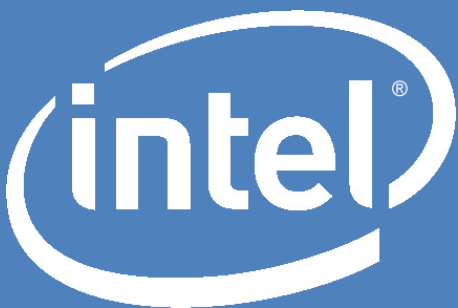


# Technology Literacy

Teach with Technology



**Teach  
Guide**



## Teach with Technology

*Technology Literacy* projects are designed to be implemented in a variety of school settings with students of diverse backgrounds and abilities. *Teach Technology Literacy* helps teachers prepare to implement the projects in their classrooms or schools and to differentiate the projects to meet the individual needs of all learners.



### Project Overview

*Technology Literacy* consists of six projects that cumulatively provide students with opportunities to become fully technology literate. Each of the *three levels* includes *two projects*. Each project consists of *four modules*, and each module includes *five activities* with time for student and teacher reflection at the end of each module.



### Facilitation

*Technology Literacy* projects can be implemented either with classroom computers or in computer laboratories or libraries. If possible, the projects should be facilitated collaboratively by classroom teachers working with technology specialists or librarians. Schools that have one-to-one computing environments can use the projects to support anytime, anywhere learning across the curriculum.



### Differentiation

*Technology Literacy* projects can be differentiated for students with diverse backgrounds and abilities. Teachers can differentiate the *content* that students learn, the *process* used to learn the content, and the *product* that demonstrates learning. The projects provide opportunities for all students, including students with special needs, gifted and talented students, and second language learners, to learn challenging content and develop technology literacy skills.

### Quote to Note

**“People are the common denominator of progress. So...no improvement is possible with unimproved people, and advance is certain when people are liberated and educated.”**

**John Kenneth Galbraith**



## Teach Guide Overview and Benefits

### Technology Literacy Overview

*Technology Literacy* includes three levels, and each level includes two projects that share a common theme. The first project at each level focuses on using technology to support research, writing, and communication. The second project at each level builds on knowledge and skills developed in the first project while focusing on using technology to support critical thinking and data analysis. Completing the projects in order is advantageous for students, but it is not required.

	Level I	Level II	Level III
Theme	<b><i>Describe with Technology</i></b>	<b><i>Explain with Technology</i></b>	<b><i>Persuade with Technology</i></b>
Project 1	Research, Write, Publish	Research, Write, Present	Research, Write, Communicate
Project 2	Think Critically with Data	Make Decisions with Data	Solve Problems with Data

#### Benefits of Technology Literacy Projects

*Technology Literacy* projects meets indicators in all six ISTE National Educational Technology Standards for Students (NETS•S)! The projects give teachers the flexibility to address a variety of content standards, learning objectives, and student outcomes.

[Overview of Benefits](#)  
(PDF; 2 pages)

### Project Design

In each *Technology Literacy* project, students work through four modules that are roughly equivalent to a unit in size and scope. In each module, students work through five activities in which they learn new vocabulary terms, explore specific content, learn new content, complete a task, and take an interactive quiz. Students look back on their learning at the end of each module.

### Describe with Technology

In the first level of *Technology Literacy*, students research complex topics, write narrative essays describing their topics, collect and analyze data to think critically about their topics, and produce publications based on their narratives.

### Explain with Technology

In the second level of *Technology Literacy*, students research complex topics, write expository essays to explain their topics, collect and analyze data to make decisions, and present multimedia slideshows to explain their topics and decisions.

#### Planning to Implement

This form helps teachers plan to implement *Technology Literacy* projects in ways that address content standards and benchmarks.

See the planning form: [Implement a TLC Project](#)



### **Persuade with Technology**

In the third level of *Technology Literacy*, students research complex issues, write persuasive essays to support their positions, publish Web sites to help present convincing arguments for their positions, collect and analyze data to solve problems, and select appropriate technologies to communicate solutions.



## Overview and Benefits Project Design

### Project Design

In each *Technology Literacy* project, students work through four modules that are roughly equivalent to a unit in size and scope. Each project can sustain inquiry into a big idea over the course of a semester or even one school year (O'Hara and McMahon, 2003). The first page of each project provides an overview of what students learn and do in the project and brief introductions to each of the four modules.

**Navigation tabs to each Module in the Project**

**Learning objectives for each Module in the Project**

**Annotated link to each Module in the Project**

(Click image to enlarge)



The *Teacher Guide* for each *Technology Literacy* project includes a form teachers can use to help plan implementation of the project. The most important planning requirements are to choose content standards and benchmarks to address, and define specific learning objectives or outcomes for students to master. *Technology Literacy* projects are designed for flexibility and can be used to explore a variety of subjects and topics in the curriculum.

Each *Teacher Guide* also includes Project Questions that can be used to introduce the associated projects. Teachers can customize the questions to focus on designated content standards and benchmarks or students' interests. Beginning a project by posing engaging and challenging questions encourages students to adopt inquisitive attitudes toward learning (Wiggins and McTighe, 2005).

### **Module Design**

In each module, students work through five activities and then look back on their learning in the module. The first page of each module describes a big idea relating to the technology literacy skills applied in the module as students investigate a content area. The page also provides annotated links to each of the five activities in the module as well as a checklist and rubric for the module.

### **Activity Design**

In each activity, students learn new vocabulary terms, explore specific content, learn new content, complete a task, and take an interactive quiz. The first page of each activity describes the key concepts that students learn in the activity and provides a link to an example student product.

### **Look Back Design**

After students work through the five activities in a module, they review what they have learned, use the checklist to make sure their culminating artifacts are complete, use the rubric to assess their products with teachers, and reflect on their accomplishments.

### **Design References**

Teachers can find more information about research on effective instructional design of technology-based projects in these sources.



## Overview and Benefits | Project Design Module Design

### Module Design

In each module, students work through five activities and then look back on their learning in the module. Depending on how teachers plan to implement a project, most students can work through each module in three to six weeks. The first page of each module describes a big idea relating to the technology literacy skills applied in the module as students investigate a content area.

The screenshot shows the 'Make Decisions with Data' module page. The navigation tabs at the top include 'Research, Write, Present', 'Make Decisions with Data', 'Teacher Guide', and 'Parent Guide'. Under 'Make Decisions with Data', there are sub-tabs for 'Decision Making', 'Data Collection', 'Data Analysis', and 'Expository Presentation'. The 'Data Collection' sub-tab is active, showing a list of activities: 'Survey Questions', 'Survey Administration', 'Database Basics', 'Database Planning', 'Database Tables', and 'Look Back'. A red box highlights these tabs with the text 'Navigation tabs for each Activity and Look Back'. Below the navigation, the 'Big Idea' section is highlighted with a red box and the text 'Learning objectives for each Activity in the Module'. The 'In this module:' section lists five activities, with a red box highlighting the first activity and the text 'Annotated link to each Activity'. The 'Look Ahead' section contains a 'Checklist' and a 'Rubric', with a red box highlighting the rubric and the text 'Rubric for the culminating student product'. The 'Look Back' section at the bottom is highlighted with a red box and the text 'Annotated link to Look Back'. At the bottom of the page, there is a 'Contact Education' button and footer information including 'Legal Information | Privacy Policy' and '© Intel Corporation'.

(Click image to enlarge)



The *Teacher Guide* for each *Technology Literacy* project includes Module Questions that can be used to help introduce the module. Teachers can customize the questions to focus on the specific learning objectives and outcomes or students' interests. Beginning a module by posing engaging and challenging questions encourages students to make connections among ideas and concepts as they work through the module.

The checklist and rubric for the module are included in a highlight box at the beginning of each module. Teachers can use the checklist to make students aware of everything they will be doing in the five activities in the module. Teachers can lead discussions about the rubric for each module to help make students aware of what they should know and be able to do by the end of the module. Teachers may want to modify the rubric depending on the specific learning objectives and outcomes they want students to master.





## Overview and Benefits | Project Design Activity Design

### Activity Design

In each activity, students learn new vocabulary terms, explore specific content, learn new content, complete a task, and take an interactive quiz. The first page of each activity describes the key concepts that students learn in the activity.

The screenshot shows the 'Database Basics' activity page. Red annotations highlight the following elements:

- Navigation menu to each instructional element in the Activity:** A vertical menu on the left with buttons for Vocabulary, Exploration, Information, Task, and Quiz.
- The task students must complete in the Activity and a goal for student achievement:** A box pointing to the 'Task' and 'Goal' sections in the 'Look Ahead' area.
- An example of student work that completes the task and meets the goal for the Activity:** A box pointing to the 'See the example' link in the 'Look Ahead' area.
- Link to the next instructional element in the Activity:** A box pointing to the 'Next to Vocabulary >' button at the bottom of the page.

The page content includes a breadcrumb trail: Research, Write, Present > Make Decisions with Data > Data Collection > Database Basics. The 'Look Ahead' section contains the following text:

**Task:** Describe five menu options in your database application's graphical user interface.

**Goal:** Explain how you can use these five options to manage your survey data.

You may want to review an example of a *database GUI explanation* before you begin.

**See the example:** Microsoft Word® | PDF

**Next to Vocabulary >**

(Click image to enlarge)



The task for each activity, the goal for students to achieve with their products, and an example student product are included in a highlight box at the beginning of each activity. The *Teacher Guide* for each *Technology Literacy* project includes Activity Questions that can be used to help introduce the activity.

**Vocabulary: Words to Remember**

Each activity begins with a Vocabulary page containing both content and technical terms that are used in the activity or reviewed from previous activities. Teachers should introduce vocabulary words to students with a brief explanation and help students associate images or symbols with key terms (Marzano et al., 2001). Teachers may need to explain to students that using correct terminology to discuss technology is an essential literacy skill in the 21st century.

Teachers may have students use each word in a sentence or act out each word. Teachers may also have students work in pairs or small groups to quiz each other or draw an image or symbol that represents each word. If necessary, teachers can pair students with a complementary partner or a peer tutor to make sure everyone acquires key terms in the vocabulary.

**Exploration: Learning from the Web**

Student exploration of Web sites is the heart of *Technology Literacy* projects. The Exploration page lists preselected Web sites along with Guiding Questions, which are similar to the Activity Questions in the *Teacher Guide* for each project. The questions guide student reading of the Web sites and increase comprehension (Lewin, 2001).

Teachers must make sure that students understand similarities and differences in reading on the Web and reading in print. One important difference is that students must be able to navigate through a Web site and understand that the structure of Web sites is much more variable than the organization of textbooks and other print materials.

Students must develop the ability to get a quick sense of how each Web site is structured and where they are likely to find the most relevant content. In order to read the Web efficiently, students must do much more scanning than they would typically do with print materials. Teachers can make sure that students have keywords in mind when they scan Web pages for relevant content, which helps prepare students to make their own searches efficiently and effectively.

Teachers should make sure students review the guiding questions for each activity before they explore the Web. Teachers can explain or to students that the guiding questions help focus online reading. Teachers may want to ask students to write guiding questions based on their own interests to increase engagement and comprehension. Teachers may want to ask students what they already know about the topic. Teachers may also want to ask students to take notes or report out to the class, another student, or a small group of students.

**Information: What to Know**

The Information page summarizes the relevant content from the Web sites listed on the Exploration page. All information that students need to complete the task in each activity can be found on the Information page. Teachers can question students to make sure they have learned the information they need to complete the task for the activity.



A presentation station can be used to lead discussions about the information. Teachers can question students about essential information and have students generate and vote on answers to the questions. Teachers can also have students use the presentation station to explain the content in their own words. Students can discuss the information in pairs, small groups, or as a class. Providing students with flexible opportunities to process information helps ensure that all students are able to learn new content (Rose and Meyer, 2002).

The amount of time spent on the Exploration and Information pages may vary from activity to activity. In some cases, teachers may choose to have students spend relatively little time exploring Web sites to accommodate time limitations or the individual needs of some learners.

### **Task: What to Do**

The Task page includes the task and goal for an activity, which are also introduced with the activity. In most cases, teachers should model the tools, resources, and processes a task requires. A presentation station consisting of a computer connected to a projection device or a television monitor allows teachers to model the knowledge and skills needed for the whole class.

The Intel® Education Help Guide provides just-in-time assistance with technology skills as students work through the task. Students can use the Help Guide highlight box on each Task page to find step-by-step directions for specific skills needed to complete the task. Students can become more self-directed by learning or reviewing technology skills as students need the skills.

Classroom teachers may want to check with a technology specialist to find out what technology tools and resources are available for students to use. Teachers may also want to ask the technology specialist to model key technical skills.

Teachers should discuss student example artifact with the whole class or small groups before students begin the task. Teachers may want to review the section of the checklist that applies to the activity and discuss whether the example artifact is complete. Teachers can also review the rubric for the module and discuss what criteria could be used to assess the example for each activity.

### **Quiz: Check Your Understanding**

The last page of each activity contains an interactive quiz with three questions. Students receive immediate feedback when they select an answer for each question, but the quiz is not scored and results are not recorded or tabulated. Teachers should make sure students read the feedback they get when they answer each question.

Optionally, teachers can use a presentation station to take the quiz as a class. Students can vote on each answer and then discuss why each answer is correct or incorrect.

In many activities, the three quiz questions only touch on a few of the important concepts or facts students should learn. Teachers can have students write their own quiz questions and share them with a peer, a small group, or the whole class.



## Overview and Benefits | Project Design Look Back Design

### Look Back Design

After students work through the five activities in a module, they review what they have learned, use the checklist to make sure their culminating artifacts are complete, use the rubric to assess their products with teachers, and reflect on their accomplishments. Students should have opportunities to share the knowledge they have created with others (Sandholtz et al., 1997).

Teachers can use the bullet points on the first page of Look Back to help students recall what they learned in the module. Teachers may want to lead a discussion to review key fundamental concepts and essential information from each of the five activities in the module.

### Checklist

Teachers can help students use the Checklist page to make sure they have completed all the tasks in the module. Completing all tasks ensures that students are ready to move on to the next module. In the fourth and final module in each project, teachers can use the checklist to make sure that students can confidently produce the culminating artifact for the project.

### Rubric

Teachers can help students use the Rubric page to self-assess the important characteristics of their culminating artifacts they produced during the module. Teachers can make sure students' self-assessments of their products and perceptions of how they did their work are accurate. Teachers should always encourage students to use their self-assessments to improve their products. Teachers may want to refine rubrics based on student work (Wiggins and McTighe, 2005).

### Reflection

Teachers should give feedback and ask questions that encourage reflection any time the opportunity arises. If possible, teachers may want to give students time to share and reflect on their products with each other as a class, in small groups, or in pairs. Teachers can use the bulleted list on the Reflection page to help students get started on their reflections.

Every *Technology Literacy* project has a *Parent Guide* that informs parents, guardians, or other trusted adults of the key fundamental concepts and essential information that students learn in each module. Teachers can make sure parents, guardians, or other trusted adults are aware of the *Parent Guide* and encourage students to take culminating artifacts home for more sharing and reflection.



## Overview and Benefits | Project Design References

### References

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## Overview and Benefits Describe with Technology

### Describe with Technology

In the first level of *Technology Literacy*, teachers empower students to use technology to understand and describe big ideas in the core curriculum.

In *Describe with Technology* projects, teachers:

- Facilitate creative, innovative, and critical thinking
- Help students build research skills and information fluency
- Encourage collaboration and communication
- Cultivate technology literacy and responsible digital citizenship

### Research, Write, Publish

In the *Research, Write, Publish* project, teachers facilitate student research into complex topics and encourage creative writing about real events. Students become more effective communicators by publishing their descriptive writing in visually appealing brochures.

### Think Critically with Data

In the *Think Critically with Data* project, teachers facilitate critical thinking as students collect and analyze opinion data to create knowledge of complex topics. Students share the knowledge they acquire by describing their data in visually appealing newsletters.



## Overview and Benefits | Describe with Technology

# Research, Write, Publish

### Research, Write, Publish

Teachers help students develop the fundamental skills needed to use technology to support research, creativity, and communication. Students become more effective researchers, writers, and publishers by learning and applying sound methods and processes. Students learn how to apply elements of narrative writing and strategies for online research, write fictional narratives, and use desktop publishing tools to publish brochures for their narratives.

In this project, teachers provide opportunities for students to:

- Use technology to research curriculum concepts and evaluate the credibility, accuracy, relevance, and bias of information sources
- Apply technology to support personal productivity, knowledge construction, and creative expression throughout the curriculum
- Design, develop, and publish creative brochures that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom
- Practice safe, responsible, ethical, and legal use of technology
- Develop and apply strategies for solving routine hardware and software problems



## Overview and Benefits | Describe with Technology

# Think Critically with Data

### Think Critically with Data

Teachers help students develop the fundamental skills needed to use technology to support critical thinking, data analysis, and communication. Students develop enduring understandings of how to monitor their own thinking and hold themselves accountable for its quality. Students learn how to practice and apply critical thinking skills, research complex topics by collecting data, analyze opinion data on complex topics, and publish newsletters about their topics.

In this project, teachers provide opportunities for students to:

- Use technology to research curriculum concepts and evaluate the credibility, accuracy, relevance, and bias of information sources
- Apply technology to support personal productivity, knowledge construction, and creative expression throughout the curriculum
- Gather, organize, and analyze real-world data and create graphs and charts to represent data visually and illustrate relationships among data
- Design, develop, and publish creative newsletters that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom
- Practice safe, responsible, ethical, and legal use of technology
- Develop and apply strategies for solving routine hardware and software problems





## Overview and Benefits Explain with Technology

### **Explain with Technology**

In the second level of *Technology Literacy*, teachers empower students to understand and explain important concepts in the core curriculum.

In *Explain with Technology* projects, teachers:

- Promote creativity and innovation
- Facilitate critical thinking and decision making
- Help students build research skills and information fluency
- Encourage collaboration and communication
- Cultivate technology literacy and responsible digital citizenship

### **Research, Write, Present**

In the *Research, Write, Present* project, teachers facilitate student research into complex topics and encourage expository writing about real events. Students become more effective communicators by designing and delivering multimedia presentations on topics to live audiences.

### **Make Decisions with Data**

In the *Make Decisions with Data* project, teachers help students define important decisions and collect and analyze opinion data that can be used to make informed decisions. Students become more effective communicators by presenting decisions to live audiences.



## Overview and Benefits | Explain with Technology

# Research, Write, Present

### Research, Write, Present

Teachers help students develop fundamental skills needed to use technology to support research, creativity, and communication. Students become more effective researchers, writers, and presenters by learning to apply known structures and processes to new topics. Students learn how to apply the elements of expository writing, research complex topics, write expository essays explaining their topics, and design and deliver multimedia presentations to explain their topics to live audiences.

In this project, teachers provide opportunities for students to:

- Use technology to research curriculum concepts and evaluate the credibility, accuracy, relevance, and bias of information sources
- Apply technology to support personal productivity, knowledge construction, and creative expression throughout the curriculum
- Design, develop, and present creative multimedia presentations that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom
- Practice and advocate safe, responsible, ethical, and legal use of technology
- Develop and apply strategies for solving routine hardware and software problems



## Overview and Benefits | Explain with Technology

# Make Decisions with Data

### Make Decisions with Data

Teachers help students develop fundamental skills needed to use technology to support decision making, data analysis, and communication. Students develop enduring understandings of how to consider different points of view with reason and fairness. Students define and research decisions about complex topics, collect opinion data to evaluate alternatives, analyze and visualize data to make choices, and design and deliver multimedia presentations to explain their decisions to live audiences.

In this project, teachers provide opportunities for students to:

- Use technology to research curriculum concepts and evaluate the credibility, accuracy, relevance, and bias of information sources
- Apply technology to support personal productivity, knowledge construction, and creative expression throughout the curriculum
- Gather, organize, and analyze real-world data and create graphs and charts to represent data visually and illustrate relationships among data
- Design, develop, and present creative multimedia presentations that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom
- Practice and advocate safe, responsible, ethical, and legal use of technology
- Develop and apply strategies for solving routine hardware and software problems



## Overview and Benefits Persuade with Technology

### **Persuade with Technology**

In the third level of *Technology Literacy*, teachers empower students to understand and take positions on important concepts in the core curriculum.

In *Persuade with Technology* projects, teachers:

- Promote creativity and innovation
- Facilitate critical thinking, decision making, and problem solving
- Help students develop research skills and information fluency
- Encourage collaboration and communication
- Cultivate technology literacy and responsible digital citizenship

### **Research, Write, Communicate**

In the *Research, Write, Communicate* project, teachers facilitate student research into complex topics and encourage persuasive writing about real events. Students become more effective communicators by designing and publishing Web sites that make convincing arguments for their positions.

### **Solve Problems with Data**

In the *Solve Problems with Data* project, teachers help students define important problems and collect and analyze opinion data to solve the problems. Students become more effective communicators by selecting and using appropriate technology tools to communicate convincing arguments for their positions.



## Overview and Benefits | Persuade with Technology Research, Write, Communicate

### Research, Write, Communicate

Teachers help students develop fundamental skills needed to use technology to support research, creativity, and communication. Students become more effective researchers, writers, and communicators by learning how to give precise instructions to computers and collaborate with their peers. Students learn how to apply the elements of persuasive writing, research complex issues and take positions, write persuasive essays to support their positions, and publish Web sites to help present convincing arguments for their positions.

In this project, teachers provide opportunities for students to:

- Use technology to research curriculum concepts and evaluate the credibility, accuracy, relevance, and bias of information sources
- Apply technology to support personal productivity, knowledge construction, and creative expression throughout the curriculum
- Collaborate with peers, experts, and others to investigate curriculum-related problems, issues, and information, and to develop innovative solutions
- Discuss social and cultural advantages and disadvantages of technology and the implications and possibilities of emerging technologies
- Design, develop, and publish creative and innovative Web sites that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom
- Practice and advocate safe, responsible, ethical, and legal use of technology
- Develop and apply strategies for solving routine hardware and software problems



## Overview and Benefits | Explain with Technology

# Solve Problems with Data

### Solve Problems with Data

Teachers help students develop fundamental skills needed to use technology to support problem solving, data analysis, and communication. Students develop an enduring understanding of the similarities among skills that help them think critically, analyze data effectively, collaborate with peers successfully, and communicate with others clearly. Students define and research problems arising from complex issues, collect opinion data to evaluate possible solutions, analyze and visualize data to devise plans to solve the problems, and select appropriate technologies to help them make convincing arguments for the implementation of their solutions.

In this project, teachers provide opportunities for students to:

- Use technology to research curriculum concepts and evaluate the credibility, accuracy, relevance, and bias of information sources
- Apply technology to support personal productivity, knowledge construction, and creative expression throughout the curriculum
- Gather, organize, and analyze real-world data and create graphs and charts to represent data visually and illustrate relationships among data
- Collaborate with peers, experts, and others to investigate curriculum-related problems, issues, and information, and to develop innovative solutions
- Select and use appropriate technology tools and resources to accomplish a variety of tasks and solve problems
- Design, develop, and publish creative and innovative Web sites that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom
- Practice and advocate safe, responsible, ethical, and legal use of technology
- Develop and apply strategies for solving routine hardware and software problems



## Teach Guide Facilitation

### Facilitation Overview

*Technology Literacy* projects simplify the challenge of integrating technology by providing a curriculum to support effective student use of technology in core subjects. Contrary to some common misconceptions, project approaches do *not* require a complete change in instructional practices or require a lot of extra time or work. Successful project-based learning does, however, require careful planning and management.

Teachers who successfully integrate technology into the core curriculum often employ a coordinated combination of instructional strategies and classroom management techniques (Sandholtz et al. 1997). *Teach Technology Literacy* helps teachers expand their repertoire of research-based instructional strategies and develop specific techniques for managing student use of technology four facilitation models— classroom computers, computer laboratories, collaborative facilitation, and one-to-one facilitation (Marzano et al. 2001; Marzano 2003).

### Classroom Computers

*Technology Literacy* projects can be facilitated by individual teachers or grade-level teams on classroom computers. Classroom teachers can facilitate the projects successfully if their classrooms have at least one instructional computer with Internet access. Classrooms that have more than one instructional computer with Internet access can support more extensive implementations.

### Computer Laboratories

*Technology Literacy* projects can be facilitated by technology teachers or librarians in a computer laboratory or similarly equipped library or media center. Technology teachers and librarians can facilitate the projects successfully if they have a working knowledge of their school's core curriculum. More explicit curriculum maps enable technology teachers and librarians to align the projects more closely to subject area content.

### Collaborative Facilitation

If possible, *Technology Literacy* projects should be facilitated by classroom teachers collaborating with technology and library specialists. Classroom teachers can connect the projects most closely to subject area content, while technology and library specialists can provide access to and support for technology tools and skills.

### Facilitation Self-Assessment

The facilitation self-assessment helps prepare teachers to use *Technology Literacy* projects to support a student-centered classroom.

See the facilitation self-assessment:  
[Facilitation Self-Assessment](#)



### **One-to-One Facilitation**

*Technology Literacy* projects are an ideal resource for the growing number of schools with one-to-one computing environments. The projects provide extensive opportunities to connect technology tools and information resources to subject area content.

### **Facilitation References**

Teachers can find more information about research on effective strategies and techniques for facilitating technology-based projects in these sources.





## Facilitation Classroom Computers

### Classroom Computers

When students have access to instructional computers and the Internet in their classrooms, projects provide excellent opportunities for developing students' technology literacy and subject area knowledge. Imagine a classroom where:

- A student who uses a home computer extensively but usually puts forth minimum effort toward schoolwork becomes more engaged with subject area content when given an opportunity to conduct online research.
- A student with no computer or Internet access at home learns to identify credible and reliable Web sites and publishes a well-researched, well-designed newsletter.
- A group of students research a local environmental problem and publish a Web site to raise awareness of the problem and propose a solution.
- A student becomes more engaged in the writing process when allowed to use a word processing application and produces an unusually comprehensive and effective essay.
- A group of students use e-mail and instant messaging to communicate with peers in other countries while researching global climate change.

### Strategies for Classroom Computers

Teachers must employ instructional strategies to ensure that students use classroom computers as productively as possible. Fortunately, a variety of instructional strategies can be effective, ranging from individual work to group work and centers.

### Techniques for Classroom Computers

When students share classroom computers, teachers must establish rules and procedures to maximize student use of the computers and minimize conflict and disruption. Even with only one computer in the classroom, teachers can employ many techniques to effectively use technology to improve student learning.



## Facilitation| Classroom Computers Strategies for Classroom Computers

### Strategies for Classroom Computers

Any teacher with at least one classroom computer connected to the Internet can facilitate successful project-based learning with technology. Fortunately, many instructional strategies that support project-based learning with technology have been shown to be effective with or without classroom computers (Marzano et al. 2001). Some effective instructional strategies for project-based learning with classroom computers include:

- **Prior Knowledge.** Teachers should activate prior knowledge when they introduce a new *Technology Literacy* project. Teachers can also activate knowledge from previous modules and activities throughout the implementation of the project.
- **Questioning.** Teachers should use guiding questions to focus student exploration and research on the Internet as well as allow students to ask and explore their own questions. Open-ended questions that call for thinking skills such as analysis, synthesis, and evaluation can increase student engagement. Teachers should make sure students understand their tasks by asking specific questions rather than general questions. For example, instead of asking, “Do you understand?” a teacher could ask, “What is the first step?” or “How are you going to do that?”
- **Explicit Modeling.** Responsible use of technology for learning requires skills that students may not acquire from their outside-of-school technology use. Teachers must model new technology skills and provide guided practice before releasing students to work independently.
- **Cooperative Learning.** Sharing classroom computers is an excellent way to give students more time to learn with technology. More importantly, students in cooperative groups are more comfortable and less anxious about their learning. When students receive instruction in how to support each other’s learning, small groups can be safe places for students to ask clarifying questions and receive help when needed.
- **Feedback.** Students who are new to projects often need to learn how to monitor their own progress. Providing effective feedback can help students develop the reflective and metacognitive thinking skills they need to address problems effectively and evaluate their work accurately. Teachers must be watchful while students work on classroom computers and provide feedback when needed.
- **Graphic Organizers.** When students have limited time to learn with technology, opportunities to think about new concepts in nonlinguistic ways can help prepare them to get the most out of their computer time. When implementing *Technology Literacy* projects, printing graphic organizers—such as concept maps, cause-and-effect graphics, T-charts, storyboards, Venn diagrams, and timelines—for students before they go to the computer can help keep students on task.



- **Assessments.** Learning with technology provides students with opportunities to produce authentic artifacts. Teachers must adopt alternative assessments, such as checklists and rubrics, for these kinds of student products.



## Facilitation| Classroom Computers

# Techniques for Classroom Computers

### Techniques for Classroom Computers

Student use of classroom computers poses some well-known classroom management challenges for teachers. However, any teacher with at least one classroom computer connected to the Internet can provide opportunities for project-based learning with technology. Teachers must develop specific rules and procedures for student use of classroom computers with negative consequences for unacceptable behavior. To effectively manage student use of classroom computers, teachers can:

- Involve students in making rules for classroom computer use, including etiquette, to ensure that students who are working on computers do not disturb the rest of the class.
- Make sure that negative consequences for breaking the rules are clearly spelled out, and enforce the rules with loss of computer privileges if necessary.
- Establish a daily schedule or signup system for both group and individual use of classroom computers.
- Provide additional computer time for students who do not have computer or Internet access at home.
- Make sure students know how to save their work to folders or portable storage devices, such as flash drives. Students can attach flash drives to identification cards or place flash drives in designated storage spaces to avoid losing the devices.
- Establish a convention for naming files—such as student name or identification number, activity name, and date—to ensure that student work is easily identifiable and less likely to be accidentally overwritten or deleted.
- Make sure students know how to print and understand when printing is acceptable.
- Designate students who are proficient with technology and able to work well with others to serve as “technology experts” who provide technical support for peers and help enforce rules, schedules, and procedures for saving and printing.
- Ask a resource teacher, instructional aide, or parent to provide any needed assistance with computers and to help enforce rules and procedures.
- If the classroom teacher has a presentation station, make sure the projection device is working properly before introducing a project, module, or activity.



Technology Literacy

- If a classroom has a Web page, blog, or wiki, add a link to the project, module, or activity so students can find it quickly. If not, teachers can add the link to the favorites or bookmarks list in the web browser or create a shortcut link on the desktop of each classroom computer.
- Provide students with hard copies of valuable support materials, such as examples and graphic organizers, before they use classroom computers.
- Make sure all students participate when working in groups by establishing roles with specific responsibilities and asking students to change roles regularly.



## Facilitation Computer Laboratories

### Computer Laboratories

When students have regular access to the Internet in a computer laboratory, projects provide excellent opportunities for developing students' technology literacy and subject area knowledge. Imagine a computer laboratory where:

- A student who uses a home computer extensively is often disruptive in the classroom but becomes an effective peer tutor when provided with an opportunity to take on the role of technology expert and move around the computer laboratory, helping other students.
- A student with no computer or Internet access at home develops technology knowledge and skills while helping the computer teacher maintain equipment and prepare materials for activities in the computer laboratory.
- Students become more engaged in writing when given an opportunity to use a word processor to review each other's essays and publish their writing in brochures, which generates improvements in both quantity and quality of the students' writing.
- A student who dislikes math but enjoys social studies uses a spreadsheet application to analyze data on a complex social problem and creates charts and graphs to illustrate relationships among data.
- Students use e-mail and instant messaging to collaboratively research an international issue with students in other countries.

### Strategies for Computer Laboratories

Technology and library specialists must employ instructional strategies based on explicit learning objectives. A variety of instructional strategies can help technology and library specialists connect technology literacy to content areas. In computer laboratories, students usually work independently, but they can also work in pairs or groups when appropriate.

### Techniques for Computer Laboratories

When students use technology in a computer laboratory (or a comparably equipped library or media center), technology and library specialists must establish rules and procedures to ensure orderly transitions and responsible educational use. Because time is always limited, students need to get to work quickly and stay on task throughout the class period.



## Facilitation | Computer Laboratories Strategies for Computer Laboratories

### Strategies for Computer Laboratories

Technology and library specialists in a computer laboratory or comparably equipped library or media center can facilitate successful project-based learning with technology. Many of the same instructional strategies that support project-based learning with technology in classrooms can be equally effective in computer laboratories. Some effective instructional strategies for project-based learning in computer laboratories include:

- **Prior Knowledge.** When students are learning new technology concepts and skills in a computer laboratory or library, accessing prior knowledge may be a challenge. Technology and library specialists must remember that although students may be able to learn technology skills by experimentation, they may not understand important concepts or have the technical vocabulary to express their knowledge. Connecting new technology concepts and vocabulary to prior knowledge, especially knowledge gained in the classroom, can help students become more technology literate.
- **Questioning.** Technology and library specialists should use guiding questions to focus student exploration of new technology concepts as well as allow students to ask and explore their own questions. Open-ended questions that call for thinking skills such as analysis, synthesis, and evaluation can increase student engagement. Technology and library specialists should make sure that students understand new technology concepts by asking specific questions rather than general questions. For example, instead of asking, “Do you understand?” a technology or library specialist could ask “What is the first step?” or “How are you going to do that?”
- **Explicit Modeling.** Effective use of technology for learning requires skills that students may not acquire outside the computer laboratory. Modeling new technology skills and providing guided practice before releasing students to work independently can make students more productive in the computer laboratory and save time in the long run.
- **Cooperative Learning.** Even when students have their own computers, cooperative learning in pairs and small groups can be effective. Encouraging students to help each other with technical problems and content questions can enable technology and library specialists to focus their attention where it is most needed. Cooperative learning in the computer laboratory can also be an effective way to develop 21st century skills of communication and collaboration while using technology.
- **Graphic Organizers.** When students have limited time to learn with technology, opportunities to think about new concepts in nonlinguistic ways can help prepare them to get the most out of their computer time. Printing graphic organizers—such as concept maps, cause-and-effect graphics, T-charts, storyboards, Venn diagrams, and timelines—and distributing them as students enter the computer laboratory can help keep students on task.



- **Assessments.** Technology and library specialists can often give students opportunities to produce more sophisticated artifacts with a greater variety of technology tools than may be available in regular classrooms. In Technology Literacy projects, technology and library specialists use varied assessments, such as checklists and rubrics, for these kinds of student products.





## Facilitation | Computer Laboratories Techniques for Computer Laboratories

### Techniques for Computer Laboratories

In many schools, computer laboratories (or comparably equipped libraries or media centers) provide the most effective opportunities for project-based learning with technology. Technology and library specialists must develop specific rules and procedures for student use of laboratory computers with negative consequences for unacceptable behavior. To effectively manage student use of laboratory and library computers, technology and library specialists can:

- Involve students in making rules for the computer laboratory to ensure that students take proper care of equipment and stay on task throughout the period.
- Make sure that negative consequences for breaking the rules are clearly spelled out, and enforce the rules with removal from the computer laboratory if necessary.
- Establish a seating chart to make sure students enter the laboratory and settle into their tasks quickly and without discussion.
- Provide additional laboratory time, possibly before or after school, for students who do not have computer or Internet access at home.
- If possible, provide folders for each student on a network fileserver and make sure students know how to save their work to the correct folder. Technology or library specialists can establish a system for backing up folders frequently to ensure that student work is not lost.
- If a network fileserver is not available, make sure students can save their work to a portable storage device, such as a flash drive. Students can attach flash drives to identification cards or place flash drives in a designated storage space to avoid losing the devices.
- Establish a convention for naming files—such as teacher name or room number, student name or identification number, activity name, and date—to ensure that student work is easily identifiable and less likely to be accidentally overwritten or deleted.
- Make sure students know how to print and understand when printing is acceptable.
- Designate students who are proficient with technology and able to work well with others to serve as “technology experts” who provide technical support for peers and help enforce rules, schedules, and procedures for saving and printing.



- Provide students with hard copies of valuable support materials such as examples and graphic organizers as they enter the computer laboratory.
- If the computer laboratory has a Web page, blog, or wiki, add a link to the project, module, or activity so students can find it quickly. If not, technology or library specialists can add the link to the favorites or bookmarks list in the web browser or create a shortcut link on the desktop of each computer in the laboratory.
- Ask students to turn off their monitors to ensure that they pay attention while the technology or library specialist introduces a project, module, or activity.
- Establish a system for students to focus their attention in an orderly fashion. For example, technology or library specialists can provide students with red, yellow, and green plastic cups. Students can then stack the cups on top of their monitors with the red cup on top when they need help, the yellow cup on top when they have a question, and the green cup on top when no assistance is needed.
- Ask classroom teachers, instructional aides, or parents to provide any needed assistance and to help enforce rules and procedures in the computer laboratory.



## Facilitation Collaborative Facilitation

### Collaborative Facilitation

When students have access to the Internet in classrooms and a computer laboratory, projects provide excellent opportunities for teachers to collaborate to develop students' technology literacy and subject area knowledge. Imagine a school where:

- All students know how to use a variety of technology tools efficiently and effectively regardless of whether they have computers or Internet access at home.
- Students learn new technology concepts and skills in the computer laboratory and immediately apply them to subject area learning in their classrooms.
- Students spontaneously access a variety of online sources and databases to supplement textbooks and research complex topics.
- Students confidently write, revise, and edit in a variety of styles for a variety of audiences.
- Students quickly collect and analyze data in a variety of subject areas and create charts, graphs, and other visual representations of relationships among data.
- Students routinely demonstrate their understanding of big ideas by producing authentic artifacts such as, publications, presentations, and Web sites.

### Strategies for Collaborative Facilitation

When students regularly use technology in both the classroom and a computer laboratory or library, classroom teachers and technology and library specialists can collaboratively coordinate instructional strategies. Classroom teachers and technology and library specialists should have co-planning time to ensure that students use technology resources productively in both the computer laboratory and classrooms.

### Techniques for Collaborative Facilitation

When students regularly use technology in both the classroom and a computer laboratory or library, classroom teachers and technology and library specialists can collaboratively establish rules and procedures. Ideally, classroom teachers should accompany students to the computer laboratory or library and team-teach with the computer teacher or librarian.



## Facilitation | Collaborative Facilitation Strategies for Collaborative Facilitation

### Strategies for Collaborative Facilitation

Technology and library specialists collaborating with classroom teachers can facilitate highly effective project-based learning in the computer laboratory and classroom. Teachers can coordinate instructional strategies so students come to the computer laboratory prepared to make the most productive use of the computers. Some effective instructional strategies for project-based learning with classroom computers and in the computer laboratory include:

- **Prior Knowledge.** When classroom teachers plan with technology and library specialists, each can access students' prior knowledge. Classroom teachers can access prior knowledge of technology concepts and skills that students have learned in the computer laboratory. Technology and library specialists can access prior subject area knowledge that students have learned in the classroom. Connecting new technology concepts and vocabulary to new subject area concepts and vocabulary can help students become more literate across the curriculum.
- **Questioning.** Classroom teachers can use guiding questions to focus student exploration and research on the Internet while technology and library specialists can pose questions to focus student exploration on new technology concepts. Open-ended or student-generated questions that call for thinking skills such as analysis, synthesis, and evaluation can increase student engagement. Classroom teachers and technology and library specialists should make sure that students understand what they think they have learned in the computer laboratory or classroom by asking specific questions rather than general questions. For example, instead of asking, "Do you understand?" a teacher or specialist could ask "What is the first step?" or "How are you going to do that?"
- **Explicit Modeling.** When classroom teachers collaborate with technology and library specialists, each teacher can model the strategies and skills in which they have the most expertise. Technology and library specialists can model efficient and effective use of a variety of technology tools. Classroom teachers can model responsible use of technology for learning in the core curriculum. Teachers must model and provide guided practice with both technology skills and subject area strategies before releasing students to work independently.
- **Cooperative Learning.** Classroom teachers can use cooperative learning in pairs and small groups to give students time on classroom computers, reserving the most computer-intensive tasks for the computer laboratory. When students receive instruction in how to support each other's learning, small groups can be safe places for students to ask clarifying questions and receive help when needed. Cooperative learning can also be an effective way to develop 21st century skills of communication and collaboration while using technology.



- **Feedback.** Students who are new to projects often need to learn how to monitor their own progress. Providing effective feedback can help students develop the reflective and metacognitive thinking skills they need to attack problems more effectively and evaluate their own work.
- **Graphic Organizers.** When students have limited time to learn with technology, opportunities to think about new concepts in nonlinguistic ways can help prepare them to get the most out of their computer time. Graphic organizers—such as concept maps, cause-and-effect graphics, T-charts, storyboards, Venn diagrams, and timelines—can help keep students on task. Classroom teachers can print graphic organizers for students before they go to computers in the classroom or the computer laboratory. Technology and library specialists can print graphic organizers and distribute them as students enter the computer laboratory or library. Assessments. When classroom teachers plan with technology and library specialists, they can provide students with opportunities to produce authentic artifacts using a greater variety of technology tools than may be available in classrooms. Classroom and technology and library specialists must adopt alternative assessments, such as checklists and rubrics, for these kinds of student products.
- **Assessments.** When classroom teachers plan with technology and library specialists, they can provide students with opportunities to produce authentic artifacts using a greater variety of technology tools than may be available in classrooms. Classroom teachers and technology and library specialists must adopt alternative assessments, such as checklists and rubrics, for these kinds of student products.



## Facilitation | Collaborative Facilitation Techniques for Collaborative Facilitation

### Techniques for Collaborative Facilitation

When students regularly use technology in both the classroom and a computer laboratory or library, classroom teachers and technology or library specialists can collaboratively establish consistent rules and procedures for student computer use. These rules should include negative consequences for unacceptable behavior that are enforced consistently throughout the school. To effectively manage student technology use in classrooms and computer laboratories in a fair and consistent way, classroom teachers and technology or library specialists can:

- Involve students in making rules for computer use in the classroom and computer laboratory or library to ensure that students take proper care of equipment, stay on task throughout their scheduled computer time, and do not disturb the rest of the class.
- Make sure negative consequences for breaking the rules are clearly spelled out, and enforce the rules with loss of computer privileges in the classroom and access to the computer laboratory or library if necessary.
- Coordinate both individual and group use of computers in the classroom and the computer laboratory or library with a master schedule or signup system.
- Avoid scheduling computer laboratory time during teacher preparation periods so classroom teachers can accompany students to the computer laboratory or library.
- Establish a seating chart for the computer laboratory or library to make sure students are located near classroom group members and settle into their tasks quickly and without unnecessary discussion.
- Provide additional computer time in the classroom and the computer laboratory or library, possibly before or after school, for students who do not have computer or Internet access at home. If possible, establish a laptop loan program that enables students to take home a school laptop for designated time periods.
- If possible, provide folders for each student on a network fileserver and make sure students know how to locate their folders and save their work to the correct folder from both the classroom and the computer laboratory or library. The classroom teacher and the technology or library specialist should establish a system for backing up folders frequently to ensure that student work is not lost.
- If a network fileserver is not available, make sure students can save their work to portable storage devices, such as flash drives. Students can attach flash drives to identification cards or place flash drives in designated storage spaces to avoid losing



the devices. If necessary, classroom teachers should make sure students have their flash drives before they depart for the computer laboratory or library.

- Establish a convention for naming files—such as teacher name or room number, student name or identification number, activity name, and date—to ensure that student work is easily identifiable and less likely to be accidentally overwritten or deleted.
- Make sure students know how to print and understand when printing is acceptable.
- Designate students who are proficient with technology and able to work well with others to serve as “technology experts” who provide technical support for peers and help enforce rules, schedules, and procedures for saving and printing.
- If the classroom or the computer laboratory or library has a Web page, blog, or wiki, add a link to the project, module, or activity so students can find it quickly. If not, the classroom teacher or the technology or library specialist can add the link to the favorites or bookmarks list in the web browser or create a shortcut link on the desktop of each computer.
- Provide students with hard copies of valuable support materials such as examples and graphic organizers before they use classroom computers or depart for the computer laboratory.
- If the classroom has a presentation station, introduce projects, modules, and activities in the classroom when possible so students can maximize hands-on time in the computer laboratory or library.
- Make sure all students participate when working in groups by establishing roles with specific responsibilities and asking students to change roles regularly.
- Establish a system for students to focus their attention in an orderly fashion. For example, classroom teachers and technology or library specialists can provide students with red, yellow, and green plastic cups. Students can then stack the cups on top of their monitors with the red cup on top when they need help, the yellow cup on top when they have questions, and the green cup on top when no assistance is needed.



## Facilitation

### One-to-One Facilitation

#### One-to-One Facilitation

When students have anytime anywhere access to the Internet with laptop computers, projects provide excellent opportunities for teachers to help students take responsibility for their own technology literacy and subject area knowledge. Imagine a school where:

- Student learning is seamless across the curriculum, and technology is always present but rarely the focus of attention or the subject of discussion.
- Students select appropriate technology tools for each subject area and use their tools efficiently and effectively throughout the school day.
- All students have access to a variety of online sources and databases both at home and at school regardless of their socioeconomic status.
- Students confidently write, revise, and edit in a variety of styles for a variety of audiences.
- Students quickly collect and analyze data in a variety of subject areas and create charts, graphs, and other visual representations of relationships among data.
- Students routinely demonstrate their understanding of big ideas by producing authentic artifacts, such as publications, presentations, and Web sites.

#### Strategies for One-to-One Facilitation

Because laptops empower students to take responsibility for their own learning, teachers must design lessons that take advantage of the capabilities of wireless laptops and engage students in subject area content. Co-planning of technology-enhanced, student-centered lessons helps to ensure that students productively and responsibly use their laptops as learning tools throughout the school day.

#### Techniques for One-to-One Facilitation

When every student has a laptop computer and wireless access to the Internet, classroom teachers, technology specialists, and librarians can collaboratively establish rules and procedures. Ideally, traditional distinctions begin to give way to an anytime, anywhere learning environment in which the computer laboratory and library follow students wherever they go.





## Facilitation | One-to-One Facilitation Strategies for One-to-One Facilitation

### Strategies for One-to-One Facilitation

One-to-one computing provides an ideal environment for classroom teachers and technology specialists to facilitate successful project-based learning with technology. When every student has anytime, anywhere access to the Internet, teachers must expand their use of student-centered instructional strategies. Some effective instructional strategies for project-based learning with one-to-one computing include:

- **Prior Knowledge.** When teachers plan together, each can access students' prior knowledge. Connecting new technology concepts and vocabulary with new concepts and vocabulary in all subject areas can help students become more literate across the curriculum. One-to-one computing gives students anytime, anywhere access to curriculum resources, previous work, and teachers. Teachers can help students access the vast amount of prior knowledge at their fingertips effectively.
- **Questioning.** Classroom teachers can use guiding questions to focus student exploration and research on the Internet, while technology and library specialists can pose questions to focus student exploration of new technology concepts. Open-ended or student-generated questions that call for thinking skills such as analysis, synthesis, and evaluation can increase student engagement.
- **Explicit Modeling.** When every student has a wireless laptop, resource and classroom teachers can team-teach, each modeling the strategies and skills in which they have the most expertise. Technology and library specialists can model efficient and effective use of a variety of technology tools. Classroom teachers can model responsible use of technology for learning in the core curriculum. Teachers must model and provide guided practice with both technology skills and subject area strategies before releasing students to work independently.
- **Cooperative Learning.** Effective one-to-one computing facilitation increases interaction among students. Classroom teachers must learn to relax control and allow students the flexibility to work in impromptu pairs and small groups. When students receive instruction in how to support each other's learning, small groups can be safe places for students to ask clarifying questions and receive help when needed. Cooperative learning can also be an effective way to develop 21st century skills of communication and collaboration around technology.
- **Feedback.** Effective one-to-one computing facilitation increases interaction of students with teachers and provides new opportunities for teachers to give students additional and new kinds of feedback. Wireless laptops empower students to take responsibility for their own learning, which makes learning how to monitor their own progress critically important. Providing effective feedback can help students develop the reflective and metacognitive thinking skills they need to attack problems more effectively and evaluate their own work.



- **Graphic Organizers.** When students have almost unlimited access to information, opportunities to think about new concepts in nonlinguistic ways can help them organize information into knowledge. Graphic organizers—such as concept maps, cause-and-effect graphics, T-charts, storyboards, Venn diagrams, and timelines—can help students organize many pieces of information into a few logical ideas or concepts.
- **Assessments.** One-to-one computing can provide students with anytime, anywhere access to a variety of technology tools and resources for research, writing, data analysis, and communication. Students can use these tools and resources to produce authentic artifacts, often for authentic audiences. Classroom teachers and technology and library specialists must collaboratively develop assessments for these kinds of student products.



## Facilitation | One-to-One Facilitation

# Techniques for One-to-One Facilitation

### Techniques for One-to-One Facilitation

One-to-one computing forces all teachers to confront the challenges of managing student technology use in the classroom. When every student has anytime, anywhere access to the Internet, teachers must establish consistent rules and procedures for student computer use. These rules should include negative consequences for unacceptable behavior that are enforced consistently throughout the school. To effectively manage student technology use in one-to-one learning environments in a fair and consistent way, teachers can:

- Involve students in making rules for laptop use in school and at home to ensure that students take proper care of equipment, stay on task throughout the school day, and do not disturb other students or classes.
- Make sure that student responsibilities are clearly explained in written agreements, hold classroom meetings to review student responsibilities when needed, and enforce the rules with loss of laptop privileges in school or at home when necessary.
- Provide folders for each student on a network fileserver and make sure students know how to locate their folders and save their work to the correct folders from anywhere in the school and, if possible, from home. Teachers should establish a system for backing up folders frequently to ensure that student work is not lost.
- If a network fileserver is not available, make sure students can save their work to portable storage devices, such as flash drives, to ensure that student work is not lost if a laptop is damaged or lost. Students can attach flash drives to identification cards or place flash drives in designated storage spaces to avoid losing the devices.
- Establish a convention for naming files—such as teacher name or room number, student name or identification number, activity name, and date—to ensure that student work is easily identifiable and less likely to be accidentally overwritten or deleted.
- Make sure students know how to print and understand when printing is acceptable.
- If the classroom has a Web page, blog, wiki, or course management system, add a link to the project, module, or activity so that students can find it quickly. If not, the link can be printed or posted so students can add it to their favorites or bookmarks list in their Web browsers or create a desktop shortcut on their desktops.
- If the classroom has a presentation station, teachers may want to ask students to close their laptops when they introduce projects, modules, and activities. If teachers want students to follow along on their laptops, teachers can position themselves at the back of the classroom so they can see students' monitors.



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- Continue to provide opportunities for students to benefit from cooperative learning and make sure all students participate when working in groups.
- Make sure students have adequate space for individual and group work with laptops.
- Maintain a constant state of awareness by moving around the classroom or making frequent eye contact with each student.
- Provide immediate feedback on all relevant aspects of student behavior and try to forecast problems with student behavior or technical problems before they occur.
- Observe and be observed by a master teacher with laptop learning experience to help hone classroom management skills.
- Consider allowing students to use e-mail or instant messaging to communicate with teachers when they need help or have questions about an assignment.
- Provide legitimate uses of e-mail and instant messaging to help keep students on task.
- Consider using remote monitoring software to help enforce rules and procedures for Internet use, e-mail and instant messaging, saving, and printing.



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## Teach Guide Differentiation

### Differentiation Overview

*Technology Literacy* projects can be used to help provide an appropriate learning environment for students with diverse backgrounds and abilities. Tomlinson (1995, 2005) points out that *all* students are different in three ways: readiness to learn, interests, and preferred mode of learning. These differences create challenges, but they also open opportunities that teachers can use to improve learning for all students. Teachers can differentiate the *content* that students learn, the *process* used to learn the content, and the *product* that demonstrates learning.

Rose and Meyer (2002) argue that technology provides an unprecedented opportunity to differentiate content, process, and product. "By virtue of one essential feature—*flexibility*—digital media surpass traditional media in their ability to meet diverse students' varied needs in a variety of instructional contexts." Teachers can take advantage of the flexibility of technology tools and resources to differentiate *Technology Literacy* projects.

*Teach Technology Literacy* provides helpful information on strategies and techniques for differentiating *Technology Literacy* projects to meet the individual needs of all learners. For the purposes of planning and management, consider three important groups of students: students with special needs, gifted and talented students, and second language learners.

### Students with Special Needs

Efforts to provide the least restrictive learning environment possible for students with special needs have created more heterogeneous classrooms. *Technology Literacy* projects can be used to provide opportunities for students with special needs to work with appropriate concepts and technology tools, and in groups of peers with a range of backgrounds and abilities.

### Gifted and Talented Students

Funding constraints often limit the ability of schools to provide programs specifically for gifted and talented students. *Technology Literacy* projects can be used to provide opportunities for gifted and talented students to work with advanced concepts and technology tools, and to learn important communication and collaboration skills in groups of peers with a range of backgrounds and abilities.

### Differentiation Self-Assessment

The differentiation self-assessment helps prepare teachers to use *Technology Literacy* projects to create accommodations for all learners.

See the differentiation self-assessment:

[Differentiation Self-Assessment](#)



### **Second Language Learners**

The rapid pace of globalization in the 21st century puts more second language learners with diverse cultural backgrounds in classrooms. *Technology Literacy* projects can be used to provide opportunities for second language learners to practice and apply new language skills individually and in groups of peers with a range of language and cultural backgrounds.

### **Differentiation References**

Teachers can find more information about research on effective strategies and techniques for differentiating technology-based projects in these sources.



## Differentiation Students with Special Needs

### Students with Special Needs

Projects allow students with special needs to develop their strengths and apply their creativity to material and products that interest them. Students with special needs, particularly those with specific learning disabilities, often have difficulty reading, writing, reasoning, remembering, or organizing information. *Technology Literacy* projects are specifically designed to develop these skills and cannot be completed successfully without them.

When students with disabilities have access to appropriate technology tools and resources, the *Technology Literacy* projects provide excellent opportunities for developing the skills these students need to be successful learners. Imagine a classroom where:

- A student with attention deficit disorder applies strategies for coping with the syndrome by gathering and organizing information during the research process.
- A blind student uses screen reading and voice recognition software to research and write a narrative essay from the point of view of a blind hurricane survivor.
- A dyslexic student who has never liked school becomes the class's foremost expert on desktop publishing and looks forward to a career in graphic design.
- A student who dislikes math because of computation difficulties uses a spreadsheet application to conduct a sophisticated analysis of survey data and creates charts that illustrate relationships among the data.
- An augmentative communication device allows a student with cerebral palsy to lead a group of students in the design and production of a newsletter on career opportunities for people with disabilities.

### Strategies for Students with Special Needs

Several strategies have been shown to be effective in teaching students with special needs and most of these strategies benefit all students.

### Techniques for Students with Special Needs

When teachers establish clear and consistent rules and procedures, regular technology use can significantly benefit students with special needs.





## Differentiation | Students with Special Needs Strategies for Students with Special Needs

### Strategies for Students with Special Needs

Several strategies have been shown to be effective in teaching students with special needs. Research has found that most of these strategies benefit all students (Marzano et al, 2001). Some effective instructional strategies for students with special needs include:

- **Assistive Technology.** Specialized keyboards, mouse alternatives, screen readers, and voice recognition software can help many students with special needs use technology more effectively. Many educational software programs—such as talking dictionaries and talking word processing applications—offer opportunities for students with special needs to improve writing skills.
- **Prior Knowledge.** Linking new knowledge to previous understanding is particularly important with students who have special needs. Know-Wonder-Learn (KWL) charts, discussions, journals, and questioning can help students use what they already know to understand what they are learning.
- **Explicit Modeling.** Activities such as note-taking, making connections among ideas, asking questions, project planning, and time-management may not come naturally to students with special needs. Teachers can break down these types of activities into smaller steps and think out loud to model each step.
- **Feedback.** Students with special needs often have difficulty monitoring their own progress. Providing effective feedback can help students develop the reflective and metacognitive thinking skills they need to evaluate their own work.
- **Graphic Organizers.** Organizing information is often a problem for students with special needs. Students with learning disabilities are often visual learners who respond well to graphic representations of information. Concept maps, cause-and-effect graphics, T-charts, storyboards, Venn diagrams, and timelines can help students incorporate new knowledge into what they already know. Multimedia such as pictures, charts, graphs, audio, and video can also help, as can kinesthetic activities, such as manipulatives, role-playing, and dramatic performances.
- **Cooperative Learning.** When students with special needs work on projects in cooperative groups, they are exposed to the learning strategies of their peers and all students learn from each other. When students receive instruction in how to support each other's learning, small groups can be safe places for students to ask clarifying questions and receive help when needed.
- **Assessments.** While students with special needs should become proficient readers and writers, they should not be limited to these methods when showing what they have learned. Models, dramatic performances, drawings, and similar activities allow students to demonstrate the content they have learned in ways that address their strengths.



## Differentiation | Students with Special Needs Techniques for Students with Special Needs

### Techniques for Students with Special Needs

When teachers establish clear and consistent rules and procedures, regular technology use can significantly benefit students with special needs. To effectively manage technology use by students with special needs, teachers can:

- Provide modifications, accommodations, and assistive technologies consistent with the students' Individual Education Plans (IEPs).
- Ask students to focus on the most important and essential concepts that are challenging and appropriate to the students' interests and abilities.
- Select specific Web sites or Web pages from each activity that are appropriate to the students' reading levels.
- Ask students to take notes or give oral responses to guiding questions while exploring a Web site.
- Make sure students understand the example product in each activity and knows how to begin working on the task.
- Use the checklist for each module to create a customized timeline for students and provide assistance and encouragement at checkpoints throughout the module.
- Provide additional computer time for students and allow students enough time to complete each task as well as possible.
- Ask a resource teacher, instructional aide, or parent to provide any needed assistance to students, such as navigating Web sites, taking notes, or completing tasks.
- Ask students who are proficient with technology and work well with others to help students with special needs complete their tasks.



## Differentiation Gifted and Talented Students

### Gifted and Talented Students

Advanced students respond particularly well to projects that “afford multiple opportunities for student construction of knowledge through inquiry, discussion, and argument” (Watters, 2000). *Technology Literacy* projects provide almost unlimited opportunities for gifted and talented students to become more autonomous learners and begin to think like writers, historians, journalists, mathematicians, scientists, and engineers.

Projects alone, however, do not necessarily stretch the learning of gifted students. Gifted and talented students acquire many learning strategies independently, but they often need additional instruction. Gifted and talented students need complex, challenging tasks to accomplish, but they also need consistent coaching to ensure optimum academic and personal growth.

When coupled with instruction and support at an advanced level, *Technology Literacy* projects provide opportunities for gifted and talented students to master the processes and skills they need to be successful. Imagine a classroom where:

- A sixth grader uses e-mail and instant messaging to communicate with an expert biologist while analyzing radio telemetry data collected from an endangered species.
- A student may be bored and whose behavior has often disrupted class is focused and cooperative while writing a play about being a refugee, creating a brochure to advertise the play, and performing the play with other students at a parent night.
- An extremely creative student who often has trouble completing projects learns a process for gathering and organizing information while researching a narrative essay, then spontaneously transfers that skill to the completion of other academic work.
- A sixth grader in an urban neighborhood school assembles a portfolio of essays, publications, data analyses, and charts and wins admission into the seventh grade program of a prestigious high school.

### Strategies for Gifted and Talented Students

Teachers must adapt instruction in a heterogeneous classroom to help gifted learners achieve their full potential. Fortunately, many of the instructional strategies that are effective for students with special needs are also appropriate for gifted and talented students.

### Techniques for Gifted and Talented Students

When teachers establish rules and procedures that enable inquiry, discussion, and argument, technology provides powerful tools to empower gifted and talented learners to achieve their full potential.



## Differentiation | Gifted and Talented Students

# Strategies for Gifted and Talented Students

### Strategies for Gifted and Talented Students

Instruction in a heterogeneous classroom must be adapted to help gifted learners achieve their full potential. Fortunately, many of the instructional strategies that are effective for students with special needs are also appropriate for gifted and talented students. Some effective instructional strategies for gifted and talented students include:

- **Questioning.** Gifted and talented students may benefit from more opportunities to explore Essential Questions. Complex concepts that demand cognitive effort build positive attitudes toward learning and increase intrinsic motivation. Open-ended questions that call for thinking skills such as analysis, synthesis, and evaluation can help gifted and talented students apply new knowledge to other situations.
- **Explicit Modeling.** Because gifted and talented students often employ higher-order thinking skills, teachers must devise ways to help students describe their thinking strategies. By asking pertinent questions and listening to student interactions, teachers can observe the kinds of thinking students are using as they work on projects and provide appropriate instruction and support.
- **Feedback.** When gifted and talented students work on projects that challenge them to take risks and stretch their thinking, feedback helps them attack problems and monitor their progress in more professional and expert ways.
- **Cooperative Learning.** Gifted and talented students sometimes feel exploited by working in groups where they may have to take on additional responsibility to ensure success. In fact, they may find it more difficult to collaborate successfully than other students. Providing instruction in collaboration strategies and setting ground rules for group interaction can minimize problems and increase group productivity. Grouping students flexibly for different purposes can address their concerns while maintaining the benefits of collaborative learning.
- **Alternative Assessments.** Differentiating instruction for gifted and talented students depends on accurate and ongoing assessment. Catharine Reed (2004), a math teacher who works with advanced students in a regular geometry classroom, explains, "A teacher should pre-assess understandings central to a unit and then purposefully modify activities to eliminate repetition and drill for those who already demonstrate mastery."



## Differentiation | Gifted and Talented Students Techniques for Gifted and Talented Students

### Techniques for Gifted and Talented Students

When teachers establish rules and procedures that enable inquiry, discussion, and argument, technology provides powerful tools to empower gifted learners to achieve their full potential. To effectively manage technology use by gifted and talented students, teachers can:

- Encourage students to focus on the most complex and essential concepts and make connections to other parts of the curriculum.
- Encourage students to ask additional guiding questions that are appropriate to the students' interests and abilities.
- Ask students to find additional Web sites or other resources, such as databases, libraries, primary sources, and experts.
- Ask students how the example product in each activity could be improved and encourage students to create more advanced products than the example.
- Ask students to create additional authentic artifacts, such as a letter to the editor, journal article, business plan, grant proposal, advertisement, game, or simulation.
- Challenge students to master advanced features of software applications and use specialized applications when they are appropriate and available.
- Coach students in providing assistance to other students who need help using technology or completing tasks.
- Encourage students to develop leadership skills when working in groups.



## Differentiation Second Language Learners

### Second Language Learners

The content knowledge of second language learners must continue to grow as they learn to communicate. A supportive classroom environment that encourages risk-taking and learning from mistakes is crucial if students are to become proficient in a new language. Projects allow second language learners to have meaningful interaction with peers and adults in both their first language and the language they are learning.

When coupled with a supportive classroom environment, *Technology Literacy* projects provide opportunities for second language learners to demonstrate their learning in ways that emphasize their strengths rather than their language limitations. Imagine a classroom where:

- A student who communicates with peers in the mainstream language but has difficulty talking about academic concepts applies the writing process to structure improved use of the mainstream language in all subjects.
- A second language learner who has rarely interacted with peers in the mainstream language becomes the class spreadsheet expert and helps other students analyze data and create charts.
- A student who is reluctant to speak in the mainstream language begins to communicate more freely when paired with a supportive peer to write and conduct a poll of other students.
- A recently immigrated student uses e-mail and instant messaging to communicate with a scientist in the student's native country while researching and writing a narrative essay in the mainstream language.

### Strategies for Second Language Learners

Teachers must scaffold the content learning of second language learners while the students learn a new language. Instruction that addresses the needs of second language learners often addresses the different learning styles and needs of all students.

### Techniques for Second Language Learners

When teachers establish rules and procedures to allow risk-taking and learning from mistakes, technology creates safe spaces for second language learners to develop knowledge and skills using both their first language and the language they are learning.



## Differentiation | Second Language Learners

# Strategies for Second Language Learners

### Strategies for Second Language Learners

Appropriate instruction scaffolds the learning of second language learners and ensures that content learning develops while students learn a new language. Instruction that addresses the needs of second language learners often addresses the different learning styles and needs of all students. Some effective instructional strategies for second language learners include:

- **First Language Support.** Second language learners need support in their first language while they are learning the mainstream language. Students can often access content in their language through the Internet. In other cases, textbooks and resource materials can be purchased in the languages most often spoken by students. Students can also be encouraged to use their first language to take notes, process information, and reflect on learning.
- **Vocabulary Instruction.** A large part of learning a subject is learning the language used to talk about the subject. Teachers can use the following strategies to help all students, especially second language learners, develop better academic vocabularies:
  - Teach abstract, complex words that are critical to understanding the content and words that students will read, hear, and use frequently.
  - Encourage students to use the appropriate words when discussing the content.
  - Connect content-related words to known words and concepts.
  - Provide several examples of content-related words in context.
  - Explain what each word is *not*, by using antonyms to show opposite meanings and synonyms to show close meanings.
  - Revisit content-related words frequently.
- **Questioning.** Teachers can check for understanding by asking specific questions rather than general questions such as “Do you understand?” Teachers should provide enough wait time for second language learners to process the question and formulate a response. Teachers should also watch for body language and facial expressions that indicate understanding or confusion.
- **Prior Knowledge.** When students are learning a new language, accessing prior knowledge may be a challenge. Teachers must remember that although students may not have the words to express their knowledge, they may have some understanding of relevant concepts. The use of materials in students' native languages along with pictures and multimedia materials can help second language learners connect new information to familiar topics.



- **Explicit Modeling.** Students who can actively use strategies to learn a second language are better able to comprehend complex topics. The Alliance for Excellent Education (2005) recommends explicit instruction in different language-learning strategies, such as using dictionaries, recognizing cognates, using context, and identifying patterns. Teachers should teach and model how students can describe their thinking processes orally and in writing. Teachers should also teach students how to assess their own learning as well as provide feedback to their peers using models, rubrics, and checklists.
- **Graphic Organizers.** When students learn a second language, they need frequent opportunities to think about new concepts in nonlinguistic ways. Many different types of graphic organizers—such as concept maps, cause-and-effect graphics, T-charts, storyboards, Venn diagrams, and timelines—can help second language learners remember, organize, and understand information. Multimedia such as pictures, charts, graphs, audio and video can also help, as can kinesthetic activities, such as manipulatives, role-playing, and dramatic performances
- **Cooperative Learning.** Second language learners who work with other students on projects benefit in a number of ways (Ellis, 2005). Students in cooperative groups are more comfortable and less anxious about their learning, which helps them feel comfortable taking risks with language. As a result, students speak more often, at greater length, using a greater variety of structures. They may also learn more academic content by discussing subjects with their peers.
- **Alternative Assessments.** Developing content knowledge while learning a second language requires accurate and ongoing assessment. While students should become proficient readers and writers in the mainstream language, they should not be limited to these methods when showing what they have learned. Models, dramatic performances, drawings, and similar activities allow second language learners to demonstrate the content they have learned in ways that address their strengths.





## Differentiation | Second Language Learners

# Techniques for Second Language Learners

### Techniques for Second Language Learners

When teachers establish rules and procedures to allow risk-taking and learning from mistakes, technology creates safe spaces for second language learners to develop knowledge and skills using both their first language and the language they are learning. To effectively manage technology use by second language learners, teachers can:

- Ask students to focus on the most important and essential concepts that are both challenging and appropriate to the students' interests and language abilities.
- Ask students to translate vocabulary words and definitions into the students' first languages, with appropriate help from resource teachers, instructional aids, or bilingual students.
- Select specific Web sites or Web pages from each activity that are most appropriate to the students' second language reading levels.
- Make sure students understand the guiding questions and allow students to take notes in their first languages while exploring Web sites and translate later.
- Ask students to find additional Web sites in their first languages, and share and compare information from the sources with other students.
- Allow students to use translation Web sites.
- Provide additional computer time for second language learners and allow students enough time to complete each task in the second language.
- Ask second language teachers, instructional aides, or parents to provide any needed assistance to the students, such as navigating Web sites, taking notes, or completing tasks.
- Ask bilingual or non-second language students who are proficient with technology and work well with others to help second language learners complete tasks with a heavy language load.
- If students are proficient with technology, coach students in providing assistance to other students who need help using technology to complete tasks.
- Make sure second language learners participate when working in groups.



## Differentiation

### Differentiation References

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