

* Select appropriate focus activities (e.g., surveys, observations, demonstrations, literature interpretations, experiments, field trips, discrepant events) that address anticipated student questions relating to the content and concepts encased in the culminating performance task:
  Anticipated Student Questions:
    - Does a problem related to this topic exist?
    - What is the problem?
    - How important is the problem?
    - Does the problem affect me personally?
    - Why should I want to study this topic?
* Make sure Focus activities address the anticipated student questions.
* Make sure Focus activities retain the following characteristics:
  - Relate continuously and consistently back to the selected topic(s), theme(s), and/or culminating performance task.
  - Integrate several content areas or disciplines (e.g., science, math, social studies, language arts).
  - Allow for data collection, tabulation, and analysis of information.
  - Allow for hands-on investigations inside or outside the classroom.
  - Promote formation of a problem definition
  - Allow for use of computer-based tools (e.g., spreadsheets, graphs, word processors, databases, Internet, multimedia).
* After selecting focus activities, think through additional student questions that students might ask. These questions should stem from the focus activities and relate directly to the culminating performance task. These anticipated student questions serve as a data

source (along with teacher-based questions) for selecting learning activities for the next stage, Current Conditions.

* List relevant and meaningful teacher-based questions (i.e., questions that students do not often asked due to a lack of background knowledge on the topic). Teacher-based questions should relate to the critical content and concepts associated with the problem, issue, or challenge embedded in the culminating performance task. The depth and breadth of the questions may stimulate more than are practical within a single instructional unit. If necessary, narrow or combine some of the questions into a new set of questions that would fit the parameters of the current instructional unit.

Note: Using key words will also help to define significant content and concepts to be investigated in the next stage.

Following is a sample focus activity (Visiting landfill site to determine problem and implications) based on the student- based question, "What is the problem with landfills?" that will help students define the problem embedded in the culminating performance task (i.e., improving local waste disposal practices).

Focus Examples

Topic/Content:

* Recycling
    - Problem Definition

Theme/Concept:

* Cycle

Data Source:

* Student-based questions

Questions:

* What is the problem with landfills?

Activities:

* Visit landfill site to determine the problem and implications.

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Current Conditions

Purpose

Current Conditions activities provide investigations and experiences to help students understand the magnitude of the problem and its relevancy to the overall topic or theme.

Key Components - Questions for Students to Ask

* How big is the problem?
* What does the problem look like?
* What do I already know?
* What do I need to know to understand the problem?
* How do I know a problem exists?

Learning Process Skills

* Comparing
* Classifying
* Analyzing

Types of Activities/Products

* Interviews
* Surveys
* Demonstrations
* Book Reports
* Class Discussions
* Internet Searches
* Field Investigations
* Case Studies
* Library/Media Research
* Experiments
* Journal Writing

Questions to Consider Before Adding a Current Conditions Activity

* Does the activity help students consider different perspectives related to the problem or theme?
* Does the activity integrate technology purposefully and authentically?
* Does the activity help students understand the magnitude of the problem under consideration?
* Does the activity move students from Awareness to Action?
* Is the introduction of a new concept, process, and/or theme connected directly or indirectly to the problem under consideration?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

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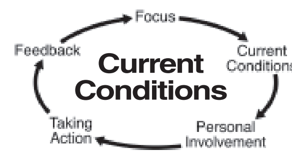
Current Conditions

(Synonym: Exploration - The act of investigating, studying, or analyzing something.)



Student investigations and learning experiences at this stage help students find answers to the previously developed student- and teacher-based questions. Current Conditions activities address the magnitude of the problem, challenge, or issue under investigation and are linked to the culminating performance task.

Begin the Current Conditions section by considering its overall direction. Remember that Current Conditions activities provide students with the background knowledge, conceptual understanding, and skill development to investigate all aspects of the problem under investigation. Use the anticipated student- and teacher-based questions to select Current Conditions activities.

* Make sure the activities (e.g., experiments, surveys, field investigations, Internet research) address the following key student-based questions:

    Anticipated Student-based Questions
    - How big is the problem?
    - What does the problem look like?
    - What do I already know?
    - What do I need to know to understand the problem?
    - How do I know a problem exists?
* Make sure the selected Current Conditions activities retain the following characteristics:
    - Relate continuously and consistently back to the selected topic(s), theme(s), and/or culminating performance task.
    - Integrate several content areas or disciplines (e.g., science, math, social studies, language arts).
    - Allow for data collection, tabulation, and analysis of information.
    - Allow for hands-on investigations inside or outside the classroom.
    - Promote different perspectives related to the problem.
    - Allow for use of computer-based tools (e.g., spreadsheets, graphs, word processors, databases, telecommunications, multimedia).
* Select appropriate instructional technologies and materials that:
    - most efficiently address the desired outcomes.

  - encourage higher order thinking skills.
  - are cost effective.
  - are accurate, up-to-date, and unbiased (in the case of materials).
* Review the unit. Check to see if:
  - a variety of activities and strategies are included.
  - students of all ability levels will be appropriately challenged and actively engaged.
  - the individual activities relate to essential content and the development of the concepts.

Following is a sample Current Conditions activity (e.g., conducting home trash survey) based on the anticipated student-based questions (e.g., How much trash does the average home generate?) that will help students explore the magnitude of the problem embedded in the culminating performance task (improving local waste disposal practices).

Current Conditions Examples

Topic/Content:

* Recycling
  - Impact of trash problem
  - Dichotomous grouping of trash
  - Properties of recyclable trash

Theme/Concept:

* Cycle

Data Source:

* Student-based questions
* Teacher-based questions (National Standards)

Questions:

* How much trash does the average home generate?
* What kind of trash causes the greatest problem?
* How do people impact ecosystems?

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Personal Involvement

Purpose

Personal Involvement activities help students identify, structure, modify, and defend solutions to the problem under investigation through the use of organizational tools and analytical strategies.

Key Components - Questions for Students to Ask

* How can the problem be fixed?
* What are the most workable solutions?
* Why are these the most workable solutions?

Learning Process Skills

* Evaluating
* Synthesizing
* Making inferences
* Communicating

Types of Activities/Products

* Experiments
* Case Studies
* I-Search Papers
* Trial and Error
* Surveys
* Field Investigations
* Inquiry Letters
* Model Buildings
* Feasibility Studies
* Debates

Questions to Consider Before Adding a Personal Involvement Activity

* Does the activity integrate technology purposefully and authentically?
* Does the activity promote students' use of the pertinent concepts and processes used to explore solutions to the problem?
* Does the activity move students from Awareness to Action?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

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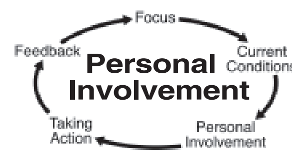
Personal Involvement

(Synonym: Solutions - The action or process of solving a problem.)



In this section, students are given organizational tools and analytical strategies to help them identify, structure, modify, and defend potential solutions to the problem under investigation. At the Personal Involvement stage, students apply the content, concepts, and processes introduced/reviewed in the Current Conditions section toward designing their "product" relating to the culminating performance task.

* Plan student-directed investigations (e.g., experiments, case studies, I Search Papers, Trial and Error, Field Investigations, feasibility studies, inquiry letters) that address the following key student-based questions:
  Anticipated Student-based Questions
    - How can the problem be fixed?
    - What are the most workable solutions?
    - Why are these the most workable solutions?
* Make sure investigations address possible solutions to the problem, challenge, or issue embedded in the culminating performance task and retain the following characteristics:
  - Allow for analysis and synthesis of information.
  - Provide opportunities for student decision-making.
  - Allow students to defend their decision(s)/solution(s).
* Select appropriate instructional technologies and materials that:
  - most efficiently address the desired outcomes.
  - encourage higher order thinking skills.
  - are cost effective.

Following is a sample Personal Involvement activity (e.g., designing and conducting composting experiment) based on the anticipated student-based question (e.g., How can we fix the problem?) that will help students develop viable solutions to the problem embedded in the culminating performance task (improving local waste disposal practices).

Personal Involvement Examples

Topic/Content:

* Recycling
    - Earth's natural cycles
    - Waste disposal solutions through natural cycles
    - Effects of cycles in ecosystem on humans

Theme/Concept:

* Cycle

Data Source:

* Teacher-based questions (State Framework)
* Student-based questions
* Teacher-based questions (National Standards)

Questions:

* What are the earth's natural cycles?
* How can we fix the problem?
* What is the most workable solution?
* How do cycles in ecosystems effect humans (e.g., waste disposal solution)?

Activities:

* Design and conduct experiments using natural cycles that could provide a solution to waste disposal problems (e.g., with earthworms, compost).
* Defend a workable solution.

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Taking Action

Purpose

Taking Action activities provide directions and strategies to help students put their solutions into action on a local, regional, and/or national basis.

Key Components - Questions for Students to Ask

* What does my action plan look like?
* Will my plan of action work?
* Does my action plan address the problem?
* Can I do it?

Learning Process Skills

* Applying
* Decision-Making
* Valuing
* Communicating

Types of Activities/Products

* Action Plans
* Petitions
* Inventions
* Letters
* Volunteering
* Patents
* Fund-Raisers
* Flyers
* Proposals

Questions to Consider Before Adding a Taking Action Activity

* Does the proposed action plan address the problem under investigation?
* Does the proposed action plan integrate technology purposefully and authentically?
* Does the proposed action plan address the pertinent concepts, processes, and theme(s)?
* Does the proposed action plan provide a natural pathway to the other stages of the Experiential-Based Action Model?

Taking Action

(Synonym: Action - The accomplishment of a thing usually over a period of time.)

This stage provides students with directions for putting their solutions relating to the culminating performance task into action. The depth and breadth of the "Taking Action" stage is only limited by the imagination of the students. For the recycling unit, community recycling campaign, school fund- raiser, or inventing a new type of biodegradable containers, are examples of a few projects that "put into action" authentic solutions relating to the culminating performance task:

> *Students will plan, organize, and carry out an action plan that addresses the issue of waste disposal practices at home, at school, and throughout the community.*

These projects can be accomplished in class or as part of an out-of-class assignment.

* Identify possible products. Determine what should be invented, written, spoken about, or manufactured that relates directly back to the Personal Involvement experiences and the culminating performance task.
* Develop "Taking Action" activities that address the following student questions:

    Anticipated Student-based Questions:
    - What does the action plan look like?
    - Does the action plan address the problem?
    - Will the action plan work?
    - Can the action plan be successfully implemented?
* Select resources that promote the desired action (e.g., a variety of construction materials or specific personnel; city mayor, teacher, coach, or parent).

Following is a a sample Taking Action product (e.g., implementing a community composting program) based on potential solutions "discovered" at the Personal Involvement stage that puts into action the culminating performance task (improving local waste disposal practices).

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Taking Action Examples

Topic/Content:
* Recycling
  - Community solutions
  - Regional differences

Theme/Concept:
* Cycle

Data Source:
* Student-based questions
* Teacher-based questions (National Standards)

Questions:
* What actions can I take to address the causes of waste management problems in my community?
* Can they be successfully implemented?
* How do the causes of and solutions to environmental degredation vary from region to region?

Activities:
* Develop an Action Plan that identifies the problem, steps toward a solution in the local region, key people involved, and timelines, and includes how the solution might differ in another region. For example, implementing a community composting program.

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Feedback

Purpose

Feedback activities help students identify milestones and quality standards so they can monitor their progress toward the attainment of specific goals.

Key Components - Questions for Students to Ask

* Did I use concepts and content to understand the problem or issue?
* Did I use appropriate investigation/problem solving processes to identify workable solutions?
* Did the products I produced and processes I used meet quality standards?

Learning Process Skills

* Evaluating
* Exploring
* Predicting

Types of Activities/Products

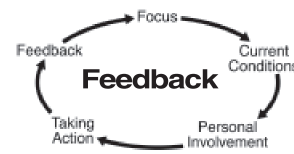
* Daily Journals
* Self Assessment
* Experiments
* Open-ended Problem-Based Questions/Investigations
* Oral Presentations
* Full Length Compositions
* Peer Review
* Electronic Portfolio

Questions to Consider Before Adding a Feedback Activity

* Does the activity assess the students' "can do" performance?
* Does the activity integrate technology purposefully and authentically?
* Does the activity assess the merits of the students' action plans related to the problem under investigation?
* Does the activity assess students' understanding of the pertinent concepts, processes, and theme(s)?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

Feedback

(Synonym: Evaluation - The act of assessing the significance, worth, or value of an accomplishment)



The Feedback stage brings the five phase Experiential-based Action Model full-cycle. Although Feedback is identified as the fifth stage, assessment is an on-going process within each of the stages of the EBAM unit (e.g., Current Conditions, Personal Involvement, Taking Action). In the assessment process, the teacher and students collect evidence and document student success based on state and local academic standards.

Performance-based assessment allows students to gauge their progress toward meeting predetermined standards of quality as articulated in state and local academic standards. Performance is assessed by teachers, student (during self assessment) and sometimes by other students using pre-defined scoring guides or rubrics.

* Identify whether group and/or individual assessment is appropriate.
* Identify content, processes and products to be assessed and appropriate methods. For example:
  - in "Current Conditions" activities, significant areas of content are taught. Content can be assessed through performance based open-ended questions that require students to use past knowledge and skills to demonstrate their understanding of the problem.
  - in "Personal Involvement" activities, processes are an important element. Here the processes used to collect and analyze data and the components of experimental design can be assessed.
  - in "Taking Action" activities, products embedded in the culminating performance task such as action plans, letters, flyers, and proposals are important elements. Assessment criteria not only can assess the content and processes encased in the student products, but can also assess how well the action plan relates to the ‘problem and how well the plan worked.

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Standards-driven Curriculum Modules that Emphasize Technology, Relevancy, and Student Activism Notes

LoTi Survival Kit

Session #11:

Professional Development Intervention

(Level 4a/4b: Integration)

Professional Development Intervention (Level 4a/4b: Integration)

Time Allotment: 20 minutes

Session #11 is a continuation of Session #10 and models a professional development intervention at a LoTi Level 4a/4b involving an instructional design called the Experiential-based Action Model or EBAM. The goal of Session #11 is for participants to reflect on the EBAM model and its implications for their own curriculum development within their respective content areas or grade levels.

Provided below is a suggested outline for implementing Session #11 of the LoTi Project Implementation.

1.0

Distribute copies of Sample EBAM Unit Outlines (part of the Session #11 handouts) for participants to review. Share with participants that each of these unit outlines was created in one day using the five stage EBAM approach.

2.0

To assist participants with understanding the experiential nature of the EBAM approach, show them the multimedia presentation of EBAM (*EBAM.htm*) based on the movie, Apollo 13.

Training Tip: *As you progress through each stage of the model using the Apollo 13 video clips, remind participants to think about the learner and his motivation to succeed. Was it just to get a decent grade or to survive and breathe another day? Ask participants which form of motivation would promote the best performance from students; meaning intrinsic or extrinsic motivation.*

3.0

After showing the Apollo 13 video clips, take any one of the sample EBAM unit outlines and review step by step each stage of the EBAM model with participants.

LoTi survival kit train-the-trainer

Professional Development Intervention (Level 4a/4b: Integration)

Training Tip: *Keep in mind that EBAM is not the only instructional design for creating LoTi Level 4 instructional units. McTighe and Wiggins'* The Understanding by Design Handbook*, Mitchell, Crawford, and the Chicago Teachers Union Quest Center's* Learning in Overdrive*, Renzoulli's* Enrichment Triad Model*, Jacobs and Borland's* Interdisciplinary Concept Model*, Yager's* Constructivist Learning Model*, and McCarthy's* 4MAT System*, are but a few of the curriculum design resources available to encourage LoTi Level 4 implementation of technology.*

Note: For additional information on the EBAM approach, have participants access the Project DaVinci website:
http://www.learning-quest.com/projectdavinci.html

LoTi Survival Kit

Session #11:

Participant Handouts

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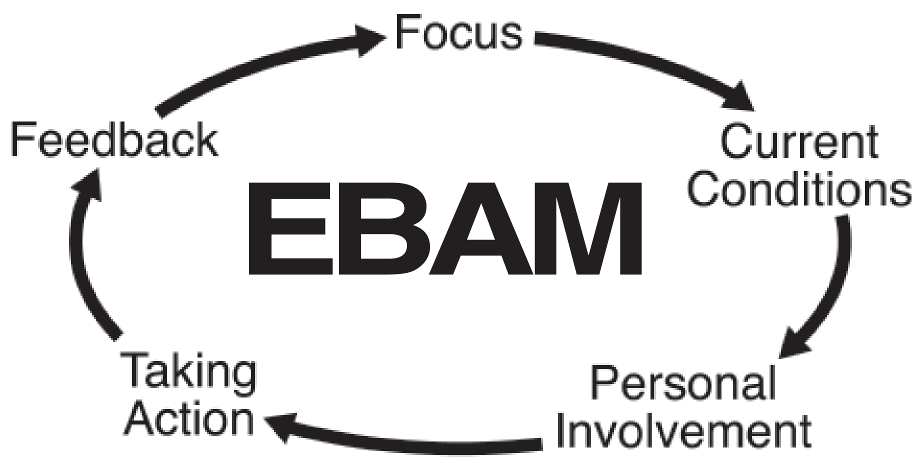
The Experiential-based Action Model

The Experiential-based Action Model is a five-step process designed to pique student academic performance while addressing critical content standards and promoting experiential learning, constructivist teaching, and authentic technology integration.



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Designing Experiential-based Action Model Units

The challenges confronting today's classroom teachers are unprecedented. Teaching to major themes, motivating reluctant learners, integrating technology-based tools (e.g., spreadsheets, databases, multimedia authoring tools, Internet), supporting standards-based instruction, and employing alternative assessment strategies have signaled both opportunities and concerns for educational practitioners nationwide. Exactly how can one expect to do all of these things in a manner that is consistent with a constructivist theory of learning and maximizes student understanding of the pertinent academic standards?

The Experiential-based Action Model (EBAM) is designed to assist classroom teachers with organizing their instructional curriculum based on the experiential needs of the learner and national and state academic standards. The model encompasses those instructional practices that rely on real life experiences as the basis for learning. According to philosopher, John Dewey, the educator's task is to ensure the continuity of present experiences upon future experiences. In this context, quality learning experiences: (1) provide the learner with a sense of direction and purpose, (2) are encased in a well-defined context, and (3) include linkage between past and future experiences. The Experiential-based Action Model consists of five key stages: Focus, Current Conditions, Personal Involvement, Taking Action, and Feedback.

Several preliminary steps should be taken before developing Standards-driven EBAM units.

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* Brainstorm with colleagues and students to identify specific content and concepts (what students should know and understand), processes (what students should be able to do), and products (what students should produce to demonstrate knowledge and skills).
* Make sure the products or culminating performance tasks are:
  - standards-driven: tasks relate to national and state academic standards and local curriculum guidelines

- challenging: tasks ask students to show their "know how" on something important and challenging, not just their knowledge.
- authentic: tasks allow students to pursue authentic solutions to a relevant problem, challenge, or issue
- feasible: tasks are worthy of the time and effort required to complete it
- thought-provoking: tasks require students to use complex thinking skills (e.g., critical/creative thinking, decision-making, problem-solving)
- experiential-based: tasks provide a constructivist outlet for students to explore and resolve a problem, issue, or challenge under investigation.

* Defining the culminating performance task for the EBAM unit is **not** a casual activity. Everything students perform in a standards-driven EBAM unit is directed toward successfully completing the culminating performance task, which encapsulates the academic standards. Student-based questions derived from the culminating performance task should inspire and energize the learner to want to learn and perform at the highest possible level. It is, therefore, essential that the culminating performance task as well as the learning experiences linked to this task be developed, selected, or refined based on the experiential needs of the learner.
* Once the culminating performance task has been defined, select/design student experiences for each stage of the Experiential-based Action Model (EBAM) that will authentically move students from Awareness to Action relating to the pertinent problem, challenge, or issue embedded in the culminating performance task.
For the purposes of this Standards-driven, EBAM unit on recycling, the culminating performance task will be as follows:
Students will plan, organize, and carry out an action plan that addresses the issue of waste disposal practices at home, at school, and throughout the community. This task will be designed to answer the essential question: Can the amount of trash destined for the landfill be significantly reduced?

Focus

Purpose

Focus activities develop awareness of an overall topic or theme and motivate students to learn more about related issues that are also current and relevant.

Key Components - Questions for Students to Ask

* Does a problem exist?
* What is the problem?
* How important is the problem?
* Does the problem affect me personally?
* Why should I be studying this topic?

Learning Process Skills

* Observing
* Recognizing
* Responding

Types of Activities/Products

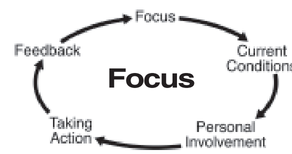
* Experiments
* Graphic Organizers
* Discrepant Events Investigations
* Demonstrations
* Literature Interpretations
* Surveys
* Field Trips
* Newspaper, Music, Cartoon Reviews

Questions to Consider Before Adding a Focus Activity

* Does the activity help students elicit challenging and thoughtful questions related to the problem or theme?
* Does the activity integrate technology purposefully and authentically?
* Does the activity establish linkage or connection between the student and the problem?
* Does the activity move students from Awareness to Action?
* Does the activity address the pertinent concepts, processes, and theme(s)?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

Focus

(Synonym: Awareness - Vigilance in observing or alertness in drawing inferences from what one experiences.)



The focus section motivates students to learn more about current, relevant issues and/or problems embedded in the culminating performance task. Focus activities are powerful events that unlock students' natural fascination and intrinsic motivation. Generating student questions and arriving at a problem definition are essential components of this stage.

* Select appropriate focus activities (e.g., surveys, observations, demonstrations, literature interpretations, experiments, field trips, discrepant events) that address anticipated student questions relating to the content and concepts encased in the culminating performance task:
  Anticipated Student Questions:
  - Does a problem related to this topic exist?
  - What is the problem?
  - How important is the problem?
  - Does the problem affect me personally?
  - Why should I want to study this topic?
* Make sure Focus activities address the anticipated student questions.
* Make sure Focus activities retain the following characteristics:
  - Relate continuously and consistently back to the selected topic(s), theme(s), and/or culminating performance task.
  - Integrate several content areas or disciplines (e.g., science, math, social studies, language arts).
  - Allow for data collection, tabulation, and analysis of information.
  - Allow for hands-on investigations inside or outside the classroom.
  - Promote formation of a problem definition
  - Allow for use of computer-based tools (e.g., spreadsheets, graphs, word processors, databases, Internet, multimedia).
* After selecting focus activities, think through additional student questions that students might ask. These questions should stem from the focus activities and relate directly to the culminating performance task. These anticipated student questions serve as a data

source (along with teacher-based questions) for selecting learning activities for the next stage, Current Conditions.

* List relevant and meaningful teacher-based questions (i.e., questions that students do not often asked due to a lack of background knowledge on the topic). Teacher-based questions should relate to the critical content and concepts associated with the problem, issue, or challenge embedded in the culminating performance task. The depth and breadth of the questions may stimulate more than are practical within a single instructional unit. If necessary, narrow or combine some of the questions into a new set of questions that would fit the parameters of the current instructional unit.

Note: Using key words will also help to define significant content and concepts to be investigated in the next stage.

Following is a sample focus activity (Visiting landfill site to determine problem and implications) based on the student- based question, "What is the problem with landfills?" that will help students define the problem embedded in the culminating performance task (i.e., improving local waste disposal practices).

Focus Examples

Topic/Content:

* Recycling
    - Problem Definition

Theme/Concept:

* Cycle

Data Source:

* Student-based questions

Questions:

* What is the problem with landfills?

Activities:

* Visit landfill site to determine the problem and implications.

Current Conditions

Purpose

Current Conditions activities provide investigations and experiences to help students understand the magnitude of the problem and its relevancy to the overall topic or theme.

Key Components - Questions for Students to Ask

* How big is the problem?
* What does the problem look like?
* What do I already know?
* What do I need to know to understand the problem?
* How do I know a problem exists?

Learning Process Skills

* Comparing
* Classifying
* Analyzing

Types of Activities/Products

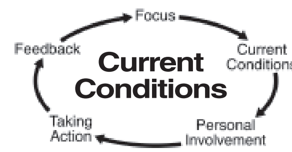
* Interviews
* Surveys
* Demonstrations
* Book Reports
* Class Discussions
* Internet Searches
* Field Investigations
* Case Studies
* Library/Media Research
* Experiments
* Journal Writing

Questions to Consider Before Adding a Current Conditions Activity

* Does the activity help students consider different perspectives related to the problem or theme?
* Does the activity integrate technology purposefully and authentically?
* Does the activity help students understand the magnitude of the problem under consideration?
* Does the activity move students from Awareness to Action?
* Is the introduction of a new concept, process, and/or theme connected directly or indirectly to the problem under consideration?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

Current Conditions

(Synonym: Exploration - The act of investigating, studying, or analyzing something.)



Student investigations and learning experiences at this stage help students find answers to the previously developed student- and teacher-based questions. Current Conditions activities address the magnitude of the problem, challenge, or issue under investigation and are linked to the culminating performance task.

Begin the Current Conditions section by considering its overall direction. Remember that Current Conditions activities provide students with the background knowledge, conceptual understanding, and skill development to investigate all aspects of the problem under investigation. Use the anticipated student- and teacher-based questions to select Current Conditions activities.

* Make sure the activities (e.g., experiments, surveys, field investigations, Internet research) address the following key student-based questions:

  Anticipated Student-based Questions
  - How big is the problem?
  - What does the problem look like?
  - What do I already know?
  - What do I need to know to understand the problem?
  - How do I know a problem exists?
* Make sure the selected Current Conditions activities retain the following characteristics:
  - Relate continuously and consistently back to the selected topic(s), theme(s), and/or culminating performance task.
  - Integrate several content areas or disciplines (e.g., science, math, social studies, language arts).
  - Allow for data collection, tabulation, and analysis of information.
  - Allow for hands-on investigations inside or outside the classroom.
  - Promote different perspectives related to the problem.
  - Allow for use of computer-based tools (e.g., spreadsheets, graphs, word processors, databases, telecommunications, multimedia).
* Select appropriate instructional technologies and materials that:
  - most efficiently address the desired outcomes.

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- encourage higher order thinking skills.
- are cost effective.
- are accurate, up-to-date, and unbiased (in the case of materials).

* Review the unit. Check to see if:
  - a variety of activities and strategies are included.
  - students of all ability levels will be appropriately challenged and actively engaged.
  - the individual activities relate to essential content and the development of the concepts.

Following is a sample Current Conditions activity (e.g., conducting home trash survey) based on the anticipated student-based questions (e.g., How much trash does the average home generate?) that will help students explore the magnitude of the problem embedded in the culminating performance task (improving local waste disposal practices).

Current Conditions Examples

Topic/Content:

* Recycling
  - Impact of trash problem
  - Dichotomous grouping of trash
  - Properties of recyclable trash

Theme/Concept:

* Cycle

Data Source:

* Student-based questions
* Teacher-based questions (National Standards)

Questions:

* How much trash does the average home generate?
* What kind of trash causes the greatest problem?
* How do people impact ecosystems?

Personal Involvement

Purpose

Personal Involvement activities help students identify, structure, modify, and defend solutions to the problem under investigation through the use of organizational tools and analytical strategies.

Key Components - Questions for Students to Ask

* How can the problem be fixed?
* What are the most workable solutions?
* Why are these the most workable solutions?

Learning Process Skills

* Evaluating
* Synthesizing
* Making inferences
* Communicating

Types of Activities/Products

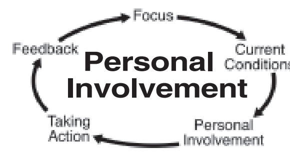
* Experiments
* Case Studies
* I-Search Papers
* Trial and Error
* Surveys
* Field Investigations
* Inquiry Letters
* Model Buildings
* Feasibility Studies
* Debates

Questions to Consider Before Adding a Personal Involvement Activity

* Does the activity integrate technology purposefully and authentically?
* Does the activity promote students' use of the pertinent concepts and processes used to explore solutions to the problem?
* Does the activity move students from Awareness to Action?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

Personal Involvement

(Synonym: Solutions - The action or process of solving a problem.)



In this section, students are given organizational tools and analytical strategies to help them identify, structure, modify, and defend potential solutions to the problem under investigation. At the Personal Involvement stage, students apply the content, concepts, and processes introduced/reviewed in the Current Conditions section toward designing their "product" relating to the culminating performance task.

* Plan student-directed investigations (e.g., experiments, case studies, I Search Papers, Trial and Error, Field Investigations, feasibility studies, inquiry letters) that address the following key student-based questions:

  Anticipated Student-based Questions
  - How can the problem be fixed?
  - What are the most workable solutions?
  - Why are these the most workable solutions?
* Make sure investigations address possible solutions to the problem, challenge, or issue embedded in the culminating performance task and retain the following characteristics:
  - Allow for analysis and synthesis of information.
  - Provide opportunities for student decision-making.
  - Allow students to defend their decision(s)/solution(s).
* Select appropriate instructional technologies and materials that:
  - most efficiently address the desired outcomes.
  - encourage higher order thinking skills.
  - are cost effective.

Following is a sample Personal Involvement activity (e.g., designing and conducting composting experiment) based on the anticipated student-based question (e.g., How can we fix the problem?) that will help students develop viable solutions to the problem embedded in the culminating performance task (improving local waste disposal practices).

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Personal Involvement Examples

Topic/Content:

* Recycling
  - Earth's natural cycles
  - Waste disposal solutions through natural cycles
  - Effects of cycles in ecosystem on humans

Theme/Concept:

* Cycle

Data Source:

* Teacher-based questions (State Framework)
* Student-based questions
* Teacher-based questions (National Standards)

Questions:

* What are the earth's natural cycles?
* How can we fix the problem?
* What is the most workable solution?
* How do cycles in ecosystems effect humans (e.g., waste disposal solution)?

Activities:

* Design and conduct experiments using natural cycles that could provide a solution to waste disposal problems (e.g., with earthworms, compost).
* Defend a workable solution.

Taking Action

Purpose

Taking Action activities provide directions and strategies to help students put their solutions into action on a local, regional, and/or national basis.

Key Components - Questions for Students to Ask

* What does my action plan look like?
* Will my plan of action work?
* Does my action plan address the problem?
* Can I do it?

Learning Process Skills

* Applying
* Decision-Making
* Valuing
* Communicating

Types of Activities/Products

* Action Plans
* Petitions
* Inventions
* Letters
* Volunteering
* Patents
* Fund-Raisers
* Flyers
* Proposals

Questions to Consider Before Adding a Taking Action Activity

* Does the proposed action plan address the problem under investigation?
* Does the proposed action plan integrate technology purposefully and authentically?
* Does the proposed action plan address the pertinent concepts, processes, and theme(s)?
* Does the proposed action plan provide a natural pathway to the other stages of the Experiential-Based Action Model?

Taking Action

(Synonym: Action - The accomplishment of a thing usually over a period of time.)

This stage provides students with directions for putting their solutions relating to the culminating performance task into action. The depth and breadth of the "Taking Action" stage is only limited by the imagination of the students. For the recycling unit, community recycling campaign, school fund- raiser, or inventing a new type of biodegradable containers, are examples of a few projects that "put into action" authentic solutions relating to the culminating performance task:

> *Students will plan, organize, and carry out an action plan that addresses the issue of waste disposal practices at home, at school, and throughout the community.*

These projects can be accomplished in class or as part of an out-of-class assignment.

* Identify possible products. Determine what should be invented, written, spoken about, or manufactured that relates directly back to the Personal Involvement experiences and the culminating performance task.
* Develop "Taking Action" activities that address the following student questions:
    Anticipated Student-based Questions:
    - What does the action plan look like?
    - Does the action plan address the problem?
    - Will the action plan work?
    - Can the action plan be successfully implemented?
* Select resources that promote the desired action (e.g., a variety of construction materials or specific personnel; city mayor, teacher, coach, or parent).

Following is a a sample Taking Action product (e.g., implementing a community composting program) based on potential solutions "discovered" at the Personal Involvement stage that puts into action the culminating performance task (improving local waste disposal practices).

Taking Action Examples

Topic/Content:

* Recycling
  - Community solutions
  - Regional differences

Theme/Concept:

* Cycle

Data Source:

* Student-based questions
* Teacher-based questions (National Standards)

Questions:

* What actions can I take to address the causes of waste management problems in my community?
* Can they be successfully implemented?
* How do the causes of and solutions to environmental degredation vary from region to region?

Activities:

* Develop an Action Plan that identifies the problem, steps toward a solution in the local region, key people involved, and timelines, and includes how the solution might differ in another region. For example, implementing a community composting program.

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Feedback

Purpose

Feedback activities help students identify milestones and quality standards so they can monitor their progress toward the attainment of specific goals.

Key Components - Questions for Students to Ask

* Did I use concepts and content to understand the problem or issue?
* Did I use appropriate investigation/problem solving processes to identify workable solutions?
* Did the products I produced and processes I used meet quality standards?

Learning Process Skills

* Evaluating
* Exploring
* Predicting

Types of Activities/Products

* Daily Journals
* Self Assessment
* Experiments
* Open-ended Problem-Based Questions/Investigations
* Oral Presentations
* Full Length Compositions
* Peer Review
* Electronic Portfolio

Questions to Consider Before Adding a Feedback Activity

* Does the activity assess the students' "can do" performance?
* Does the activity integrate technology purposefully and authentically?
* Does the activity assess the merits of the students' action plans related to the problem under investigation?
* Does the activity assess students' understanding of the pertinent concepts, processes, and theme(s)?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

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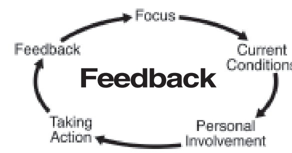
Feedback

(Synonym: Evaluation - The act of assessing the significance, worth, or value of an accomplishment)



The Feedback stage brings the five phase Experiential-based Action Model full-cycle. Although Feedback is identified as the fifth stage, assessment is an on-going process within each of the stages of the EBAM unit (e.g., Current Conditions, Personal Involvement, Taking Action). In the assessment process, the teacher and students collect evidence and document student success based on state and local academic standards.

Performance-based assessment allows students to gauge their progress toward meeting predetermined standards of quality as articulated in state and local academic standards. Performance is assessed by teachers, student (during self assessment) and sometimes by other students using pre-defined scoring guides or rubrics.

* Identify whether group and/or individual assessment is appropriate.
* Identify content, processes and products to be assessed and appropriate methods. For example:
    - in "Current Conditions" activities, significant areas of content are taught. Content can be assessed through performance based open-ended questions that require students to use past knowledge and skills to demonstrate their understanding of the problem.
    - in "Personal Involvement" activities, processes are an important element. Here the processes used to collect and analyze data and the components of experimental design can be assessed.
    - in "Taking Action" activities, products embedded in the culminating performance task such as action plans, letters, flyers, and proposals are important elements. Assessment criteria not only can assess the content and processes encased in the student products, but can also assess how well the action plan relates to the ‘problem and how well the plan worked.

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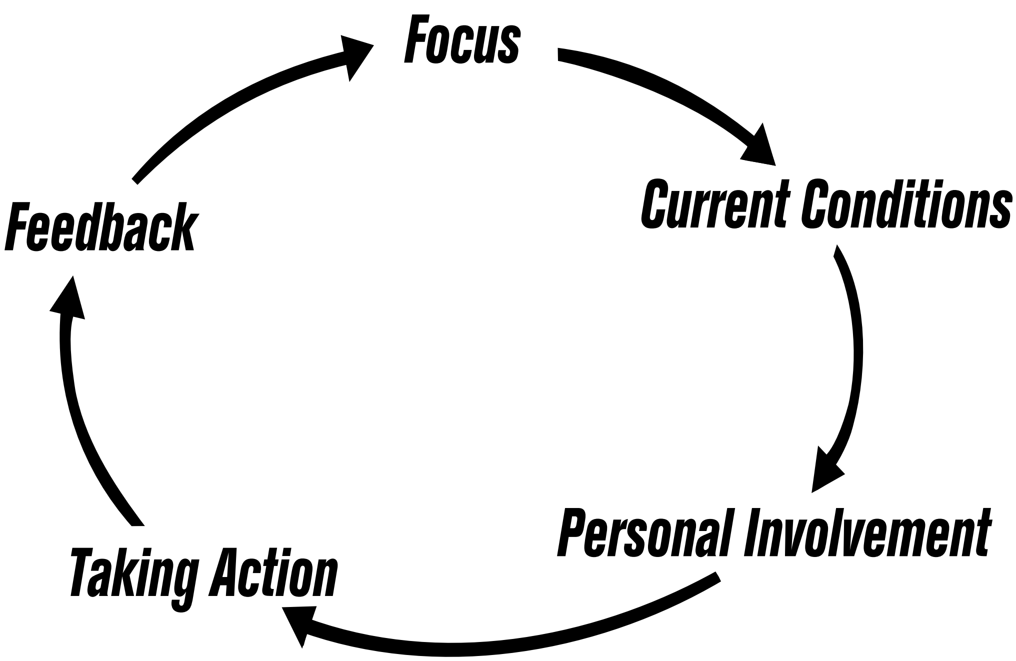
Standards-driven Curriculum Modules that Emphasize Technology, Relevancy, and Student Activism Notes

What do I need to successfully grow a plant?

Grade Level........... *Early Childhood*
Duration................. *2-3 Months*
Submitted by .... *Maria Lopez*

The Experiential-based Action Model

The Experiential-based Action Model is a five-step process designed to pique student academic performance while addressing critical content standards and promoting experiential learning, constructivist teaching, and authentic technology integration.



EBAM

EBAM Outline

What do I need to successfully grow a plant?

Early Childhood

Purpose:
To understand the importance of contributing to the community via community improvement projects.

Duration:
2 to 3 months

Content Standards:
Math:
- Using pictures, symbols, and/or vocabulary to convey the path to the identified solution
- Interpreting the concepts of the task and translating them into mathematics

Science:
- Conduct procedures to collect, organize, and display data
- Analyze results to develop conclusions

Social Studies:
- Describe how human environment relationships develop and evaluate the consequences for people and for their environment

Language Arts:
- Take notes or create graphics related to reading

Discrete Thinking Operations:
- Translating/interpreting information
- Examining component parts or elements (e.g., of structures, systems, different perspectives, errors)
- Comparing/contrasting
- Classifying

Complex Thinking Skill Strategies:
- Creative problem-solving
- Decision-making
- Reasoning
- Experimental inquiry
- Investigation

Culminating Performance Task (Student Product):
Students will build a garden for the school and get other classrooms involved in an effort to promote community improvement projects.

Task description by Model Phase:

Focus:

(Synonym: Awareness - Vigilance in observing or alertness in drawing inferences from what one experiences.)

- Does a problem related to this topic exist?
- What is the problem?
- How important is the problem?
- Does the problem affect me personally?
- Why should I want to study this topic?

Activity #1:

Bring in two plants. One is healthy and one is dying. Compare and contrast both plants. Ask each student, "What do you think is wrong with this plant?" Graph student answers to the oral survey. Students discuss what they think the best solution is for the dying plant based on the survey results. Students participate in another oral survey/vote. Which plant would you want to eat tomatoes from? Discuss why. Chart answers to questions in a spreadsheet/graph program.

Technology Integration: Using spreadsheets and graphs to analyze survey data about plants.

Activity #2:

Bring in some plant seeds. Sort seeds by color, structure, texture, shape, and/or size. Graph the differences between different types of seeds.

Technology Integration: Using spreadsheets and graphs to compare seed data.

Activity #3:

Demonstrate living things from non-living things.

Activity #4:

Read *Carrot Seed*.

Activity #5:

Sing the song *In my Garden*.

Possible Student Questions:

- What types of plants can we grow?
- How do I grow a healthy plant?
- Can the types of plants we choose for our garden complement one another?
- What does the life cycle of a plant look like?

Current Conditions:

(Synonym: Exploration - The act of investigating, studying, or analyzing something.)

- How big is the problem?
- What does the problem look like?
- What do I already know?
- What do I need to know to understand the problem?
- How do I know a problem exists?

What do I need to successfully grow a plant?

EBAM Outline

Early Childhood

What do I need to successfully grow a plant?

Activity #1:

Survey the whole class to determine students opinions about which of the seeds they think will grow (a) in water and soil without light, (b) in soil and light without water, (c) in soil and water with light, and (d) in light with water, but without soil.

Technology Integration: Using spreadsheets and graphs to analyze survey results.

Activity #2:

Conduct experiments about which seeds will grow in which conditions. Have students document and illustrate observations in a plant log book on Monday, Wednesday, and Friday for two weeks.

Technology Integration: Using spreadsheets and graphs to analyze plant growth data.

Activity #3:

Students use the same survey questions about growing conditions from Activity #1 and survey 10 people at home or in the community.

Activity #4:

Draw a picture chart of the plant life cycle. Draw a picture chart of seed development.

Activity #5:

Living things have features that help them survive. Observe, compare, and contrast various seeds. Explain how shape helps them to be distributed.

Technology Integration: Using word processing programs to write explanations.

Activity #6:

Students bring different seeds from home. In groups of 4, they decide on one way to sort their seeds and explain to the class why they decided to sort them that way.

Activity #7:

Demonstrate how water travels up the stem to the different parts of the plant. Use a daisy and a stalk of celery in colored water. Students can predict what will happen.

Personal Involvement:

(Synonym: Solutions - The action or process of solving a problem.)

- How can the problem be fixed?
- What are the most workable solutions?
- Why are these the most workable solutions?

Activity #1:

Students use the internet and class discussions to learn about the plant life cycle. Students will illustrate and write their own sequence of the plant life cycle.

Technology Integration: Using the internet to research the plant life cycle.

Activity #2:

Students will work with a partner to dissect a seed and identify the different developing parts of the seed. They will draw and label each part.

Activity #3:

Students will grow their own pinto bean plants. Use a plastic baggy to observe the developmental stages of the seed. Once the stem has reached about two inches in height, transfer it to a pot. Students will use a different log book to document information about their own plant. They will measure the plant with cubes each Monday for a month.

Technology Integration: Using spreadsheets and graphs to analyze bean growth data.

Activity #4:

Take a walk around the school or have students bring in a couple of leaves from home. Compare and contrast the differences. Use the leaves for a leaf rubbing.

Activity #5:

Students create a still life painting of some flowers.

Activity #6:

Students create a seed mosaic.

Taking Action:

(Synonym: Action - The accomplishment of a thing usually over a period of time.)

- What does the action plan look like?
- Does the action plan address the problem?
- Will the action plan work?
- Can the action plan be successfully implemented?

Activity #1:

Students form small groups and decide what to plant in the school garden. Students determine how to care for their plants.

Activity #2:

Students go to other classrooms and ask them to also plant in the school garden.

Feedback:

(Synonym: Evaluation - The act of assessing the significance, worth, or value of an accomplishment)

- Did I use concepts and content to understand the problem or issue?
- Did I use appropriate investigation/problem solving processes to identify workable solutions?
- Did the products I produced and processes I used meet quality standards?

Activity #1:

Students will discuss, write, and illustrate the conditions that lead to the success of their garden. (Students will demonstrate understanding that living things need resources from environment to live and grow, and an understanding of community enhancement projects.)

What do I need to successfully grow a plant?

EBAM Outline

Early Childhood

Assessment using the following criteria:

- 5 = Thorough Understanding (Exemplary)
- 4 = Ample Understanding (Strong)
- 3 = Partial Understanding (Proficient)
- 2 = Developing
- 1 = Emerging

Plant Survival:

- 5 = Plant survived, is healthy, has grown well.
- 4 = Plant survived, is healthy, but can use more attention and care.
- 3 = Plant survived, but is not healthy, some withering, needs to be watered
- 2 = Plant has withered, only little life left
- 1 = Plant died

Analysis/Cooperation:

- 5 = Worked well together to objectively identify problems, analyze and record solutions, came up with many solutions
- 4 = Worked well together, used to objectivity to identify problems, analyze and record solutions, came up with few solutions
- 3 = Had some difficulty working with others can identify problems, but has really no objectivity
- 2 = Has difficulty identifying problems and coming up with solutions, has difficulty working together has strong bias to one point of view
- 1 = Unable to identify problems and come up with solutions, unable to work together

Spacing:

- 5 = Spacing is accurate with equal measurement between each plant allowing enough space to plant and successfully grow
- 4 = Spacing is clear and accurate, but measurements are not equal between plants
- 3 = Spacing is clear, measurements are not equal, more room is needed for plants to grow
- 2 = Attempted to use spacing, but is not consistent, did not allow enough space, lacks understanding of need for spacing, some plants may be overlapping
- 1 = Unable to space plants, no understanding of need for spacing, plants overlapping

Use of Content and Concepts:

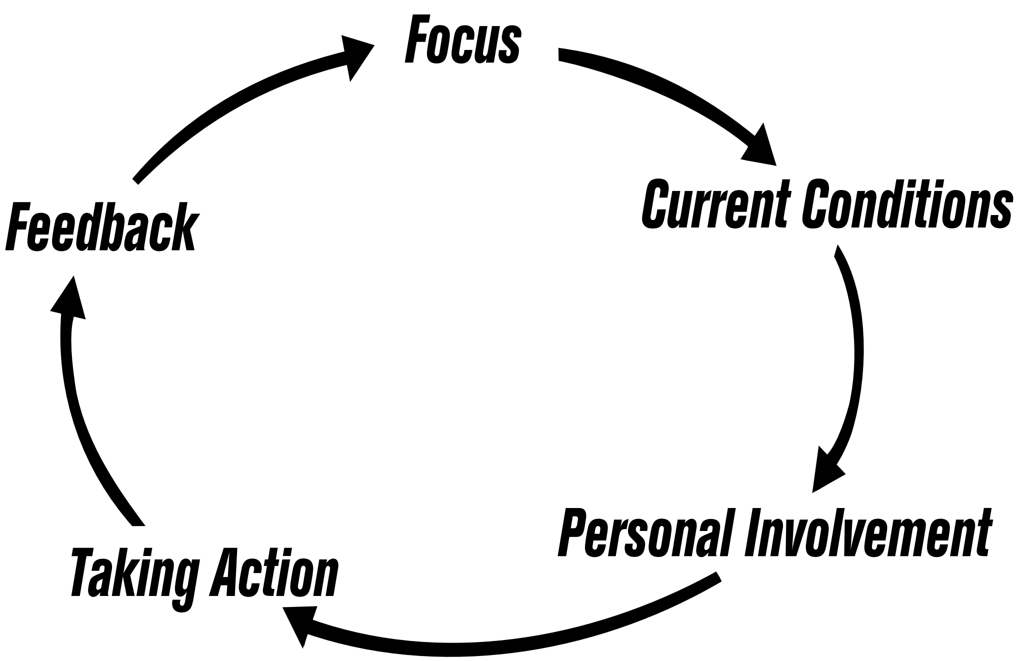
5 = Science content and concepts are accurately and appropriately used in explanations and analysis, they are directly related
4 = Science content and concepts are appropriately used in explanations and analysis, they are related
3 = Science content and concepts are used, but some may not be appropriate or accurate, content is indirectly related to scientific concepts
2 = Scientific content and concepts are not used accurately or appropriately, content is not related to scientific concepts
1 = Scientific concepts are omitted, content not related to scientific concepts

Ecosystems

Grade Level........... *Elementary*
Duration................. *1-2 Months*
Submitted by .... *Kristi Maruno, Marcia Murakami, and Cheryl Sato*

The Experiential-based Action Model

The Experiential-based Action Model is a five-step process designed to pique student academic performance while addressing critical content standards and promoting experiential learning, constructivist teaching, and authentic technology integration.



EBAM

EBAM
Outline

Ecosystems

Elementary

Purpose:
To implement an integrated, thematic unit addressing man's interdependence with the ecosystem.

Duration:
1 to 2 months

Content Standards:
Math:
- Solve real life problems using statistics and probability
- Make inferences based on data analyses
- Collect, organize, and describe data using a systematic approach

Science and Technology:
- Demonstrate competent use of word processor, database, and spreadsheet
- Analyze, infer, evaluate, and discuss findings with clarity in oral, written, or graphic format

Social Studies:
- Describe and discuss the causes, consequences, and possible solutions to contemporary concerns such as health, security, economic development, and environmental quality
- Understand our basic economic system as it relates to personal financial planning

Language Arts:
- Demonstrate knowledge, response, and experience with a subject through writing
- Demonstrate ability to prepare and deliver an effective formal speech

Discrete Thinking Operations:
- Translating/interpreting information
- Examining component parts or elements (e.g., of structures, systems, different perspectives, errors)
- Comparing/contrasting
- Making judgments about value - refuting/supporting claims/arguments
- Demonstrating knowledge and skills

Complex Thinking Skill Strategies:
- Creative problem-solving
- Decision-making
- Reasoning
- Experimental inquiry
- Investigation

Culminating Performance Task (Student Product):
Students will design an action plan that addresses a potential problem within Oahu's ecosystem.

Task description by Model Phase:

Focus:

(Synonym: Awareness - Vigilance in observing or alertness in drawing inferences from what one experiences.)

- Does a problem related to this topic exist?
- What is the problem?
- How important is the problem?
- Does the problem affect me personally?
- Why should I want to study this topic?

Activity #1 - Food chain game:

Children will simulate the ocean food chain. They will be divided into three groups; zooplankton, small fish, and big fish. Each group will be given a chance to feed. At the end of the round, the number of survivors will be recorded. They will continue to feed for several rounds. Differences in population will be recorded and analyzed by inputting the data into a spreadsheet and graphing the results.

Technology Integration: Using spreadsheets and graphs to analyze simulation results.

Activity #2 - Build a mini-ecosystem:

Students will discuss, research, plan, illustrate, and build a mini-ecosystem which contains water, fish, plants, and soil. They will use various non-living materials (containers, rocks, cups, etc.) in their mini-ecosystem. They will be challenged to keep their system balanced.

Possible Student Questions:

- How will I build a balanced ecosystem?
- What does the human food chain look like?
- What can I do to ensure the survival of my ecosystem?
- What affect do I have on my own ecosystem?

Current Conditions:

(Synonym: Exploration - The act of investigating, studying, or analyzing something.)

- How big is the problem?
- What does the problem look like?
- What do I already know?
- What do I need to know to understand the problem?
- How do I know a problem exists?

Activity #1 - Mini-lesson:

Students will be given a mini-lesson on how to collect data and take notes. They will formulate a template for everyone to use. An official class recorder will then type up a template for note taking/data collection.

Activity #2 - Field investigations:

Students will note and analyze daily changes and conditions of their ecosystem. Data will be entered by the official class recorder. Needed graphs will be generated to determine the reasons for daily changes.

Technology Integration: Using spreadsheets and graphs to analyze ecosystem conditions.

Activity #3 - Rebuilding the ecosystem:

Based on the notes, data collected, and student research, students will be given the opportunity to rebuild and improve their ecosystem. Performing internet searches or looking up information in the encyclopedia will aid students in reworking their ecosystem.

Technology Integration: Using the internet for information gathering.

Activity #4 - Change the variables within each ecosystem:

Each group will change one variable (temperature, population, density, and/or nutrient content) in their ecosystem. They will gather information to determine how each variable affects the balance of each ecosystem. The class recorder will input data into a spreadsheet and each student will graph their own results.

Technology Integration: Using spreadsheets and graphs to analyze ecosystem conditions after adding variable.

Activity #5 - Adjust your ecosystem:

Make appropriate adjustments/corrections to each ecosystem based on the data to increase the survival rate of all living things.

Personal Involvement:

(Synonym: Solutions - The action or process of solving a problem.)

- How can the problem be fixed?
- What are the most workable solutions?
- Why are these the most workable solutions?

Activity #1 - Do some research:

Students will research Oahu's ecosystem via the internet and determine how it affects them.

Technology Integration: Using the internet to research Oahu's ecosystem.

Activity #2 - Take a field trip:

Students will take a walking field trip around their school to see examples of actual mini-ecosystems.

Activity #3 - Create a slideshow:

Students will report on how their ecosystem affects their daily life based on what they've learned via a HyperStudio or PowerPoint presentation.

Technology Integration: Using presentation software to convey information.

Activity #4 - Identify some problems:

Identify examples or conditions of where our island ecosystem is being downgraded or compromised.

Taking Action:

(Synonym: Action - The accomplishment of a thing usually over a period of time.)

- What does the action plan look like?
- Does the action plan address the problem?
- Will the action plan work?
- Can the action plan be successfully implemented?

Activity #1 - Culminating performance task:

Develop a personal action plan of what each child will do to help sustain and improve Oahu's ecosystem. Plans will be presented to community members to encourage everyone to be more aware of how fragile the ecosystem is and its importance to man and all living things in the form of HyperStudio or PowerPoint presentations. The entire class' presentations will be burned onto a CD for community distribution.

Feedback:

(Synonym: Evaluation - The act of assessing the significance, worth, or value of an accomplishment)

- Did I use concepts and content to understand the problem or issue?
- Did I use appropriate investigation/problem solving processes to identify workable solutions?
- Did the products I produced and processes I used meet quality standards?

Assessment using the following criteria:

Exemplary = Work is exceptional and memorable. It shows a sophisticated application of knowledge and skills.

Strong = Work exceeds standards. It shows thorough and effective application of knowledge and skills.

Proficient = Work has met the standards relating to the application of essential knowledge and skills. Minor errors do not detract from overall quality.

Developing = Student has not yet met the standard. Work shows basic, but inconsistent application of knowledge and skills.

Emerging = Work shows a partial application of knowledge and skills. It is superficial, fragmented, or incomplete and needs considerable development. Work at this level contains errors or omissions.

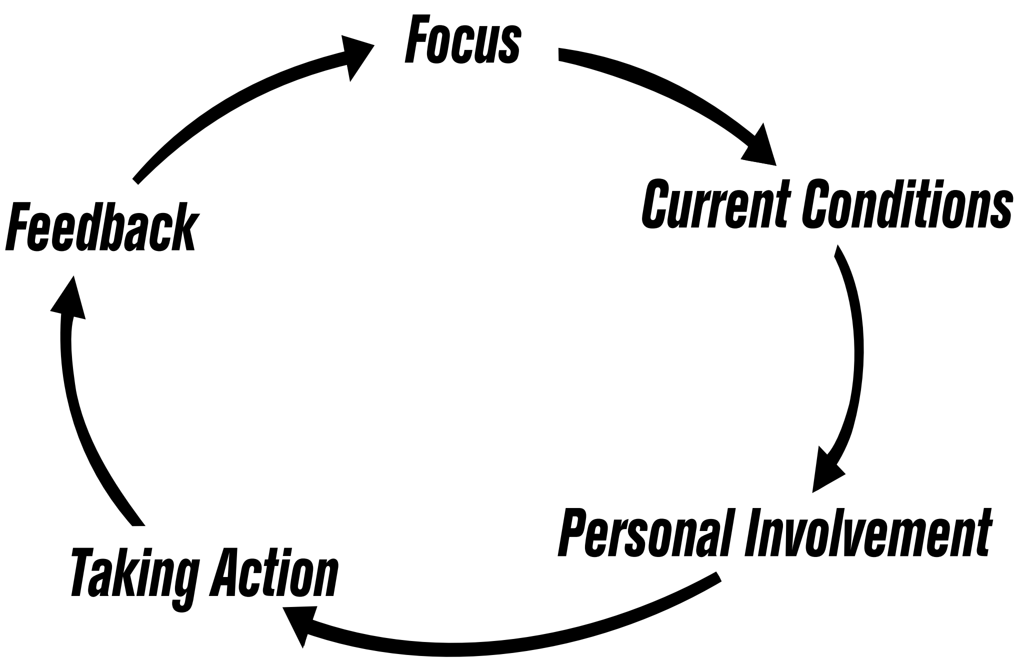
Beginning = Work shows little or no application of knowledge and skills. It contains major errors or omissions.

Ka Honua Maoli: Real World 2013

Grade Level........... *Middle School*
Duration................. *2-3 Months*
Submitted by .... *Iris Clyne*

The Experiential-based Action Model

The Experiential-based Action Model is a five-step process designed to pique student academic performance while addressing critical content standards and promoting experiential learning, constructivist teaching, and authentic technology integration.



EBAM

EBAM Outline

Ka Honua Maoli

Real World 2013

Middle School

Purpose:
To implement an integrated, thematic unit addressing (1) the life skills of decision-making and problem-solving, (2) the value of education, and (3) career exploration.

Duration:
2 to 3 months

Content Standards:
Math:
- Solve real life problems using statistics and probability
- Make inferences based on data analyses
- Collect, organize, and describe data using a systematic approach

Science:
- Demonstrate competent use of word processor, database, and spreadsheet
- Analyze, infer, evaluate, and discuss findings with clarity in oral, written, or graphic format

Social Studies:
- Describe and discuss the causes, consequences, and possible solutions to contemporary concerns such as health, security, economic development and environmental quality, especially in island communities
- Understand our basic economic system as it relates to personal financial planning

Language Arts:
- Demonstrate knowledge, response, and experience with a subject through writing
- Demonstrate ability to prepare and deliver an effective formal speech

Discrete Thinking Operations:
- Demonstrating knowledge and skills
- Translating/interpreting information
- Examining component parts or elements (e.g., of structures, systems, different perspectives, errors)
- Comparing/contrasting
- Making judgments about value - refuting/supporting claims/arguments
- Recombining elements and parts into a new whole

Complex Thinking Skill Strategies:
- Creative problem-solving
- Decision-making
- Reasoning
- Reflective thinking

Culminating Performance Task (Student Product):
Students will provide a Personal Life Action Plan including:
- Career choices
- Educational plan
- Family plan
- Financial plan
- Optional plans: community involvement, wellness

Students will give a Group Presentation to a Community Panel including:
- Oral Presentation that includes (1) an analysis of project experiences and (2) individual presentation of conclusions and application to personal life action plans.

Students will also assess their project electronically on the school web page.

During the life simulation, your group will be "dealt" different cards containing predicaments that must be addressed during the course of one's life such as child rearing, marriage, career moves, accidents, as well as changing goals. Your final "Action Plan" newsletter must show the following:
- Your analysis and problem solving for your life situation
- All computations and data analysis where appropriate or useful
- A summary showing what you learned from the simulation
- A personal action plan describing your own personal goals and strategies to accomplish these goals

Task description by Model Phase:

Focus:
(Synonym: Awareness - Vigilance in observing or alertness in drawing inferences from what one experiences.)
- Does a problem related to this topic exist?
- What is the problem?
- How important is the problem?
- Does the problem affect me personally?
- Why should I want to study this topic?

Activity #1:
Class Reunion Information Survey

Activity #2:
Show video: Peggy Sue Got Married

Activity #3:
Will it be you? Students receive random life information regarding education, income level, marital status, etc.

Possible Student Questions:
- What will I be like in the future?
- Will I be able to afford the lifestyle I'm accustomed to?
- Can I control the outcome of my life?
- Will the simulation meet my expectations?
- Is my life action plan going to be viable?

Ka Honua Maoli

Real World 2013

EBAM Outline

Middle School

Current Conditions:

(Synonym: Exploration - The act of investigating, studying, or analyzing something.)

- How big is the problem?
- What does the problem look like?
- What do I already know?
- What do I need to know to understand the problem?
- How do I know a problem exists?

Week #1

Activity #1 - Live with the cards you're dealt:

Task 1 - Identify job possibilities; apply for a job

Technology Integration: Using the internet for information gathering on potential jobs.

Task 2 - Make up an individual or family-based budget based on job salary

Technology Integration: Using spreadsheets and graphs to plan budget.

Task 3 - Find affordable day care if necessary

Technology Integration: Using the internet for information gathering on day care.

Week #2

Activity #2 - Housing:

Task 1 - Using $1000 and six months of your salary, find a place to rent

Technology Integration: Using the internet for information gathering on potential places to live.

Task 2 - Determine housing budget including utilities and other housing costs

Technology Integration: Using spreadsheets and graphs to plan budget.

Week #3

Activity #3 - Transportation and food:

Task 1 - How will you get to work? Find some affordable wheels.

Technology Integration: Using the internet for information gathering on purchasing a car.

Task 2 - Determine transportation budget including (1) loan payments, (2) car insurance, (3) maintenance and repairs, and (4) gas and weekly mileage

Technology Integration: Using spreadsheets and graphs to plan budget.

Task 3 - Plan a weekly food menu for your family that is balanced and includes the weekly food groups

Technology Integration: Using calender software for meal planning.

Task 4 - Look through the grocery store and newspaper ads for food prices; deter mine a monthly food budget

Technology Integration: Using spreadsheets and graphs to plan budget.

Task 5 - Complete your monthly budget by including health insurance, clothing, entertainment, and miscellaneous; calculate your monthly savings from the "leftovers"

Technology Integration: Using spreadsheets and graphs to plan budget.

Week #4

Activity #4 - Good News/Bad News:

Students will be thrown random "wrenches" (e.g., car breaks down, laid off work, child car increase, eviction notice, vacation, promotion) and will have to problem solve and make decisions regarding aspects of their life such as getting to work, doing your job, relating to friends, paying bills, saving money, self respect, and community standing

Task 1 - Transportation Wrench

- If your car costs under $1000, your vehicle will blow a head gasket and cost $1000 to repair
- If your car costs $1000-$2500, your safety inspection sticker expires; you get a $25 ticket and have to pay $500 to repair your muffler
- If your car costs $2500-$5000, your car needs $1000 worth of repair, but someone has offered to buy it for what you paid for it
- If your car costs over $5000, you got a flat tire on the way to work and were l late; while on the roadside, someone breaks into your car; total cost is $600

Week #5

Activity #5 - Health Wrench:

Task 1 - If you bought alcohol with your budget, roll the dice

- If you rolled a 1, you were convicted of a DUI (1st offense), are fined $200, and sentenced to 20 hours of community service and 2 weeks of alcohol counseling.
- If you rolled a 2, your license was revoked for a 2nd DUI, you are fined $500, and sentenced to 40 hours community service and 3 weeks of alcohol counseling.
- If you rolled a 3, you wrecked your call while driving drunk and it will cost $3000 to repair it; your are convicted of a DUI (1st offense), are fined $200, and sentenced to 20 hours of community service and 6 months of alcohol counseling; need time off work to attend sessions resulting in 2% loss of income.
- If you rolled a 4, you are spitting up blood and have alcoholic hepatitis; you are out of work for 2 weeks, then you work only 80% for 6 months while you recover; health care goes up 25% of net income; attend counseling 3 times a week

Task 2 - If you did not buy liquor under your food budget, roll the dice

- If you rolled a 1, your car insurance discounts your rate 30% for good driving and your HMO discounts your rate 25% for superb health.
- If you rolled a 2, you have been working 80% of time and are now moved to full time, increasing your net income by 20%.
- If you rolled a 3, you are given a plaque, $500, and a 2.5% pay raise based on excellent performance at work.

Week #6

Activity #6 - 10 years later:

Task 1 - During this week, people graduate from college, find new jobs, get raises, have babies, lost jobs, get promotions, etc. Each family unit will use an electronic concept map to project what your simulated life will become in 10 years. Explain why you made the decisions you did.

Technology Integration: Using concept-mapping software such as Inspiration or CMAP to map out the future.

Ka Honua Maoli

Real World 2013

Personal Involvement:

(Synonym: Solutions - The action or process of solving a problem.)

- How can the problem be fixed?
- What are the most workable solutions?
- Why are these the most workable solutions?

Week #7

Activity #1 - Drawing Conclusions:

Task 1 - Students reflect on what they learned in the simulation and begin to apply what they've learned to their own life plan

Taking Action:

(Synonym: Action - The accomplishment of a thing usually over a period of time.)

- What does the action plan look like?
- Does the action plan address the problem?
- Will the action plan work?
- Can the action plan be successfully implemented?

Week #8

Activity #1 - Development of Personal Life Action Plan newsletter:

Task 1 - Each student will develop an action plan covering career choices, educa tional plan, family plan, financial plan, decision-making plan, community involvement plan, and wellness plan

Technology Integration: Using page layout software such as PageMaker or QuarkExpress to create personal action plan newsletter.

Week #9

Activity #2 - Prepare individual presentation of life plan:

Technology Integration: Using presentation software such as HyperStudio or PowerPoint to create the life plan presentation.

Week #10

Activity #3 - Class Reunion 2013:

Task 1 - Students share Personal Life Action Plan newsletter at class reunion to be held at local hotel (mock of real class reunion). Community members join teachers and students at round tables to reenact their simulated lives and assess student learning. Students celebrate their class reunion with ice breakers, dance, and luncheon. Electronic Porfolio Assessment of key activities on school web site to be viewed.

Technology Integration: Using electronic portfolios and the internet for assessment.

EBAM Outline

Feedback:

(Synonym: Evaluation - The act of assessing the significance, worth, or value of an accomplishment)

- Did I use concepts and content to understand the problem or issue?
- Did I use appropriate investigation/problem solving processes to identify workable solutions?
- Did the products I produced and processes I used meet quality standards?

Middle School

Assessment using the following criteria:

- 5 = Thorough Understanding (Exemplary)
- 4 = Ample Understanding (Strong)
- 3 = Partial Understanding (Proficient)
- 2 = Developing
- 1 = Emerging

Data Analysis:

- 5 = Analysis is complete with no errors in logic. Reasoning is fully explained and justified. Conclusions fully address the questions and are well supported by available data. Provides a clear and comprehensive summary of the reasoning that led to his/her action plan decisions.
- 4-3 = Analysis is incomplete and/or contains some errors in logic. Reasoning is used but stated in general terms with limited explanation or justification. Conclusions address some of the questions or may be only partially justified by available data. Describes the process that led to his/her action plan decisions.
- 2-1 = Analysis is limited or not evident. Reasoning, if attempted, contains significant errors in logic. Conclusions are not directly related to the questions, are not justified by available data, or are not made at all. Student does not present a rationale for his/her action plan selection.

Math Applications:

- 5 = Demonstrates mastery over the process of using "relative numbers" (ratio, proportion, percent) to make comparisons and decisions in a variety of real-world situations. Can compute and translate between fractions, decimals, and percents without error and with little or no conscious effort.
- 4 = Demonstrates a complete understanding of the process of using "relative numbers" (ratio, proportion, percent) to make comparisons and decisions in a variety of real-world situations. Computes and translates accurately.
- 3 = Carries out the process of using "relative numbers" (ratio, proportion, percent) to make comparisons and decisions in a variety of real-world situations. Computes and translates without significant errors.
- 2 = Makes significant errors when computing and translating but can complete a rough approximation of the process of using "relative numbers" (ratio, proportion, percent) to make comparisons and decisions in a variety of real-world situations.
- 1 = Makes many critical errors when computing and translating and cannot apply the process of using "relative numbers" (ratio, proportion, percent) to make comparisons and decisions in a variety of real-world situations.

Quality of Writing:

5 = Clearly communicates the main ideas in each section and answers all parts of the question; elaborates expansively without repeating ideas; uses own words (does not just fill in the blanks on the guidelines sheet); uses paragraphs and complete sentences.

4 = Clearly communicates the main ideas in response to each question; elaborates on most questions; does not repeat ideas; uses the writing guideline to lead into the question, but then uses own words to personalize the response; is formatted in paragraphs and complete sentences.

3 = Ideas are reasonably clear, but the reader needs to fill in occasional gaps; elaborates on some questions and sometimes could elaborate more fully; uses the writing guideline, effectively filling in the blanks; generally uses paragraphs and complete sentences.

2-1 = Ideas are often unclear, little or no elaboration; words are taken directly from writing guideline in most instances; has some problems using paragraphs and/or complete sentences.

Public Speaking:

5 = Exhibits liveliness, poise, and confidence; enunciates well and speaks with appropriate volume; delivers speech with minimal and unobtrusive use of notes.

4 = Exhibits poise; makes eye contact with audience; enunciates well and speaks with appropriate volume; refers to notes, but does not just read from them.

3 = Makes eye contact with audience; avoids “filler” phrases; enunciates well enough to be understood; speaks loudly enough to be heard; uses notes efficiently, looking up frequently when reading.

2 = Exhibits some self-consciousness, but makes some eye contact with audience; makes and effort to enunciate and speak loudly and is somewhat successful; reads smoothly from notes, looking up occasionally.

1 = Exhibits some self-consciousness, may have trouble getting started, uses “filler” phrases frequently; makes little eye contact with audience; needs to improve enunciation and/or volume; may have some difficulty reading from or handling notes.

Complex Thinking Skills:

5 = Action plan contains carefully selected procedures and timelines which focus on individual problems and insightful solutions based on simulated lives; results are well crafted and appropriate. The plan is doable.

4-3 = Action plan procedures and timelines address the problems and solutions, but some are not specific enough to determine their value. Products are acceptable in quality. Parts of the plan seem doable.

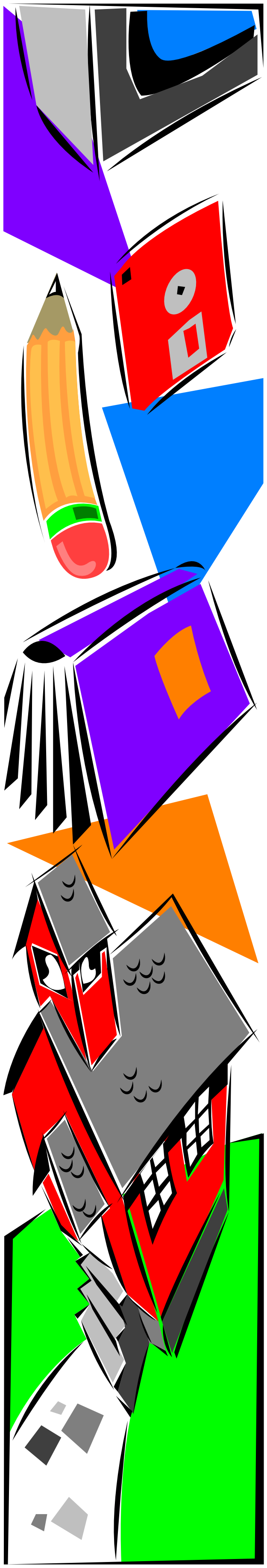
2-1 = Procedures, timelines, and products lack clarity and direction. The plan is difficult to assess in its present form.

Ka Honua Maoli

Real World 2013

EBAM Outline

Middle School



My Personal Life Plan
Shellie-Ann

Career Plan

The career I am interested in at this time of my life is photography. This career sounds good to me because I like taking pictures. I think I would be good at this because I have experience with a camera.

To be hired for this job, you need no education. The requirements are experience with a camera. I can expect a starting salary of $10,000-$20,000 per year.

The kind of person who is successful in this career is someone who is patient and can work with people and animals.

In the Real World simulation, I learned that the managers of certain jobs are very strict with applications, resumes, and cover letters. This helped me develop a career plan because it showed me that my parents don't have it as easy as I thought they did.

Educational Plan

For the career that interests me I don't need any college or university education, but I plan on getting one anyway to better my chances at getting a job. For my education, I plan on getting a degree in photography and a degree in business. The degree in business is so I can possibly own my own photography shop.

The school I am most interested in attending is Hawaii Pacific University because it has a good reputation and lots of different races go there.

In the Real World simulation, I learned that the better the education you have the better chance of getting hired you have and you can earn more money. This helped me develop my education plan because it showed me that there are many different types of degrees.

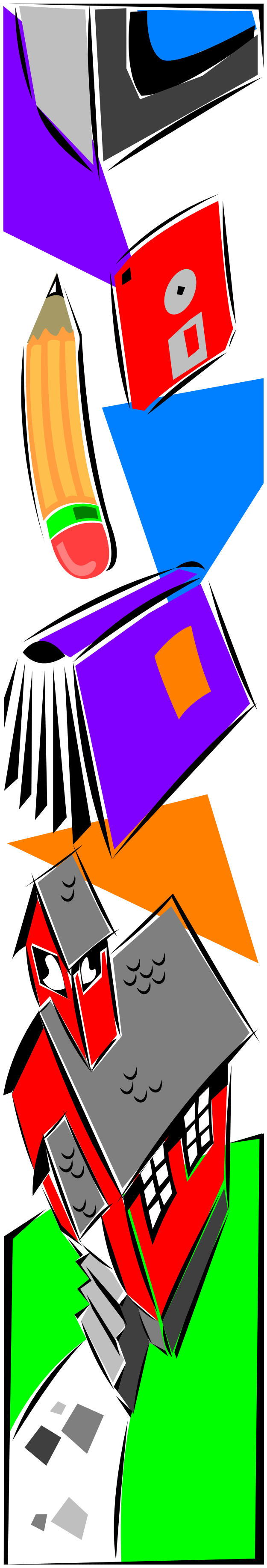
Financial Plan

I hope to be living independently by the time I am in my third year of college. To do this I will need to become more responsible and I am planning on living in an apartment with a friend.

I plan to pay for my education with a loan or with my bank account.

By the time I am thirty years old, I would like to be able to live independently and possibly have a family of my own. To be able to live this way, I will need to have a good education and a high paying salary.

In the Real World simulation, I learned about financial aid and things can be hard to pay for. This helped me develop a financial plan because I found out that if you don't have one you might suffer.



Family Plan

I am not sure if I want to get married or stay single because I have other things on my mind at this point in my life. I am also not sure on whether or not I plan on having children.

Some of the things I learned in the Real World simulation about being married is that the income is big and you have to consult with that person on everything you do. This helped me develop my family plan because now I have an idea on what being married is like.

Life Interests and Personal Growth

Sports is an interest of mine that is so important it will influence my other life plans. I am not planning on developing sports into a career. In order to pursue this interest, I will need to be able to work out and/or be able to have the sports equipment.

Basketball is something I plan to be involved in all my life. It's a game that is very popular among people. This is very important to me because I have a basketball hoop at home.

Another activity that I plan to pursue is taking care of animals. What I mean by taking care of animals is that I want to own pets and maybe even a ranch. I enjoy this activity because animals have a personality that can sometimes be human like.

Using Graphs to Communicate Information

Grade Level........... *High School*
Duration................. *1 Month*
Submitted by .... *Deborah Atkins*

The Experiential-based Action Model

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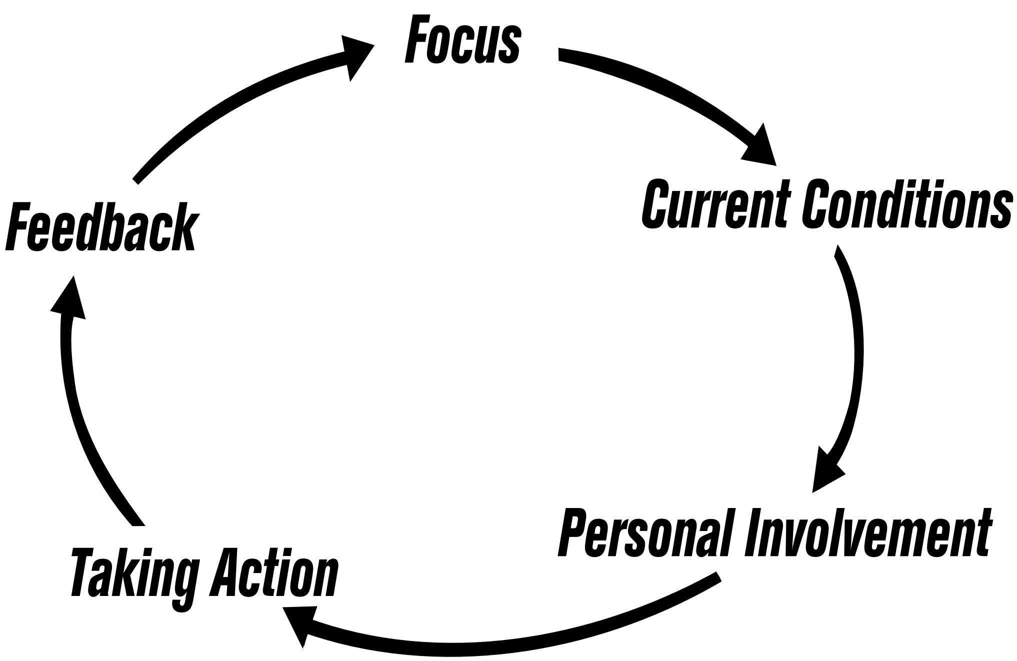


EBAM
Outline

Using Graphs to Communicate Information

High School

Purpose:
As consumers are bombarded with a plethora of information which is designed to persuade or to inform, this unit focuses on the appropriate uses and interpretation of graphs.

Duration:
1 month

Content Standards:
Math:
- In addition to solving the task, *identifiable evidence* of a second look at the concepts/strategies/calculations to defend a solution
- Choosing strategies that can work, and then carrying out the strategies chosen

Science:
- Conduct procedures to collect, organize, and display data
- Analyze results to develop conclusions
- Use observations/concepts to formulate and express scientific questions/ hypotheses to frame investigations.

Social Studies:
- Describe and discuss the causes, consequences, and possible solutions to contemporary concerns such as health, security, economic development, and environmental quality

Language Arts:
- Demonstrate knowledge, response, and experience with a subject through writing

Discrete Thinking Operations:
- Translating/interpreting information
- Comparing/contrasting
- Classifying

Complex Thinking Skill Strategies:
- Creative problem-solving
- Reasoning
- Experimental inquiry
- Investigation

Culminating Performance Task (Student Product):
Through this unit, students will become skilled at creating a survey, collecting data, and choosing and producing the appropriate graph. The class will use their results to produce a report which will help incoming freshmen to become better oriented with the high school.

Task description by Model Phase:

Focus:

(Synonym: Awareness - Vigilance in observing or alertness in drawing inferences from what one experiences.)

- Does a problem related to this topic exist?
- What is the problem?
- How important is the problem?
- Does the problem affect me personally?
- Why should I want to study this topic?

Activity #1:

Discuss students' feelings before entering the high school.

Activity #2:

Review materials which are currently made available to incoming freshmen.

Possible Student Questions:

- How could we make students feel more comfortable entering high school?
- What types of activities will help students get to know one another?
- How can we engage other grade levels to welcome incoming freshmen?
- Will participating in the new program generate enough interest to make this year's incoming freshmen volunteer to run next year's program?

Current Conditions:

(Synonym: Exploration - The act of investigating, studying, or analyzing something.)

- How big is the problem?
- What does the problem look like?
- What do I already know?
- What do I need to know to understand the problem?
- How do I know a problem exists?

Activity #1:

A middle school guidance counselor will describe the current orientation process.

Activity #2:

Visit or write other schools to find out how they introduce incoming freshmen to their high school.

Technology Integration: Using email to write other schools or using the internet to take virtual visitations of other schools.

Personal Involvement:

(Synonym: Solutions - The action or process of solving a problem.)

- How can the problem be fixed?
- What are the most workable solutions?
- Why are these the most workable solutions?

Activity #1:

Examine a variety of survey formats.

Activity #2:

Create a survey which will gather information from all current freshmen about their orientation experience.

Activity #3:

Design a spreadsheet which will clearly record the results of the survey.

Technology Integration: Using spreadsheets and graphs to analyze survey results.

Activity #4:

Determine the best way to represent the results.

Taking Action:

(Synonym: Action - The accomplishment of a thing usually over a period of time.)

- What does the action plan look like?
- Does the action plan address the problem?
- Will the action plan work?
- Can the action plan be successfully implemented?

Activity #1:

Write a report which describes the results of the survey.

Activity #2:

Create a plan which can improve the orientation process.

Technology Integration: Using concept-mapping software such as Inspiration or CMAP to map out the new orientation process.

Activity #3:

Meet with the incoming freshmen before the end of the school year.

Feedback:

(Synonym: Evaluation - The act of assessing the significance, worth, or value of an accomplishment)

- Did I use concepts and content to understand the problem or issue?
- Did I use appropriate investigation/problem solving processes to identify workable solutions?
- Did the products I produced and processes I used meet quality standards?

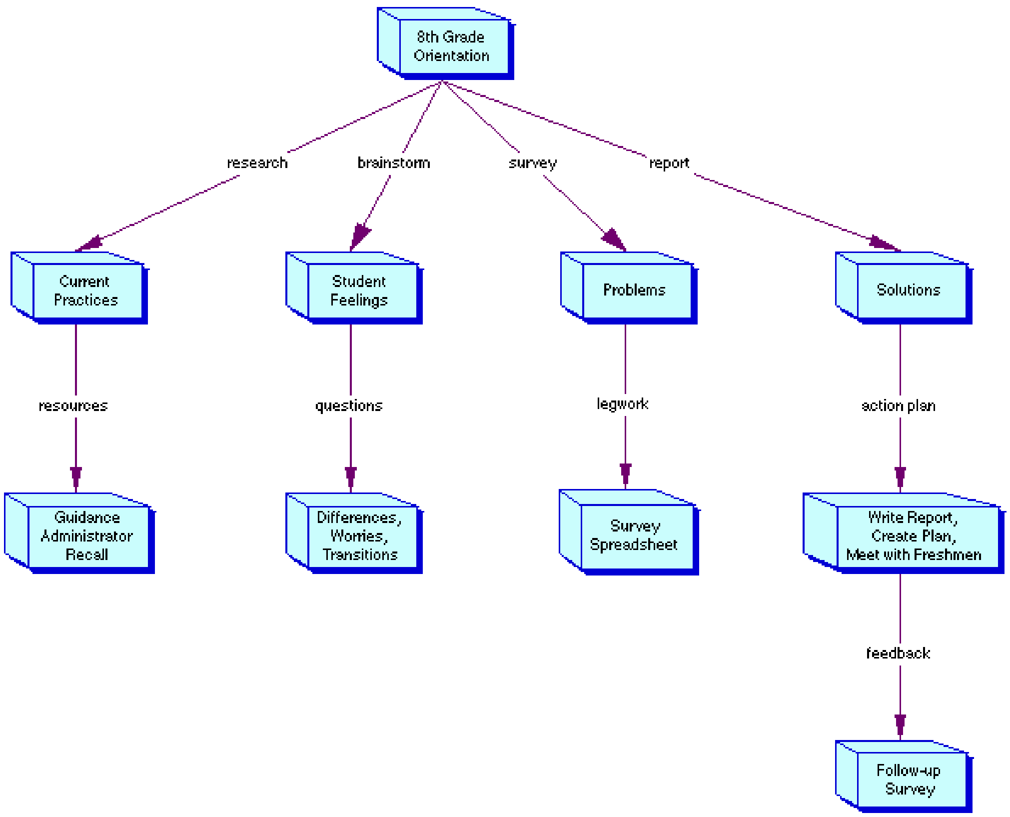
Activity #1:

Survey the new freshmen in the fall to determine the success of the new program.

Activity #2:

Make the results available to middle and high school administrators, guidance counselors, and the next surveying group.

Technology Integration: Using spreadsheets and graphs to analyze and display data for the next surveying group.



Using Graphs to Communicate Information

EBAM Outline

High School

Romeo & Juliet: Conflict Resolution

Grade Level**...........** *High School*
Duration**.................** *1-2 Months*

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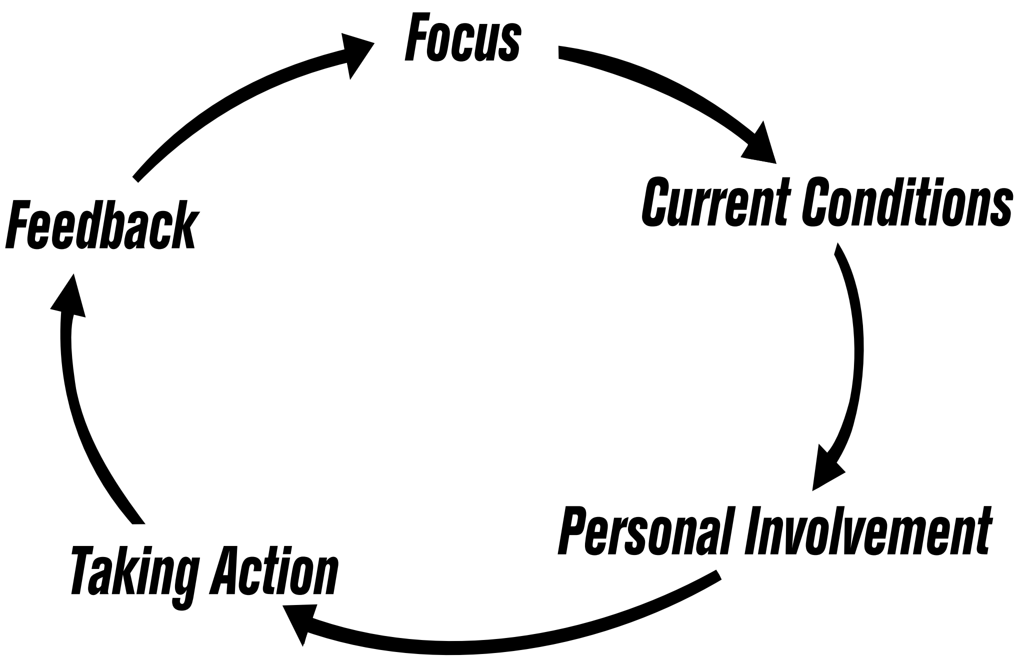

EBAM

EBAM Outline

Romeo & Juliet: Conflict Resolution

High School

Purpose:
To develop appropriate methods of accepting and resolving conflict situations at home, at school, and throughout the community.

Duration:
1 to 2 months

Content Standards:
Math:
- Using pictures, symbols, and/or vocabulary to convey the path to the identified solution
- Choosing strategies that can work, and then carrying out the strategies chosen

Science:
- Conduct procedures to collect, organize, and display data
- Analyze results to develop conclusions

Social Studies:
- Describe how human environment relationships develop and evaluate the consequences for people and for their environment

Language Arts:
- Demonstrate knowledge, response, and experience with a subject through writing

Discrete Thinking Operations:
- Translating/interpreting information
- Examining component parts or elements (e.g., of structures, systems, different perspectives, errors)
- Comparing/contrasting
- Making judgments about value - refuting/supporting claims/arguments

Complex Thinking Skill Strategies:
- Creative problem-solving
- Decision-making
- Reasoning
- Reflective thinking

Culminating Performance Task (Student Product):
Students will create an advice column in the school newspaper dedicated to resolving conflict situations at school and in the community.

Task description by Model Phase:

Focus:

(Synonym: Awareness - Vigilance in observing or alertness in drawing inferences from what one experiences.)

- Does a problem related to this topic exist?
- What is the problem?
- How important is the problem?
- Does the problem affect me personally?
- Why should I want to study this topic?

Activity #1:

Students simulate an argument between school athletes and student government, then draw conclusions based on the scenario. Students participate in a class discussion where they identify conflicts that need resolving at home, at school, or in their community.

Activity #2:

Students read Shakespeare's *Romeo and Juliet*.

Possible Student Questions:

- What conflicts exist in my home, school, or community?
- What can I personally do to help resolve this conflict?
- Can I create a program to encourage conflict resolution?
- Can viewing other forms of conflict resolution help me resolve my own conflicts?

Current Conditions:

(Synonym: Exploration - The act of investigating, studying, or analyzing something.)

- How big is the problem?
- What does the problem look like?
- What do I already know?
- What do I need to know to understand the problem?
- How do I know a problem exists?

Activity #1:

Students watch the movie, *Shakespeare's Romeo & Juliet*. Students discuss the types and levels of conflicts in the movie with emphasis on Humanity vs. Humanity including peer pressure, generational differences, gang activity, guilt, love, fear, responsibility, class, religion, and customs.

Activity #2:

Students will chart the conflict situations from their discussion as they relate to the student's lives using a concept mapping software program such as Inspiration or CMAP. Charts should catalogue a student's life with conflict in the following areas: man vs. man (individuals, parents, peers); man vs. society (school, community); man vs. self (your own decisions); and man vs. technology/nature (environmental).
Technology Integration: Using concept mapping software to identify student's life as it relates to conflict.

Activity #3:

Students generate a survey about the types of problems students have with parents, siblings, boy/girl friends, teachers, and/or employers in their own lives. Students then graph and analyze the data.

Technology Integration: Using spreadsheets and graphs to analyze survey results.

Activity #4:

Students create a chart to display choices is people's lives that lead to negative consequences such as substance abuse, uncooperative behavior, emotional outbursts, withdrawl, depression, eating disorders, extrovert behavior, and/or suicide. Students then identify the characters from *Romeo and Juliet* as they relate to the chart. Students also discuss parallels between the 16th century and 20th century versions of the play/movie.

Activity #5:

Students create a model or a multimedia presentation that shows decay or breakdown, increased disabilities, and medical problems associated with effects of unresolved conflicts on the human body.

Technology Integration: Using presentation software such as HyperStudio or PowerPoint to create a multimedia presentation.

Personal Involvement:

(Synonym: Solutions - The action or process of solving a problem.)

- How can the problem be fixed?
- What are the most workable solutions?
- Why are these the most workable solutions?

Activity #1:

Students use concept mapping software such as Inspiration or CMAP to brainstorm how problems increase with poor communication between parties.

Technology Integration: Using concept maps for brainstorming.

Activity #2:

Students write about a problem that arose due to lack of communication, then get into groups and discuss ways to resolve their communication problems.

Activity #3:

Students will choose three of the solutions discussed in their groups and write a five paragraph essay that supports those solutions.

Technology Integration: Using word processors or word processing software to type an essay.

Activity #4:

Students analyze their data from the earlier survey and group the conflicts discussed by type, and degree or magnitude. Students then work in groups of four to develop alternatives and possible solutions to conflicts on the school campus.

Activity #5:

Students prepare an oral presentation on their campus conflict solutions which show parallels between solutions presented in *Romeo and Juliet*, between athletes and student government, and in their personal lives. Students will also correlate (compare/contrast) the solutions.

Taking Action:

(Synonym: Action - The accomplishment of a thing usually over a period of time.)

- What does the action plan look like?
- Does the action plan address the problem?
- Will the action plan work?
- Can the action plan be successfully implemented?

Activity #1:

Students write an article for the school newspaper discussing the conflicts on campus, encouraging other students to write in editorials to be addressed in the "Conflict Advice Column".

Activity #2:

In response to letters discussing the problems at school, students write responses and suggested solutions in their "Conflict Advice Column" to aid other students in resolving their issues nonviolently.

Feedback:

(Synonym: Evaluation - The act of assessing the significance, worth, or value of an accomplishment)

- Did I use concepts and content to understand the problem or issue?
- Did I use appropriate investigation/problem solving processes to identify workable solutions?
- Did the products I produced and processes I used meet quality standards?

Assessment using the following criteria:

A = **Exemplary** - Work is exceptional and memorable. It shows a sophisticated application of knowledge and skills.

B = **Meets Standard** - Student has met the standard application of essential knowledge and skills. Minor errors do not detract from the overall quality.

C = **Developing** - Student has not yet met the standard. Work shows basic, but inconsistent application of knowledge and skills.

D = **Beginner** - Work shows little or no application of knowledge and skills. It contains major errors or omissions.

LoTi Survival Kit

Session #12:

Professional Development Intervention

(Level 4a/4b: Integration)

Professional Development Intervention (Level 4a/4b: Integration)

Time Allotment: 20 minutes

Session #12 is a continuation of Session #11 and provides an opportunity for participants to design an outline for a curriculum unit at a LoTi Level 4a/4b using EBAM. The goal of Session #12 is for participants to experience the process of designing LoTi Level 4a/4b instructional units for use in their classrooms.

Provided below is a suggested outline for implementing Session #12 of the LoTi Project Implementation.

1.0

Distribute copies of the EBAM unit outline template (part of the Session #12 handouts) for each group of participants.

2.0

Have participants create a sample EBAM unit outline based on a specific theme/topic (e.g., Student Parking), content focus (e.g., Geometry), and audience (e.g., high school students).

Training Tip: *When creating EBAM unit outlines, the key is to (1) identify the targeted content standards, (2) design a compelling and experientially-based performance task based on the needs, interests, and aspirations of the learner, and (3) carefully sequence learning experiences that will motivate students intrinsically to perform at the optimum level as they strive to complete the performance task.*

3.0

Have participants use the EBAM templates and EBAM handout to create their own LoTi Level 4 unit outlines for implementation in their respective classrooms.

Note: You might suggest participants submit a timeline for implementing their EBAM units so as to provide a sense of accountability for its use and evaluation.

LoTi Survival Kit

Session #12:

Participant Handouts

experiential-based action model template

EBAM Unit Title:

____

____

Purpose:

To ______________________________________

____

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Unit Duration:

____

Academic Standards:

* Science ________________________________
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  ____
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* Social Studies ____________________________
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* Language Arts ____________________________
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* Mathematics _____________________________
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experiential-based action model template

Thinking Process Emphasis:

Performance Task: (Student Product)

Students will . . . .

experiential-based action model template

Task Description By Model Phases:

Focus: (Synonym - Awareness)

Key Questions:
Does a problem exist?
What is the problem?
How important is the problem?
Does the problem affect me personally?
Why should I be studying this topic?

Apollo 13 Connection:
Houston, we have a problem!

* Activity # ____ : ____
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Technology Integration: ____
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* Activity # ____ : ____
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Technology Integration: ____
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* Activity # ____ : ____
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Technology Integration: ____
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experiential-based action model template

* Activity # _____ : ____

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Technology Integration: _______________________________________

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* Activity # _____ : ____

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Technology Integration: _______________________________________

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Student-based Questions:

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experiential-based action model template

Current Conditions: (Synonym - Exploration)

Key Questions:
How big is the problem?
What does the problem look like?
What do I already know?
What do I need to know to understand the problem?
How do I know that a problem exists?

Apollo 13 Connection:
People, what do we know that works above that spacecraft?

* Activity # _____ : ____

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Technology Integration: ______________________________________

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* Activity # _____ : ____

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Technology Integration: ______________________________________

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* Activity # _____ : ____

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Technology Integration: ______________________________________

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experiential-based action model template

* Activity # _____ : ____

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Technology Integration: ____________________________________

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* Activity # _____ : ____

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Technology Integration: ____________________________________

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Student-based Questions:

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experiential-based action model template

Personal Involvement: (Synonym - Finding Solutions)

Key Questions:
How can the problem be fixed?
What are the most workable solutions?
Why are these the most workable solutions?

Apollo 13 Connection:
We must find a way to get this to fit into that using what's on the table!

* Activity # _____ : ____
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Technology Integration: ____
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* Activity # _____ : ____
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Technology Integration: ____
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* Activity # _____ : ____
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Technology Integration: ____
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experiential-based action model template

* Activity # _____ : ____

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Technology Integration: ______________________________________

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* Activity # _____ : ____

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Technology Integration: ______________________________________

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Student-based Questions:

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experiential-based action model template

Taking Action: (Synonym - Presentation/Production/Solution)

Key Questions:
What does my action plan look like?
Will my plan of action work?
Does my action plan address the problem?
Can I do it?

Apollo 13 Connection:
Splash down

See Performance Task:

Students will . . . . ____

Technology Integration: ____

Feedback: (Synonym - Assessment)

Key Questions:

Did I use concepts and content to understand the problem or issue?
Did I use investigation/problem solving processes to identify workable solutions?
Did the products I produced and processes I used meet quality standards?

Apollo 13 Connection:

Successful Failure?

Scoring Guide:

(Place your Scoring Guide here!) ________________________________

experiential-based action model template

Resources:

Useful Links:

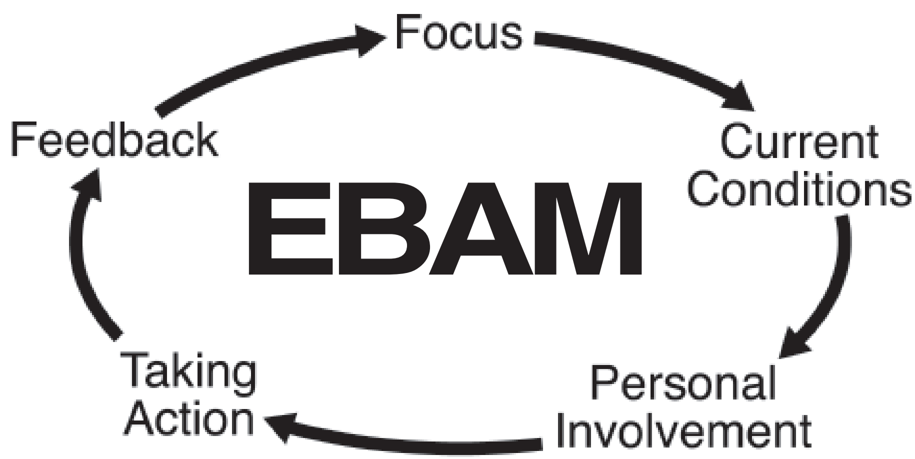
experiential-
based action
model template

Experiential-based Action Model Template Notes

standards-driven curriculum modules that emphasize technology, relevancy, and student activism

The Experiential-based Action Model

The Experiential-based Action Model is a five-step process designed to pique student academic performance while addressing critical content standards and promoting experiential learning, constructivist teaching, and authentic technology integration.



standards-driven curriculum modules that emphasize technology, relevancy, and student activism

Designing Experiential-based Action Model Units

The challenges confronting today's classroom teachers are unprecedented. Teaching to major themes, motivating reluctant learners, integrating technology-based tools (e.g., spreadsheets, databases, multimedia authoring tools, Internet), supporting standards-based instruction, and employing alternative assessment strategies have signaled both opportunities and concerns for educational practitioners nationwide. Exactly how can one expect to do all of these things in a manner that is consistent with a constructivist theory of learning and maximizes student understanding of the pertinent academic standards?

The Experiential-based Action Model (EBAM) is designed to assist classroom teachers with organizing their instructional curriculum based on the experiential needs of the learner and national and state academic standards. The model encompasses those instructional practices that rely on real life experiences as the basis for learning. According to philosopher, John Dewey, the educator's task is to ensure the continuity of present experiences upon future experiences. In this context, quality learning experiences: (1) provide the learner with a sense of direction and purpose, (2) are encased in a well-defined context, and (3) include linkage between past and future experiences. The Experiential-based Action Model consists of five key stages: Focus, Current Conditions, Personal Involvement, Taking Action, and Feedback.

Several preliminary steps should be taken before developing Standards-driven EBAM units.

* Review National and State Content and/or Performance Standards and local curriculum guidelines for important topics (content) and themes (concepts).
* Brainstorm with colleagues and students to identify specific content and concepts (what students should know and understand), processes (what students should be able to do), and products (what students should produce to demonstrate knowledge and skills).
* Make sure the products or culminating performance tasks are:
  - standards-driven: tasks relate to national and state academic standards and local curriculum guidelines

- challenging: tasks ask students to show their "know how" on something important and challenging, not just their knowledge.
- authentic: tasks allow students to pursue authentic solutions to a relevant problem, challenge, or issue
- feasible: tasks are worthy of the time and effort required to complete it
- thought-provoking: tasks require students to use complex thinking skills (e.g., critical/creative thinking, decision-making, problem-solving)
- experiential-based: tasks provide a constructivist outlet for students to explore and resolve a problem, issue, or challenge under investigation.

* Defining the culminating performance task for the EBAM unit is **not** a casual activity. Everything students perform in a standards-driven EBAM unit is directed toward successfully completing the culminating performance task, which encapsulates the academic standards. Student-based questions derived from the culminating performance task should inspire and energize the learner to want to learn and perform at the highest possible level. It is, therefore, essential that the culminating performance task as well as the learning experiences linked to this task be developed, selected, or refined based on the experiential needs of the learner.
* Once the culminating performance task has been defined, select/ design student experiences for each stage of the Experiential-based Action Model (EBAM) that will authentically move students from Awareness to Action relating to the pertinent problem, challenge, or issue embedded in the culminating performance task.
For the purposes of this Standards-driven, EBAM unit on recycling, the culminating performance task will be as follows:
Students will plan, organize, and carry out an action plan that addresses the issue of waste disposal practices at home, at school, and throughout the community. This task will be designed to answer the essential question: Can the amount of trash destined for the landfill be significantly reduced?

Focus

Purpose

Focus activities develop awareness of an overall topic or theme and motivate students to learn more about related issues that are also current and relevant.

Key Components - Questions for Students to Ask

* Does a problem exist?
* What is the problem?
* How important is the problem?
* Does the problem affect me personally?
* Why should I be studying this topic?

Learning Process Skills

* Observing
* Recognizing
* Responding

Types of Activities/Products

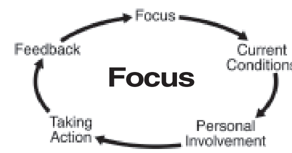
* Experiments
* Graphic Organizers
* Discrepant Events Investigations
* Demonstrations
* Literature Interpretations
* Surveys
* Field Trips
* Newspaper, Music, Cartoon Reviews

Questions to Consider Before Adding a Focus Activity

* Does the activity help students elicit challenging and thoughtful questions related to the problem or theme?
* Does the activity integrate technology purposefully and authentically?
* Does the activity establish linkage or connection between the student and the problem?
* Does the activity move students from Awareness to Action?
* Does the activity address the pertinent concepts, processes, and theme(s)?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

Focus

(Synonym: Awareness - Vigilance in observing or alertness in drawing inferences from what one experiences.)



The focus section motivates students to learn more about current, relevant issues and/or problems embedded in the culminating performance task. Focus activities are powerful events that unlock students' natural fascination and intrinsic motivation. Generating student questions and arriving at a problem definition are essential components of this stage.

* Select appropriate focus activities (e.g., surveys, observations, demonstrations, literature interpretations, experiments, field trips, discrepant events) that address anticipated student questions relating to the content and concepts encased in the culminating performance task:
  Anticipated Student Questions:
  - Does a problem related to this topic exist?
  - What is the problem?
  - How important is the problem?
  - Does the problem affect me personally?
  - Why should I want to study this topic?
* Make sure Focus activities address the anticipated student questions.
* Make sure Focus activities retain the following characteristics:
  - Relate continuously and consistently back to the selected topic(s), theme(s), and/or culminating performance task.
  - Integrate several content areas or disciplines (e.g., science, math, social studies, language arts).
  - Allow for data collection, tabulation, and analysis of information.
  - Allow for hands-on investigations inside or outside the classroom.
  - Promote formation of a problem definition
  - Allow for use of computer-based tools (e.g., spreadsheets, graphs, word processors, databases, Internet, multimedia).
* After selecting focus activities, think through additional student questions that students might ask. These questions should stem from the focus activities and relate directly to the culminating performance task. These anticipated student questions serve as a data

source (along with teacher-based questions) for selecting learning activities for the next stage, Current Conditions.

* List relevant and meaningful teacher-based questions (i.e., questions that students do not often asked due to a lack of background knowledge on the topic). Teacher-based questions should relate to the critical content and concepts associated with the problem, issue, or challenge embedded in the culminating performance task. The depth and breadth of the questions may stimulate more than are practical within a single instructional unit. If necessary, narrow or combine some of the questions into a new set of questions that would fit the parameters of the current instructional unit.

Note: Using key words will also help to define significant content and concepts to be investigated in the next stage.

Following is a sample focus activity (Visiting landfill site to determine problem and implications) based on the student- based question, "What is the problem with landfills?" that will help students define the problem embedded in the culminating performance task (i.e., improving local waste disposal practices).

Focus Examples

Topic/Content:
* Recycling
    - Problem Definition

Theme/Concept:
* Cycle

Data Source:
* Student-based questions

Questions:
* What is the problem with landfills?

Activities:
* Visit landfill site to determine the problem and implications.

standards-driven curriculum modules that emphasize technology, relevancy, and student activism

Current Conditions

Purpose

Current Conditions activities provide investigations and experiences to help students understand the magnitude of the problem and its relevancy to the overall topic or theme.

Key Components - Questions for Students to Ask

* How big is the problem?
* What does the problem look like?
* What do I already know?
* What do I need to know to understand the problem?
* How do I know a problem exists?

Learning Process Skills

* Comparing
* Classifying
* Analyzing

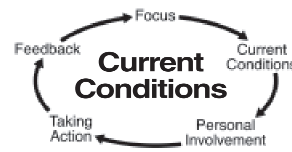
Types of Activities/Products

* Interviews
* Surveys
* Demonstrations
* Book Reports
* Class Discussions
* Internet Searches
* Field Investigations
* Case Studies
* Library/Media Research
* Experiments
* Journal Writing

Questions to Consider Before Adding a Current Conditions Activity

* Does the activity help students consider different perspectives related to the problem or theme?
* Does the activity integrate technology purposefully and authentically?
* Does the activity help students understand the magnitude of the problem under consideration?
* Does the activity move students from Awareness to Action?
* Is the introduction of a new concept, process, and/or theme connected directly or indirectly to the problem under consideration?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

Current Conditions



(Synonym: Exploration - The act of investigating, studying, or analyzing something.)

Student investigations and learning experiences at this stage help students find answers to the previously developed student- and teacher-based questions. Current Conditions activities address the magnitude of the problem, challenge, or issue under investigation and are linked to the culminating performance task.

Begin the Current Conditions section by considering its overall direction. Remember that Current Conditions activities provide students with the background knowledge, conceptual understanding, and skill development to investigate all aspects of the problem under investigation. Use the anticipated student- and teacher-based questions to select Current Conditions activities.

* Make sure the activities (e.g., experiments, surveys, field investigations, Internet research) address the following key student-based questions:

  Anticipated Student-based Questions
  - How big is the problem?
  - What does the problem look like?
  - What do I already know?
  - What do I need to know to understand the problem?
  - How do I know a problem exists?
* Make sure the selected Current Conditions activities retain the following characteristics:
  - Relate continuously and consistently back to the selected topic(s), theme(s), and/or culminating performance task.
  - Integrate several content areas or disciplines (e.g., science, math, social studies, language arts).
  - Allow for data collection, tabulation, and analysis of information.
  - Allow for hands-on investigations inside or outside the classroom.
  - Promote different perspectives related to the problem.
  - Allow for use of computer-based tools (e.g., spreadsheets, graphs, word processors, databases, telecommunications, multimedia).
* Select appropriate instructional technologies and materials that:
  - most efficiently address the desired outcomes.

- encourage higher order thinking skills.
- are cost effective.
- are accurate, up-to-date, and unbiased (in the case of materials).

* Review the unit. Check to see if:
  - a variety of activities and strategies are included.
  - students of all ability levels will be appropriately challenged and actively engaged.
  - the individual activities relate to essential content and the development of the concepts.

Following is a sample Current Conditions activity (e.g., conducting home trash survey) based on the anticipated student-based questions (e.g., How much trash does the average home generate?) that will help students explore the magnitude of the problem embedded in the culminating performance task (improving local waste disposal practices).

Current Conditions Examples

Topic/Content:

* Recycling
  - Impact of trash problem
  - Dichotomous grouping of trash
  - Properties of recyclable trash

Theme/Concept:

* Cycle

Data Source:

* Student-based questions
* Teacher-based questions (National Standards)

Questions:

* How much trash does the average home generate?
* What kind of trash causes the greatest problem?
* How do people impact ecosystems?

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Personal Involvement

Purpose

Personal Involvement activities help students identify, structure, modify, and defend solutions to the problem under investigation through the use of organizational tools and analytical strategies.

Key Components - Questions for Students to Ask

* How can the problem be fixed?
* What are the most workable solutions?
* Why are these the most workable solutions?

Learning Process Skills

* Evaluating
* Synthesizing
* Making inferences
* Communicating

Types of Activities/Products

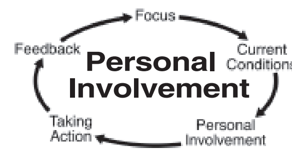
* Experiments
* Case Studies
* I-Search Papers
* Trial and Error
* Surveys
* Field Investigations
* Inquiry Letters
* Model Buildings
* Feasibility Studies
* Debates

Questions to Consider Before Adding a Personal Involvement Activity

* Does the activity integrate technology purposefully and authentically?
* Does the activity promote students' use of the pertinent concepts and processes used to explore solutions to the problem?
* Does the activity move students from Awareness to Action?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

Personal Involvement

(Synonym: Solutions - The action or process of solving a problem.)



In this section, students are given organizational tools and analytical strategies to help them identify, structure, modify, and defend potential solutions to the problem under investigation. At the Personal Involvement stage, students apply the content, concepts, and processes introduced/reviewed in the Current Conditions section toward designing their "product" relating to the culminating performance task.

* Plan student-directed investigations (e.g., experiments, case studies, I Search Papers, Trial and Error, Field Investigations, feasibility studies, inquiry letters) that address the following key student-based questions:

  Anticipated Student-based Questions
  - How can the problem be fixed?
  - What are the most workable solutions?
  - Why are these the most workable solutions?

* Make sure investigations address possible solutions to the problem, challenge, or issue embedded in the culminating performance task and retain the following characteristics:
  - Allow for analysis and synthesis of information.
  - Provide opportunities for student decision-making.
  - Allow students to defend their decision(s)/solution(s).

* Select appropriate instructional technologies and materials that:
  - most efficiently address the desired outcomes.
  - encourage higher order thinking skills.
  - are cost effective.

Following is a sample Personal Involvement activity (e.g., designing and conducting composting experiment) based on the anticipated student-based question (e.g., How can we fix the problem?) that will help students develop viable solutions to the problem embedded in the culminating performance task (improving local waste disposal practices).

Personal Involvement Examples

Topic/Content:

* Recycling
  - Earth's natural cycles
  - Waste disposal solutions through natural cycles
  - Effects of cycles in ecosystem on humans

Theme/Concept:

* Cycle

Data Source:

* Teacher-based questions (State Framework)
* Student-based questions
* Teacher-based questions (National Standards)

Questions:

* What are the earth's natural cycles?
* How can we fix the problem?
* What is the most workable solution?
* How do cycles in ecosystems effect humans (e.g., waste disposal solution)?

Activities:

* Design and conduct experiments using natural cycles that could provide a solution to waste disposal problems (e.g., with earthworms, compost).
* Defend a workable solution.

Taking Action

Purpose
Taking Action activities provide directions and strategies to help students put their solutions into action on a local, regional, and/or national basis.

Key Components - Questions for Students to Ask
* What does my action plan look like?
* Will my plan of action work?
* Does my action plan address the problem?
* Can I do it?

Learning Process Skills
* Applying
* Decision-Making
* Valuing
* Communicating

Types of Activities/Products
* Action Plans
* Petitions
* Inventions
* Letters
* Volunteering
* Patents
* Fund-Raisers
* Flyers
* Proposals

Questions to Consider Before Adding a Taking Action Activity
* Does the proposed action plan address the problem under investigation?
* Does the proposed action plan integrate technology purposefully and authentically?
* Does the proposed action plan address the pertinent concepts, processes, and theme(s)?
* Does the proposed action plan provide a natural pathway to the other stages of the Experiential-Based Action Model?

Taking Action

(Synonym: Action - The accomplishment of a thing usually over a period of time.)

This stage provides students with directions for putting their solutions relating to the culminating performance task into action. The depth and breadth of the "Taking Action" stage is only limited by the imagination of the students. For the recycling unit, community recycling campaign, school fund- raiser, or inventing a new type of biodegradable containers, are examples of a few projects that "put into action" authentic solutions relating to the culminating performance task:

> *Students will plan, organize, and carry out an action plan that addresses the issue of waste disposal practices at home, at school, and throughout the community.*

These projects can be accomplished in class or as part of an out-of-class assignment.

* Identify possible products. Determine what should be invented, written, spoken about, or manufactured that relates directly back to the Personal Involvement experiences and the culminating performance task.
* Develop "Taking Action" activities that address the following student questions:
  Anticipated Student-based Questions:
  - What does the action plan look like?
  - Does the action plan address the problem?
  - Will the action plan work?
  - Can the action plan be successfully implemented?
* Select resources that promote the desired action (e.g., a variety of construction materials or specific personnel; city mayor, teacher, coach, or parent).

Following is a a sample Taking Action product (e.g., implementing a community composting program) based on potential solutions "discovered" at the Personal Involvement stage that puts into action the culminating performance task (improving local waste disposal practices).

Taking Action Examples

Topic/Content:

* Recycling
  - Community solutions
  - Regional differences

Theme/Concept:

* Cycle

Data Source:

* Student-based questions
* Teacher-based questions (National Standards)

Questions:

* What actions can I take to address the causes of waste management problems in my community?
* Can they be successfully implemented?
* How do the causes of and solutions to environmental degredation vary from region to region?

Activities:

* Develop an Action Plan that identifies the problem, steps toward a solution in the local region, key people involved, and timelines, and includes how the solution might differ in another region. For example, implementing a community composting program.

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Feedback

Purpose

Feedback activities help students identify milestones and quality standards so they can monitor their progress toward the attainment of specific goals.

Key Components - Questions for Students to Ask

* Did I use concepts and content to understand the problem or issue?
* Did I use appropriate investigation/problem solving processes to identify workable solutions?
* Did the products I produced and processes I used meet quality standards?

Learning Process Skills

* Evaluating
* Exploring
* Predicting

Types of Activities/Products

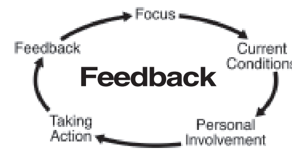
* Daily Journals
* Self Assessment
* Experiments
* Open-ended Problem-Based Questions/Investigations
* Oral Presentations
* Full Length Compositions
* Peer Review
* Electronic Portfolio

Questions to Consider Before Adding a Feedback Activity

* Does the activity assess the students' "can do" performance?
* Does the activity integrate technology purposefully and authentically?
* Does the activity assess the merits of the students' action plans related to the problem under investigation?
* Does the activity assess students' understanding of the pertinent concepts, processes, and theme(s)?
* Does the activity provide a natural pathway to the other stages of the Experiential-Based Action Model?

Feedback

(Synonym: Evaluation - The act of assessing the significance, worth, or value of an accomplishment)



The Feedback stage brings the five phase Experiential-based Action Model full-cycle. Although Feedback is identified as the fifth stage, assessment is an on-going process within each of the stages of the EBAM unit (e.g., Current Conditions, Personal Involvement, Taking Action). In the assessment process, the teacher and students collect evidence and document student success based on state and local academic standards.

Performance-based assessment allows students to gauge their progress toward meeting predetermined standards of quality as articulated in state and local academic standards. Performance is assessed by teachers, student (during self assessment) and sometimes by other students using pre-defined scoring guides or rubrics.

* Identify whether group and/or individual assessment is appropriate.
* Identify content, processes and products to be assessed and appropriate methods. For example:
  - in "Current Conditions" activities, significant areas of content are taught. Content can be assessed through performance based open-ended questions that require students to use past knowledge and skills to demonstrate their understanding of the problem.
  - in "Personal Involvement" activities, processes are an important element. Here the processes used to collect and analyze data and the components of experimental design can be assessed.
  - in "Taking Action" activities, products embedded in the culminating performance task such as action plans, letters, flyers, and proposals are important elements. Assessment criteria not only can assess the content and processes encased in the student products, but can also assess how well the action plan relates to the 'problem and how well the plan worked.

standards-driven curriculum modules that emphasize technology, relevancy, and student activism

Standards-driven Curriculum Modules that Emphasize Technology, Relevancy, and Student Activism Notes

LoTi Survival Kit

Session #13:

LoTi Project - Next Steps

LoTi
survival kit
train-the-trainer

LoTi Project:
Next Steps

Time Allotment: 20 minutes

Session #13 provides a summary of what participants need to be thinking about as they implement higher levels of technology implementation in the classroom.

Provided below is a suggested outline for implementing Session #13 of the LoTi Project Implementation.

1.0

Have participants view the *LoTi Project - Next Steps* multimedia presentations (*Next_Steps_Institutional.htm* and *Next_Steps_Instructional.htm*). The purpose of these presentations is for participants to reflect on ways to help move themselves and their colleagues to a higher level of technology implementation in the classroom.

Training Tip: *The key talking points around the multimedia presentations are as follows:*

For Technology Leaders (Institutional):

* *Establish a common vision tied to the Target Technology Level*
* *Promote instructional leadership*
* *Consolidate professional development into one integrated package*
* *Raise the level of expectation*
* *Promote targeted professional development*

For Classroom Teachers (Instructional):

* *Avoid single technology application solutions*
* *Innovate different instructional approaches*
* *Communicate your experiences with others*
* *Immerse yourself with a new innovation*
* *Keep it simple, yet dynamic*
* *Keep the focus on kids, not computers*

LoTi Project:
Next Steps

2.0

Have participants brainstorm types of systemic changes that could be made within their instructional curricula that could help elevate technology use in the classroom.

Training Tip: *Use the Next Steps form to operationalize ideas, recommendations, or courses of action made during the brainstorming phase. This form allows you to summarize your LoTi data and the results from other indicators (e.g., student test scores) in the preparation of an action plan leading to higher levels of technology implementation campus-wide.*

LoTi Survival Kit

Session #13:

Participant Handouts

level of technology implementation next steps

Next Steps Plan for the Current School Year

Date Created: ____________________

School Site: ____________________

LoTi Data:

LoTi: ____________________

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PCU: ____________________

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CIP: ____________________

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Statewide Assessment Data:

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District Curriculum Initiatives:

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level of technology implementation next steps

Goal Statements:

Sample: *By the end of the 2002-2003 school year, our school site will move 25% of our staff from a LoTi Level 1 to a LoTi Level 2.*

Goal #1: ____

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Goal #2: ____

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Goal #3: ____

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Goal #4: ____

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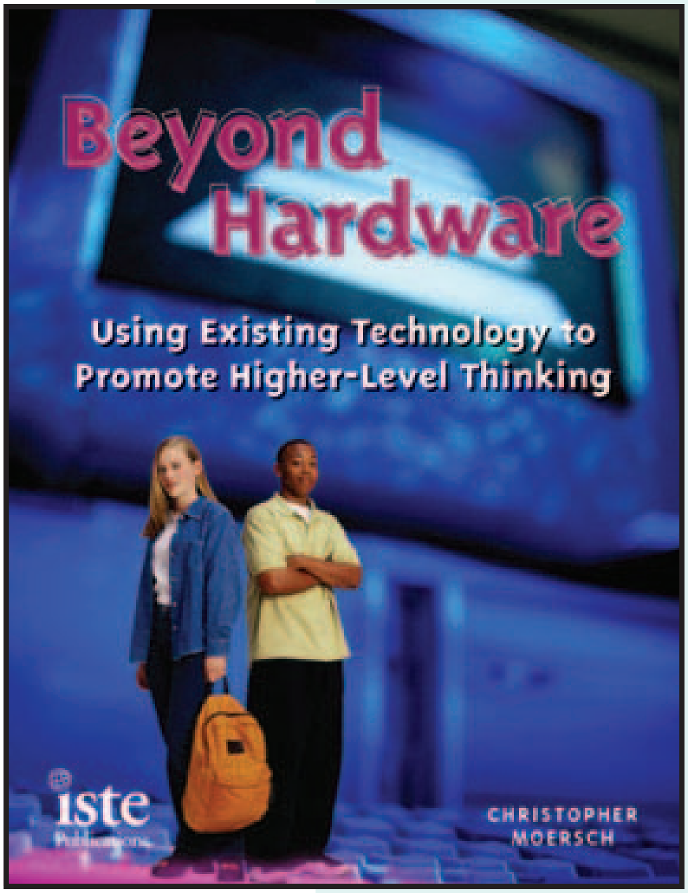
Action Steps:

Event:	Responsible:	Date:	Potential Barriers:

Beyond Hardware: Using Existing Technology to Promote Higher-Level Thinking is an insightful, humorous, and candid look at ways to boost effective technology use in school systems nation-wide. Learn about the New Technoloogy Infrastructure and its use in combination with the NETS (National Education Technology Standards) and the TSSA (Technology Standards for School Adminis-trators) to transform dormat, lackluster classrooms into vibrant and exciting learning environments using the available hardware.



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Chris Moersch

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