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

Level 0 Non-Use
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:
- "Using computers is the least of my problems. Have you seen my class enrollment?"
- "Using computers gets in the way of what I am supposed to be doing."
- "I really don't have the time to deal with computers anyway."
- "My computer crashed. I am still waiting for someone to fix it."
- I'm too old!

Level 1 Awareness (Teacher "does the doing.")
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

- One step removed from the classroom teacher
  - Children are "dropped off" at the computer lab
  - Integrated Learning System labs
  - Central word processing labs
  - Computer Literacy Classes

<u>Teacher Comments:</u>
- "This grading program is fabulous. Computers are great!"
- "My students go to the lab each Tuesday. This frees me to catch up on my grades or meet with parents."
- "I designed my own web page so that students can view their weekly assignments."

Level 2 Exploration (Knowledge/Comprehension Level)
<u>Description:</u>
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.

<u>Classroom Observations:</u>
- 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)
- Employed as one of the following:
  - Extension Activities
  - Enrichment Activities
  - Reinforcement Activities
- Complement selected multimedia and/or web-based projects
  - PowerPoint Presentations - informational
  - Internet "Research & Report" – basic facts
  - Web Pages - informational

<u>Teacher Comments:</u>
- My students have built some very sophisticated PowerPoint presentations during the year."
- "My kids graphed some data from an AIMS activity last week. They love the way the graphs look on the screen."
- "When students finish their packets early, they often go back to the computers and practice their computer skills."

Level 3 Infusion (Analysis/Synthesis/Evaluation Levels)
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).

Tool-based applications are used primarily by students for analyzing data, making inference, drawing conclusions.
Technology tools include:
- Spreadsheets - Excel
- Graphing programs – Graph Club
- Concept Mapping - Inspiration
- Word Processing/Desktop Publishing - Word
- Presentations - PowerPoint
- Access – Databases
- WebQuests – research and draw conclusions
- Simulation Software – Tom Snyder

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 students never use the school's drinking fountains."
- "My students created a multimedia presentation that analyzed the issue of poverty among 18-25 year old adults."

Level 4a 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 "pre-packaged" materials, instructional designs (4-MAT, EBAM, Understanding by Design), interventions (e.g., professional development workshops), and and/or outside resources (e.g., assistance from other colleagues) to implement student-centered learning experiences. However, teacher's classroom management concerns and perceived infrastructure barriers still exist. 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 kiosk idea was based on an existing unit that I borrowed from one of the 5th grade teachers."
- "The travel brochure was part of the culminating performance task developed by a consultant with the assistance from the 4th grade teachers."

Level 4b Integration (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, with no outside assistance, 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.

<u>Classroom Observations:</u>
- 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.

<u>Teacher Comments:</u>
- "Our student mediation unit was prompted by the recent rise in fights on campus."
- "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 Expansion (Classroom without Walls)
<u>Description:</u>
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.

<u>Classroom Observations:</u>
- 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.

<u>Teacher Comments:</u>
- "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."
- "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 Refinement

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—even outside with our wireless network."