

I. Overview

Computers are changing the way children learn, play, and communicate. More and more children are using the Internet, e-mail, and computer software in school, at home, in libraries, and in community centers. Although schools are providing children with the chance to use computers, children are not able to spend enough time using a computer during the school day. In some schools there are up to 17 students for every one computer with Internet access (National Center for Education Statistics, Fall 1999). This does not allow enough time for children to master the skills they need for their future success in education and employment.

Community Technology Centers (CTCs) can help fill in the gap, by providing quality computer education programs for children. After-school technology programs provide children with the chance to learn new technologies, and the time to practice and master those skills. Through a variety of programs including job training skills for adults, tutoring and homework help for students, and educational programs for children, CTCs can provide individualized attention, and a safe place to explore new technologies, surf the Internet, or use educational software.

The success of a CTC depends on the quality of the classes and programs it offers. The tips and resources in this book are designed to help you develop quality educational programs for children.

II. Designing Age Appropriate CTC Activities

When you design an activity for the CTC, make sure the activity is one the children are developmentally capable of doing. It is important to remember that children grow and develop at different rates – some children more quickly than others. **Table 1** on the next page shows general characteristics of how children usually think and learn during grades K-2, grades 3-5, and grades 6-8. Remember that these are only general characteristics – there are often differences in child development within a single age group. When you design an activity for children in a CTC, you can use this Table as a guide to determine if the activity is something that the children will be able to understand and do.

Table 2, “A Guide to Age-Appropriate Computer Activities” on page 3, shows what computer activities children are capable of doing at ages 4-7, ages 8-11, ages 12-14, and ages 15-18. This table will also help you decide if the children in the CTC are developmentally able to do a computer activity that you design.

Table 1
Thinking and Learning Characteristics of Young People

Source: *Sharing Science with Children: A Survival Guide for Scientists and Engineers*,
 North Carolina Museum of Life and Science, Durham, NC.

Early Elementary (K-2)	Late Elementary (3-5)	Middle Grades (6-8)
<i>As a thinker...</i>	<i>As a thinker...</i>	<i>As a thinker...</i>
<ul style="list-style-type: none"> • Learns through manipulating objects. • Believes what he or she sees. • Can't trace steps back from a conclusion. • Sees parts, not the whole. • Does not understand that making physical changes in an object does not change its amount. 	<ul style="list-style-type: none"> • Although still somewhat tied to seeing in order to believe, begins to understand concepts as well as objects. • Understands hierarchical classification systems. • Can combine, sort, multiply, substitute, divide. • Begins to generalize, formulate hypotheses, and use systematic problem-solving strategies. • Likes to memorize and to learn facts. 	<ul style="list-style-type: none"> • Can hypothesize, create propositions, and evaluate. • Can conceptualize in the abstract and understand probability. • Begins to understand multiple causation. • Developing an understanding of ethical principles.
<i>As a learner...</i>	<i>As a learner...</i>	<i>As a learner...</i>
<ul style="list-style-type: none"> • Is expansive, adventurous, curious, eager to learn, energetic, always in motion, loud, and emotional — has mood swings. • Wants to please adults. • Has difficulty controlling impulses and regulating behavior. • Is very "me" centered. Seeks attention. Loves praise. • Likes to work in groups, but will need assistance. • Can sit still and listen 10-15 minutes; needs frequent change of pace. 	<ul style="list-style-type: none"> • Likes group activities and excursions. Is a great socializer and eager to fit in. • Understands rules and can follow them. • Considers fairness to be important. • Takes initiative and is self motivated. • Is becoming an independent learner. • Is a perfectionist who will practice the same thing over and over again. • Can sit still and listen 20-30 minutes (variety increases attention span). 	<ul style="list-style-type: none"> • Is emotional, restive, and eager to get moving. • Is easily bored. • Challenges rules, routines, and authority. • Is typically more oriented to small group activities. • Has a vulnerable ego and is very self-conscious and concerned about how he/she is perceived by others. • Can handle 30-40 minute sessions.

Table 2

A Guide to Age-Appropriate Computer Activities

Adapted from the *Parents' Guide to the Information Superhighway*, The Children's Partnership; the Oregon Department of Education's *Guidelines for District Technology Skills for Students*; and the Dallas Independent School District *Benchmarks for Performance in Instructional Technology*.

Computer Based Activities	Ages 4-7	Ages 8-11	Ages 12-14	Ages 15-18
Playing Computer Games	X	X	X	X
Using the Internet With Guidance	X			
Use the Internet Without Guidance		X	X	X
Exploring Web Sites for Children With Guidance	X			
Using Online Encyclopedias		X	X	X
Conducting Sophisticated Internet Searches			X	X
Downloading Pictures & Graphics for School Reports		X	X	X
Putting Together Multimedia Reports				X
Sharing an Email Address	X			
Having an Email Address		X	X	X
Communicating With Pen Pals		X	X	X
Working on Internet Projects with People in Remote Places			X	X
Using Chat Rooms			X	X
Evaluating & Understanding Internet Ads		X	X	X
Understanding Rules About Online Behavior		X	X	X
Understanding Laws Governing Online Behavior & the Consequences for Breaking Them		X	X	X
Understanding What to Do if Harassed Online		X	X	X
Understanding Ethical Use of Information, Including Using Appropriate Citations & Adhering to Copyright Rules		X	X	X
Receiving Information About Job Opportunities, Internships, & Colleges & Universities			X	X
Performing Basic Keyboarding Functions	X			
Print, Save, & Retrieve Files	X	X	X	X
Using Simulation Software to Study, Analyze, Explain, & Predict Behavior Over Time for Systems		X	X	X
Using & Creating Simulations to Analyze & Predict Behavior Over Time for Systems			X	X
Using Graphing Software to Display Data & Extract Quantitative Relationships			X	X
Using Spread Sheets to Organize & Calculate Data		X	X	X
Using Spread Sheets to Organize, Calculate, & Analyze Data			X	X
Using Databases to Access & Understand Information	X	X	X	X
Using Databases to Access, Organize, & Analyze Information to Create Reports		X	X	X
Selecting & Using Appropriate Software Independently		X	X	X
Selecting & Using Appropriate Technology Devices		X	X	X
Using Technology Safely	X	X	X	X
Figuring Out & Solving Simple Technology Problems		X	X	X

III. Designing Standards-Based CTC Activities

Raising K-12 educational standards in mathematics, science, reading, writing, and technology is a major emphasis of U.S. school reform. Since one of the objectives of the CTC should be to reinforce the learning that takes place in school, CTC activities should be linked to school-based activities.

Academic content standards are your tool to linking the topics taught in the CTC to what the students are learning in school. Academic content standards define what all students should know, understand, and be able to do in basic subject areas such as science, math, and reading. When you identify a topic for the CTC, the standards will show you what the children should be learning in school and at what grade level. The following Internet link should help provide you with an explanation of standards:

Standards: What are They?

<http://www.ed.gov/pubs/IASA/newsletters/standards/pt1.html>

Most national standards are available online and in print form. **Appendix A** includes contact information and web addresses for some national education standards.

In addition to national education standards, states and most local districts have also established their own standards. Your state and local standards will provide more specific information on what the students are doing in your state and in your district. Your state standards are probably available online through your state education agency for no cost. The easiest way to find those standards is to consult the web site of the Council of Chief State School Officers (CCSSO):

Links to State Education Agencies

<http://www.ccsso.org/seamenu.html>

In linking CTC activities to school-based activities, it is important to remember that the CTC is not school. While the CTC will be using academic content standards, activities must be both entertaining and a learning experience.

IV. Incorporating CTC Activities into After-School Programs

Every effort should be made to link the CTC activities to other ongoing after-school programs to encourage maximum participation. Since many CTCs are located in community centers or churches, the CTC can tie its programs to other activities that the children participate in, such

as sports teams, tutoring, health clubs, homework help, arts and crafts, performing arts, and more.

Computer software is available for all subject areas, so classes can be designed to meet the specific interests of the participants. For example:

- A sports team could use the CTC to explore statistics software, to create charts and graphs in Excel, or to use sports-related educational software.
- An arts and crafts class could use the Internet and the CTC to explore the history of a particular craft, or create designs and pictures with a graphics program.
- A homework help group or a tutoring group could use the CTC to write reports, do research, or practice skills in science, math, reading, etc.

Given the right resources, there is no limit to the types of activities you can do in the CTC.

V. Guidelines for Selecting Resources

The best CTC activities are those that use computers, the Internet, *and* offline activities to teach a single concept. This combination keeps the students interested and gives them time to learn a concept and to practice it in a variety of ways. The CTC should develop a library of software titles, a library of resource materials, and a library of supplies for hands-on activities.

Examples of offline activities include:

- hands-on science and math activities (see **Appendix B** for some suppliers of hands-on math and science materials),
- field trips,
- videos and educational television shows,
- educational games,
- science magazines, and
- career role models.

Offline resources can be found by:

- searching the Internet,
- using the teachers' guide that comes with most software titles,
- visiting the local library, visiting bookstores, and using classroom textbooks,

- visiting museums, botanical gardens, zoos, and planetariums,
- looking through educational catalogs such as Delta Education, Creative Publications, and Carolina Biological Supply,
- reading the science section of the local newspaper, and
- taping children's science shows, such as Newton's Apple, Bill Nye the Science Guy, or The Magic School Bus.

As suggested in the *CTCNet Start-Up Manual* (CTCNet, 1996), look for educational resources – software, hands-on activities, CDs, online resources, etc. – that:

- provide children the opportunity to work together to find solutions to problems,
- have more than just one answer,
- encourage students to use other sources to explore CTC topics,
- provide accurate ideas and information from reliable sources,
- are interactive and allow users to do more than just press return or make a choice between presented options,
- appeal to an audience that is diverse in ages and interests,
- offer constructive feedback and online help,
- encourage creativity and originality,
- have attractive graphics and good presentation that complement the content,
- are non-violent, free of gender or ethnic stereotypes, and are representative of the user population, and
- are fun to use and give users a sense of accomplishment.

No single software title, hands-on activity, or Internet resource will meet all of the guidelines listed above, but choose resources that include as many of the positive qualities as possible. See **Appendix C** for more information on finding software and software reviews.

VI. Evaluating Student Work

Despite the informal education nature of a CTC, it is still necessary to assess (evaluate) student work. Students should be able to demonstrate what they have learned in the CTC and how they can apply that knowledge. The assessment (evaluation) of student work should not only include pencil and paper tests, but also performance-based assessment.

A performance-based assessment is any assessment that requires a student to perform an action, such as writing in a journal, demonstrating a skill, or drawing a picture. Developing performance-based assessment is a major component of U.S. school reform. Since one of the objectives of the CTC is to reinforce the learning that takes place in school, CTCs should also use performance-based assessment.

One example of a performance-based assessment is for the CTC staff to maintain portfolios for the students who participate in the CTC. These portfolios can include records on what classes the children have taken, print-outs of work they have done, copies of certificates of achievement, etc. These portfolios can be used to track students' progress and can also be used to show parents and guardians what the students have been doing in the CTC.

The following performance-based assessment activities are recommended for use in the CTC:

- Observe and listen to students.
- Conduct student focus groups or discussions.
- Interview students.
- Have students generate short reports.
- Have students create pictorials.
- Have students design an experiment – observe, record, and determine if they did it in the most logical way.
- Have students complete a hands-on task – observe, record, and determine if they did it in the most logical way.
- Collect students' print-outs and disks – these should be dated so that you can compare students' beginning work with work to date.

The following links will provide some additional information about performance-based assessment:

What Are Promising Ways to Assess Student Learning

<http://www.ed.gov/pubs/IASA/newsletters/assess/pt3.html>

Oregon Educational Technology Consortium: Recommended Technology Assessment Guide

<http://www.oetc.org/tech/assess.html>

Student Portfolios: Classroom Uses

<http://www.ed.gov/pubs/OR/ConsumerGuides/classuse.html>

VII. Planning a CTC Activity

When designing activities for the CTC:

- Select a partner or group to work with to develop a CTC activity. Partners or groups should have a mix of knowledge about the subject and a mix of computer skills.
- Select an age-appropriate topic for the activity using education standards. It is best to focus on one topic area. Examples of topics include fractions, estimation, electric circuits, measuring blood pressure, understanding the functions of the lung, etc. If your CTC includes students from local schools, you may want to check with teachers about topics that they would like to see reinforced at the CTC.
- Determine what you expect the students to learn and how you will know when they have achieved this learning objective.
- Discuss the topic selection and the learning objective with the individual in charge of planning activities for the CTC. We'll call this individual the CTC Coordinator.
- Once the CTC Coordinator approves the topic selection, complete a CTC Activity Plan (AP). The activity plan, located in the next section of this book, will walk you through all of the points you need to think about when designing an activity.
- Discuss the activity plan with the CTC Coordinator and arrange to pilot test the activity plan with no less than 6 children. Pilot testing means trying out an activity with a small group of children and determining if they have understood the instructor(s) and learned what you expected.
- Conduct the pilot test and record notes. During pilot testing, it is important to observe students and periodically ask students if they understand what you expect them to do. Try to distinguish if students do not understand certain words in your instruction or if they do not understand the subject matter content. Based on what the students understand and if the students learn what you expect, your activity plan may or may not need to be revised.
- Once the AP is pilot tested, discuss the results with the CTC Coordinator. Based on this discussion and suggested revisions, the AP may need to be re-piloted, or will be accepted as a regular activity of the CTC. The accepted AP can be used for a class, workshop, or a drop-in center activity.
- Once the APs are finalized, the CTC Coordinator should keep them in a central place for future use by other staff and volunteers.

VIII. CTC Activity Plan (AP) Format

Use the following format when you design an activity for the CTC:

1. What is the topic? (Use education standards to determine a topic.)
2. What grade level is this activity for? (Check One)

K - 3	_____
4 - 5	_____
6 - 8	_____
9 - 12	_____

3. What is the educational objective? (What do you expect the students to learn?)
4. What is the time frame for the activity? (Ideally computer activities should be no longer than 20 to 30 minutes per session. Another 20 to 30 minutes can be allotted for offline activities per session.)
5. What types of computer skills are needed to do this activity? (See Table 2, A Guide to Age-Appropriate Computer Activities.)
6. What software will be used for subject matter content? (Review the software in the CTC library.)
7. What online activities will be used for subject matter content? (Conduct an Internet search for activities.)
8. What offline activities will be conducted?
9. What supplies will be needed for offline activities?
10. What are some offline ideas and online links for making this activity culturally relevant?
11. What are some offline resources and online links to real life applications or situations?
12. What are some offline and online career links for this activity?
13. What are some offline and online adaptations that may be needed for children with disabilities?

14. What are some offline and online safety concerns related to this activity?

15. What evaluation methods will you use to determine if students learn what you expect them to? Check all that apply.

- Observe and listen to students _____
- Student focus groups (discussion) _____
- Interview students _____
- Short student-generated reports _____
- Pictorials _____
- Have students design an experiment _____
- Have students complete hands-on task _____
- Collect students' print-outs and disks _____

Other evaluation techniques:

16. What will go into the student portfolios kept by the CTC Coordinator?

17. What types of online/computer activities can be done after this activity in the CTC or at home?

18. What types of offline activities can be done after this activity in the CTC or at home?

IX. Summary and Tips for Teachers

- Be flexible, energetic, and positive.
- Be prepared. Assemble all of your materials before your class and practice conducting any hands-on activities.
- Arrive early to allow yourself time to set up, and leave time at the end of the class to clean up.
- Be sure you have volunteers to assist you with hands-on and computer activities.
- Divide children into groups by grade level. Based on how children grow and develop, the best grouping for classes is grades K-3, grades 4-5, grades 6-8, and grades 9-12.
- Consider each student's skill level and learning style when designing your activity.
- Repeat activities and build on previous activities to reinforce what you are teaching the children.

- Provide opportunities for the children to work together in groups of two or more, as well as to work independently.
- Actively involve the children in hands-on experiments and inquiry-based computer activities.
- Allow every student the opportunity to experiment, to write, and to apply his or her knowledge to everyday life.
- Actively model behaviors that you want your students to follow and practice.
- Recognize and explore cultural differences.
- Use language and resources that are non-sexist, non-racist, and non-stereotypical.
- Connect your lessons to different types of science and mathematics careers.
- Make safety a priority!
- Use a variety of assessment techniques to evaluate student achievement such as student-generated reports, pictorials, or observing students performing a hands-on task.
- Ask questions, encourage the children to ask questions, and allow time for writing about the experiences and for reflection and discussion.
- Maintain high standards and high expectations for *all* students.
- Encourage parents to participate. Talk to them about the importance of being involved in their children's education.

X. CTC Activities

The following pages contain activities that you can use in your Community Technology Center. Each activity is based on national education standards, and has been carefully reviewed by our staff and the staff of our CTCs. These activities are meant to complement, not take the place of, what children are learning in school. We encourage you to use the Activity Plan Format to develop new activities, and to share your activities with individuals in your CTC and in other CTCs. By working together, we can better prepare today's children for the technological world of tomorrow.

Each activity lists the grade level, estimated time, materials needed, education standards, safety concerns, adaptations for children with disabilities, the educational objective, questions to ask students as they do the activity, information on why it happens, links to web sites, software suggestions, recommended reading materials, and career connections. **The activity sheets included at the end of each activity contain the instructions for how to do the activity.**