

Level of Technology Implementation

In 1994, Dr. Christopher Moersch developed the Level of Technology Implementation (LoTi) scale in a effort to accurately measure authentic classroom technology use. This scale focuses on the use of technology as an interactive learning medium because this particular component has the greatest and lasting impact on classroom pedagogy and is the most difficult to implement and assess. The challenge is not merely to use technology to achieve isolated tasks (e.g., word processing a research paper, creating a multimedia slide show, browsing the Internet), but rather to integrate technology in an exemplary manner that supports purposeful problem-solving, performance-based assessment practices, and experiential learning—all vital characteristics of the "Target Technology" level established by the CEO Forum on Education and Technology. Use the menu to the left to explore the eight levels of the LoTi scale as well as sites and contacts who are using LoTi to drive their technology planning.

Level of Technology Implementation LoTi Breakdown

Levels of Technology Implementation (LoTi) Breakdown	
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

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Level of Technology Implementation

Level 0 - Nonuse

Sometimes, it appears that we are pushing against instead of pulling along when it comes to an innovation.

Description:

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).

Classroom Observations:

- 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 supposed 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

Level 1 - Awareness

Do we sometimes look across the way from a safe distance to view an innovation in action?

Description:

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).

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 of Technology Implementation

Level 2 - Exploration

Just because the innovation is within our grasp does not necessarily mean we are using it to its fullest potential.

Description:

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.

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."

Projects:

[Classroom Connect—The Connected Teacher](#)
[Classroom Connect—Connected University](#)
[The Virtual Field Trip Site](#)
[Introduction to Web Page Authoring: A Beginner's Guide to HTML](#)
[Writing a WebQuest for Your Classroom](#)
[PBS TeacherSource](#)
[21st Century Problem Solving](#)
[MathMagic!](#)

[Ask Dr. Math](#)
[Consortium for Oceanic Activities for Students & Teachers \(COAST\)](#)
[The Great Satellite Search](#)
[Techno Teen](#)
[Outta Ray's Head](#)
[Odyssey Online](#)
[Virtual Tours](#)
[Dino-web](#)
[Eastwood Open Room](#)

Level of Technology Implementation

Level 3 - Infusion

Sometimes we feel our use of an innovation is complete, but in reality, it may be missing some pieces.

Description:

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).

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 post them either 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."

Projects:

[ThinkQuest](#)
[Geometry Through Art](#)
[ExploreScience.com](#)
[GLOBE Project](#)
[EnergyNet](#)
[Project NOPP Drifters](#)
[A Celebration of Young Poets](#)

[The Virtual Quilt](#)
[Digital Education Network](#)
[Seminar on the United Nations and International Affairs \(SUNIA\)](#)
[Project P.A.T.C.H.](#)
[Arts World Wide--Visual Arts Curriculum](#)
[The Card Game Web Site](#)

Level of Technology Implementation

Level 4a – Integration (Mechanical)

At times, we may have accepted the idea of an innovation, but may have difficulty with its actual implementation.

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/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.

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."

Projects:

[Schools Online](#)
[Odyssey in Egypt](#)
[Girls to the 4th Power](#)

[Global Thinking Project](#)
[Center for Applied Academics](#)
[Treasure Island Online](#)
[Seeds of Change Garden](#)

Level of Technology Implementation

Level 4b - Integration (Routine)

The use of the innovation has become routine.

Description:

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.

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 ethnic 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.

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."

Projects:

[PowerQuest](#)

Level of Technology Implementation

Level 5 - Expansion

The full use of the innovation is now approaching uncharted territories.

Description:

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.

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 topographic 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 of Technology Implementation

Level 6 - Refinement

The use of the innovation has now taken on a new dimension.

Description:

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 identified "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.

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."