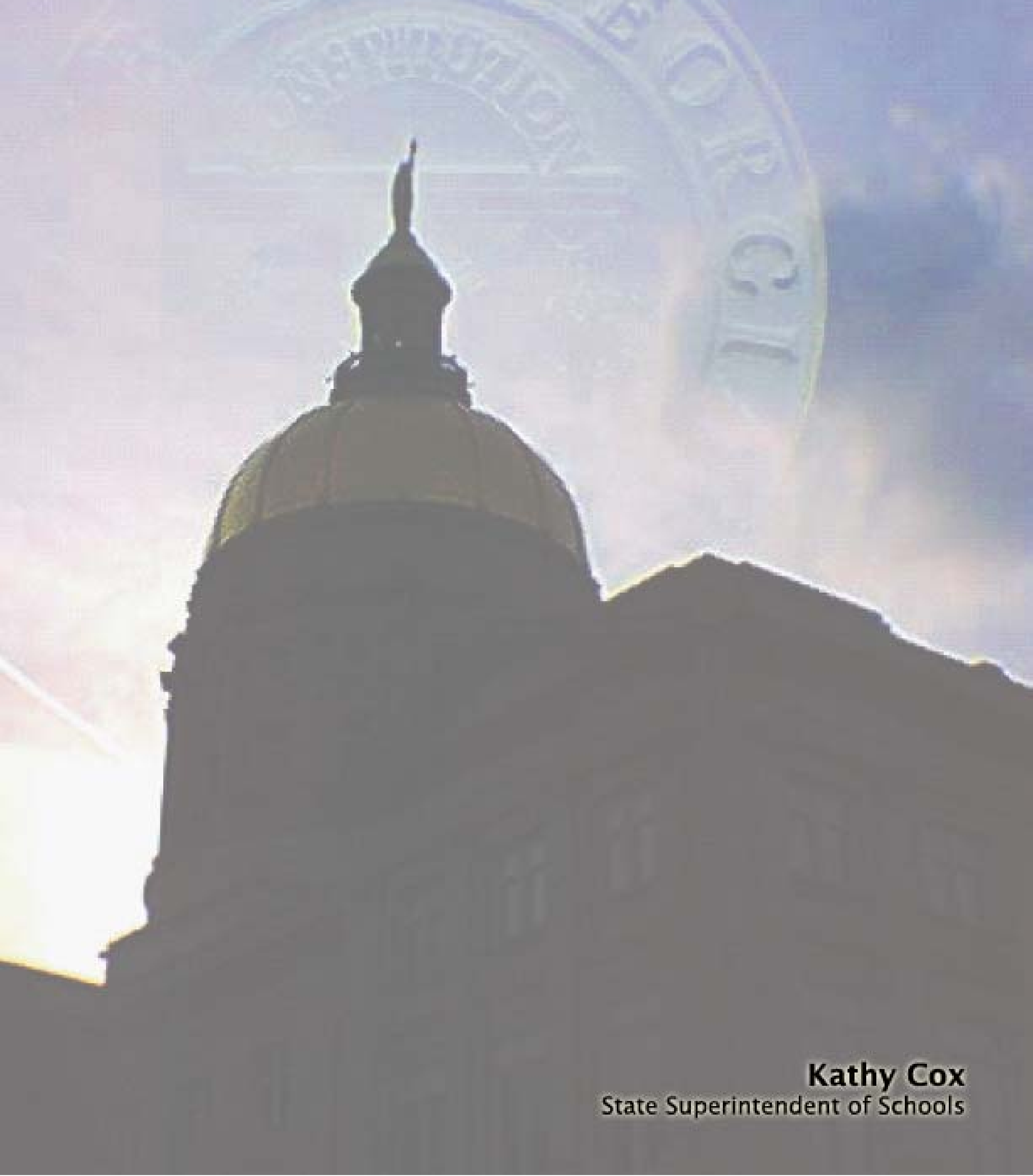
Approved by the State Board of Education on July 10, 2003

The State of Georgia K-12 Technology Plan

A Collaborative venture between the Georgia Department of Education, Georgia K-12 public school systems, and other community partners.



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Introduction

Purposes:
The purposes of this plan:

- To establish how technology can contribute to statewide goals of improving student achievement in Georgia's K-12 public schools.
- To publish common goals that will unite efforts of the Georgia Department of Education (GA DOE), other state-funded education agencies, local systems, and additional educational partners charged with improving education through technology.
- To describe the strategies that the GA DOE will deploy toward goal attainment.
- To outline an evaluation plan by which statewide progress toward common goals will be measured.
- To serve as required documentation to the United States Department of Education (US DOE) for federal technology funding.[1]

Planning and Drafting Process:
The GA DOE began work on this document in the Fall of 2001.

First, a draft outline of the Technology Integration Plan was shared with the State Board of Education Rules Committee and with an Educational Partners Committee for input.

Second, a series of public meetings were convened to (1) review the previous State Technology Plan; (2) celebrate accomplishments; and (3) develop new directions for the future.

The approximately 200 attendees at these public meetings included state education agency staff, school system employees, parents, business representatives, and not-for-profit partners.

At the meetings, attendees worked in groups to describe specific conditions, behaviors, and results related to instructional technology they hoped would become a reality in Georgia's schools over the next three to five years.

In this way, participants provided the content for the vision, goals, and objectives referenced in this document.

Along the way, other groups have made the following contributions:

- An External Scan Committee searched for research and information that might be critical to the planning process. Of special interest to the group were recent research studies on educational technology and information on emerging technologies.
- The Information Technology Advisory Board, a standing committee comprised of school system personnel and representatives from other government agencies such as the Georgia Technology Authority, also reviewed draft documents and provided critical input.
- Georgia State University (GSU) faculty and staff analyzed data from the most recent GA DOE Statewide Hardware and Level of Technology Implementation (LoTI) Surveys in order to help describe the current situation of technology programs in Georgia and to identify current needs. A GSU evaluation team also developed the third part of the evaluation plan, which begins to address the very difficult issues of documenting technology's contributions to student achievement.

Appendix B acknowledges those who attended meetings, reviewed documents, and served on committees.

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[1] This document is an extension of the *Consolidated Application for Funding* already approved by the State Board of Education. It provides more detail about technology programs in the state and will be submitted to the US DOE as a condition under the Elementary and Secondary Education Act, Title IID: Enhancing Education Through Technology (2002).

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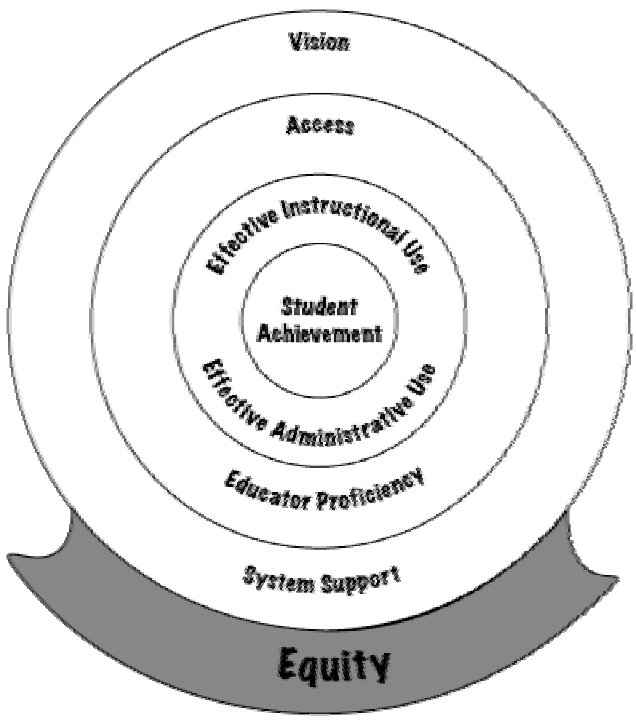
Section One: National Scan

For many years, the educational community has recognized the potential of computing and information technologies to support effective and innovative instructional practices. For example, remote scientific instrumentation, authentic audiences for student work, current information on relevant topics, and hosts of new software tools should enable teachers and students to pursue inquiry, knowledge construction, communication, and expression in new and more meaningful ways (Bruce & Levin, 2003; Bruce & Levin, 1997). Such technology-supported practices not only promise to strengthen motivation to learn, transfer of knowledge, and understanding of content, but they also allow students to acquire new literacy skills necessary for work, life, and responsible citizenry in the 21st century (Lemke, 2002; NETS Project, 2000; Secretary's Commission on Necessary Skills, 1991).

Educators have warned, however, that technology's potential will only be realized under *very specific conditions*. Researchers have established that "the success or failure of technology is more dependent on human and contextual factors than on hardware or software" (Valdez et al., 2000). According to a synthesis of several national frameworks (enGauge, 2000; Lemke & Coughlin, 1998; Porter, 2002) technology programs most likely to improve student learning will require:

Figure 1: **Essential Conditions for Success**



- Effective instructional use;
- Effective administrative use;
- Adequate access to technology;
- Educators who are proficient in technology integration;
- Wide-spread commitment to a common vision;
- Adequate system support for technology; and
- Equitable access to high-quality technology programs for all students, parents, and educators.

This national scan will define each of these critical conditions and document national progress in each category.

Effective Instructional Technology Use

Ongoing research continues to suggest that technology-enhanced learning can and does improve student achievement of learning goals ranging from the basics to higher-order thinking (Center for Applied Research in Educational Technology, 2003; Valdez et al., 2000; Wenglinsky, 2002).

However, to achieve these positive results, the technology must be implemented effectively — and defining "effectively" currently comprises a center of activity in the field of educational technology today. As research agendas have evolved over the last decade, scholars have rejected simplistic questions such as "Does technology improve student achievement?" and turned toward questions such as "What conditions need to be in place in order for technology to improve student learning?" and "What types of technologies are most effective in which situations and for what types of results?" (Dickard, Honey, & Wilhem, 2003). While ongoing research around such questions constantly yields new understanding, current evidence suggests that, for technology use to be effective, it must be:

- Aligned to learning standards;
- Integral to the instructional process;
- Frequent enough to make an impact on learning;
- Appropriate for the types of cognitive skills that students are expected to acquire; and
- Embedded in instructional strategies matched to the desired learning goal.

First, improving student achievement is extremely dependent on aligning instructional tools and strategies to local, state, and national curriculum standards (Valdez et al., 2000). If instruction and the use of technology are not focused on achieving specific learning standards, the likelihood of achieving measurable impact on student achievement is low.

Second, effective instructional technology use is integrated into students' mainstream learning activities and not viewed as an "add-on." Technology use associated only with play, reward, remediation, or enrichment tends to remain peripheral to the learning process and does not necessarily affect all students (Moersch, 2001). Effective technology use is seamless and transparent. It is naturally intertwined into daily activity much in the same way technology is embedded into daily work or personal tasks for adults. Truly integrated technology also moves beyond teacher-only use and allows students to assume user roles, as well. When teachers use technology, they can certainly extend the resources available to the students for learning and enhance their own presentation of material. However, students also need hands-on access in order to develop the information literacy and the critical thinking skills associated with effective instructional technology use (NETS Project, 2000).

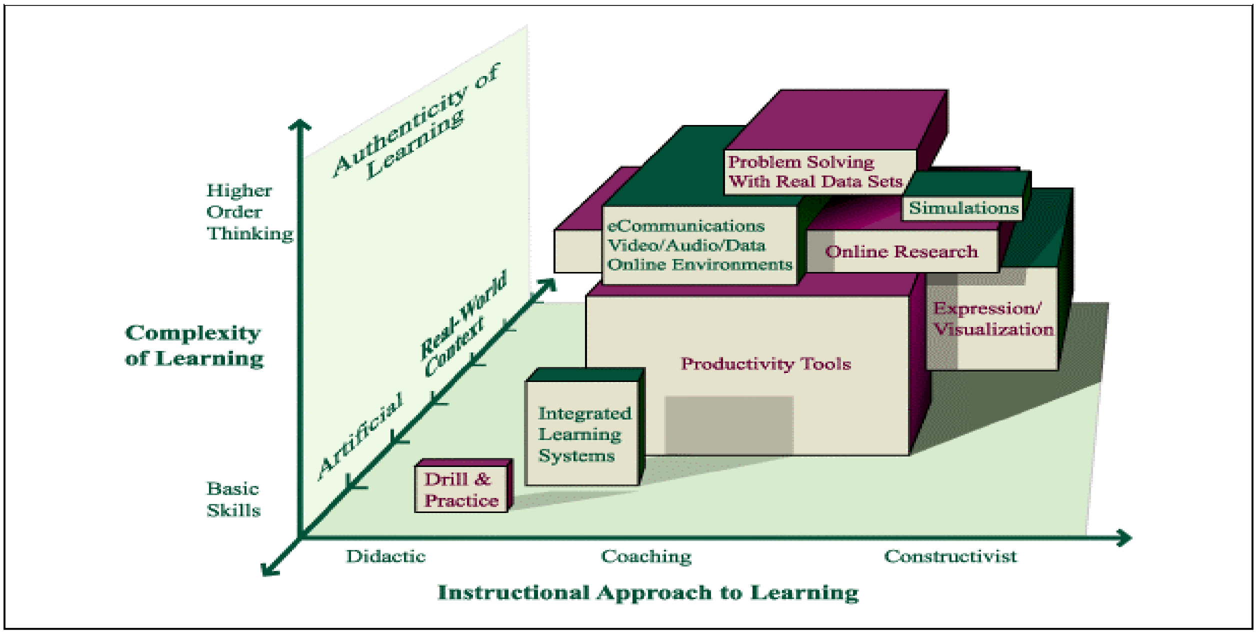
Third, student technology use must be frequent enough to play a significant role in the learning process. While it is impractical and unproductive to establish frequency thresholds that define effective or ineffective use or to examine frequency in isolation from other variables, it is still important to consider how often students use technology for learning. For example, technology that is used only once or twice a year is unlikely to have a significant impact on achievement (Becker, Ravitz, & Wong, 1999).

Finally, student technology use and the instructional context in which it is deployed must be appropriate for the type of cognitive skill that students are expected to acquire (Jacobson &

Spiro, 1995). In other words, research has illustrated that some technology tools and instructional approaches are more effective in yielding specific types of results. As a result of this research, educators now have more ways to talk about different types of technology and to consider which technological tools and instructional approaches are more appropriate for achieving desired learning outcomes.

The following chart from North Central Educational Laboratory's enGauge project attempts to summarize some of these key findings surrounding effective deployment of instructional technology use in classrooms (enGauge, 2000).

Figure 2: **Range of Use Chart, NCREL's enGauge Framework**



The Y-axis describes the uses of technology best suited to supporting various levels of thinking skills as represented in Krathwohl, Bloom, & Masia's Taxonomy (1984, pp. xv-xix). In this taxonomy, thinking skills are represented from the simple to the complex as follows: (1) Knowledge; (2) Comprehension; (3) Application; (4) Synthesis; (5) Analysis; and (6) Evaluation.

As represented in the chart, researchers have found most drill and practice and integrated learning systems target basic skill acquisition, while a range of other technology tools are better able to support higher-level thinking and problem solving.

Of course, the instructional approaches into which these tools are embedded are also important factors in the learning process, as well. The X-axis illustrates how certain pedagogies create the most fruitful context for certain technology tools and thinking skills. Didactic pedagogies are characterized by lecture and use of tools (texts, software, etc.) that transmit information to students. According to the enGauge framework students in didactic situations "receive, take in, and respond." Students in more constructive instructional settings have higher levels of engagement and experience with content, and they make more decisions about their learning. In these environments, students "construct, examine, and evaluate meaning" instead of passively receiving it.

Currently, researchers advocate constructivist practices over predominantly didactic models. This preference is supported by research indicating that when basic skills are taught via constructivist approaches, students:

- Retain knowledge better;
- Transfer concepts flexibly across situations; and
- Exhibit a deeper understanding of content.

Constructivist methods are also touted for their ability to encourage the student acquisition of higher-order thinking and problem solving skills and to boost motivation and interest in learning.

As represented in the enGauge chart, productivity tools, expression/visualization software, online communication and multimedia tools, simulations, online research, and problem solving with real data sets are thought to have the strongest potential for supporting constructivist approaches.

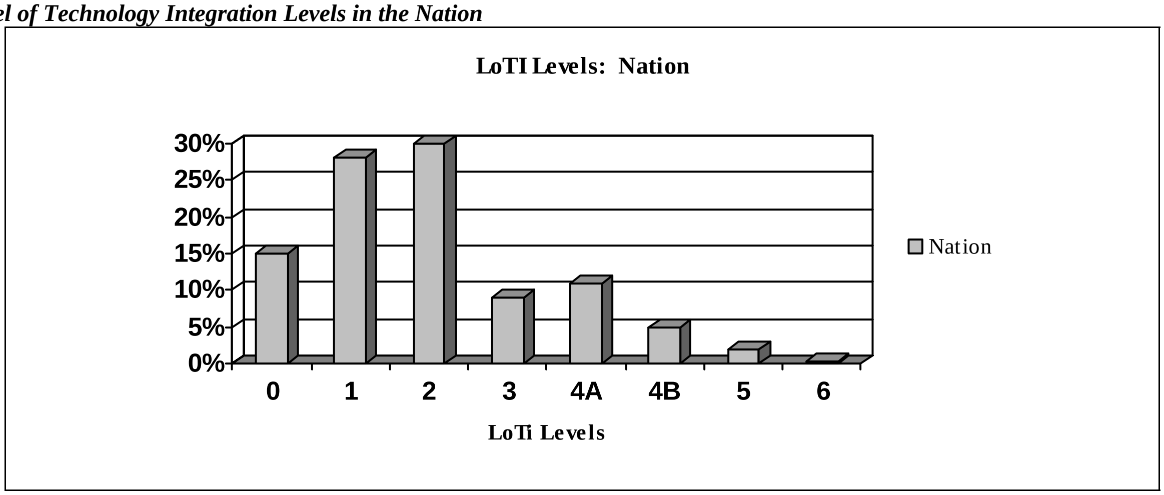
The Z-axis is designed to identify technology applications that might be the best springboards to real-world contexts for learning. Research findings have consistently indicated that learning improves when students use inquiry to solve real problems and to create knowledge that is valued by persons or communities outside the school environment (Bransford, Brown, & Cocking, 1999; Newmann, 1996; Newmann & Wehlage, 1995). These instructional features seem to be especially important for at-risk students. Information technology infrastructure and tools which allow students to connect to the outside world and construction tools that allow them to prepare products for publication for others are among those most important for supporting authentic learning. In fact, such technologies may actually enable new learning opportunities that would have been very difficult or impossible to achieve without them.

As the chart illustrates, all types of technology use and instructional modes can be effective in achieving learning goals. Therefore, many researchers, such as Valdez et al. (2000) recommend that schools "maximize" the effectiveness of their investments in technology by using it often, and in "a spectrum of ways" (p. 6).

Yet, recent data collections indicate that the frequency and range of use in America's schools likely falls far below desired goals. For example, according to results from nationally-validated Level of Technology Use surveys (Moersch, 2001), 71 percent of teachers fall in Levels 0-2 of Technology Use (Table 1). The practices of the largest group of teachers, nearly 30 percent, are best described as Level 2, Exploration. Students in these teachers' classrooms *do* use technology for the purposes of learning. However, the technology-based activities are usually peripheral to daily activities, often as supplemental remediation, reward, or enrichment activities, and the focus of learning is on lower level cognitive skills, such as knowledge or comprehension. An additional 41 percent of teachers' practices are best characterized as Level 0, Non-use, or Level 1, Awareness. At these levels, teachers may use technology to complete their work, but students either do not use technology for instruction (Level 0) or use it in labs or pull-out programs where an adult other than the teacher takes primary responsibility for instruction (Level 1).

Study results also indicate that less than ten percent of teachers nationally are performing at Level 4B or above—the levels which begin to align with constructive practices, higher-order thinking, and authentic learning experiences as represented on NCREL's Range of Use chart (enGauge, 2000).

Table 1
Level of Technology Integration Levels in the Nation



Such findings highlight the need to encourage instructional technology use in the context of authentic, student-centered learning environments that promote critical thinking and problem-solving. Since national learning standards, workforce needs, and standardized assessments are increasingly focused on higher-order thinking, it would seem reasonable that predominant pedagogical strategies and technology use patterns should be appropriately aligned.

To accomplish these goals, a variety of constructivist learning models, including those with strong authentic learning components, may be extremely useful to educators. These approaches include, but are certainly not limited to, student-centered learning, collaborative learning, reality-based learning, authentic instruction, anchored instruction, inquiry-based learning, project-based learning, and problem-based learning.

The Engaged Learning model, found in *Plugging In* by Jones, Valdez, Norakowski, and Rasmussen (1995), may be of special interest to educators interested in technology implementation (see Table 2). These indicators provide a thorough overview of the instructional strategies most appropriate for technology use targeted toward higher-order thinking and problem solving.

Table 2
Levels of Technology Implementation

Level of Technology Implementation Framework	
Level:	**Description:**
0 – Non-use	Technology is not used for instructional purposes.
1 – Awareness	The use of technology-based tools is either (1) one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pull-out programs, computer literacy classes, central word processing labs), (2) used almost exclusively by the classroom teacher for classroom and/or curriculum management tasks (e.g., taking attendance, using grade book programs, accessing e-mail, retrieving lesson plans from a curriculum management system or the Internet) and/or (3) used to embellish or enhance teacher-directed lessons or lectures (e.g., multimedia presentations).
2-Exploration	Technology-based tools supplement the existing instruction at the knowledge/comprehension level. The electronic technology is employed either as extension activities, enrichment exercises, or technology-based tools and generally reinforces lower cognitive skill development relating to the content under investigation.
3 - Infusion	Technology-based, complement-selected instructional events at the analysis, synthesis, and evaluation levels. Though the learning activity may or may not be perceived as authentic by the student, emphasis is, nonetheless, placed on higher levels of cognitive processing and in-depth treatment of the content using a variety of thinking skill strategies (e.g., problem-solving, decision-making, reflective thinking, experimentation, scientific inquiry).
4A – Integration (mechanical)	Technology-based tools are integrated in a mechanical manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials and/or outside resources (e.g., assistance from other colleagues), and/or interventions (e.g., professional development workshops) that aid the teacher in the daily management of their operational curriculum. Technology is perceived as a tool to identify and solve authentic problems as perceived by the students relating to an overall theme/concept. Emphasis is placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.
4B – Integration (Routine)	Technology-based tools are integrated in a routine manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. At this level, teachers can readily design and implement learning experiences that empower students to identify and solve authentic problems relating to an overall theme/concept using the available technology with little or no outside assistance. Emphasis is again placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.
5 - Expansion	Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from other schools, business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle via Internet), research institutions, and universities to expand student experiences directed at problem-solving, issues resolution, and student activism surrounding a major theme/concept. The complexity and sophistication of the technology-based tools used in the learning environment are now commensurate with (1) the diversity, inventiveness, and spontaneity of the teacher's experiential-based approach to teaching and learning and (2) the students' level of complex thinking (e.g., analysis, synthesis, evaluation) and in-depth understanding of the content experienced in the classroom.
6 - Refinement	Technology is perceived as a process, product (e.g., invention, patent, new software design), and/or tool for students to find solutions related to a "real-world" problem or issue of significance to them. At this level, there is no longer a division between instruction and technology use in the classroom. Technology provides a seamless medium for information queries, problem-solving, and/or product development. Students have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task at school. The instructional curriculum is entirely learner-based. The content emerges based on the needs of the learner according to his/her interests, needs, and/or aspirations and is supported by unlimited access to the most current computer applications and infrastructure available.

Table 3
Indicators of Engaged Learning

Variable	Indicator	Indicator Definition
Vision of Learning	Responsible for learning Strategic Energized by learning Collaborative	Learner involved in setting goals, choosing tasks, developing assessments and standards for the tasks; has big picture of learning and next steps in mind; Learner actively develops repertoire of thinking/learning strategies; Learner is not dependent on rewards from others; has a passion for learning; Learner develops new ideas and understanding in conversations and work with others.
Tasks	Authentic Challenging Multidisciplinary	Pertains to real world, may be addressed to personal interest; Difficult enough to be interesting but not totally frustrating, usually sustained; Involves integrating disciplines to solve problems and address issues.
Assessment	Performance-based Generative Seamless and ongoing Equitable	Involving a performance or demonstration, usually for a real audience and useful purpose; Assessments having meaning for learner, maybe produce information, product, service; Assessment is part of instruction and vice versa, students learn during assessment; Assessment is culture fair.
Instructional Model	Interactive Generative	Teacher or technology program responsive to student needs, requests (e.g., menu driven); Instruction oriented to constructing meaning, providing meaningful activities/experiences.
Learning Context	Collaborative Knowledge-building Empathetic	Instruction conceptualizes students as part of learning community; activities are collaborative; Learning experiences set up to bring multiple perspectives to solve problems such that each perspective contributes to shared understanding for all, goes beyond brainstorming; Learning environment and experiences set up for valuing diversity, multiple perspectives, strengths.
Grouping	Heterogeneous Equitable Flexible	Small groups with persons from different ability levels and backgrounds; Small groups organized so that over time all students have challenging tasks/experiences; Different groups organized for different instructional purposes so each person is a member of different work groups, works with different people.
Teacher Roles	Facilitator Guide Co-learner/co-investigator	Engages in negotiation, stimulates and monitors discussion and project work but does not control; Helps students to construct their own meaning by modeling, mediating, explaining when needed, redirecting focus, providing options; Teacher considers self as learner, willing to take risks to explore areas outside his or her expertise, collaborates with other teachers and practicing professionals.
Student Roles	Explorer Cognitive Apprentice Teacher Producer	Students have opportunities to explore new ideas/tools, push the envelope in ideas and research; Learning is situated in relationship with mentor who coaches students to develop ideas and skills that simulate the role of practicing professionals (i.e., engage in real research); Students encouraged to teach others in formal and informal contexts; Students develop products of real use to themselves and others.

Effective Administrative Uses

It is sometimes difficult to distinguish between instructional and administrative technology use—especially when administrative applications for technology are evolving so rapidly. However, for the purposes of this plan, administrative applications are defined by their focus on managing assessment information and the business operations of a school system. Most often, these administrative applications are made available at the school system level and have many users. Primary users of administrative technologies include administrative/clerical staff and teachers. School board members, parents, and other decision-making stakeholders in the system are especially interested in the types of reports these administrative technologies yield. Students use administrative technologies much less frequently, if at all. Examples of administrative technologies traditionally include:

- Grading software that teachers use to keep their own administrative records of student achievement;
- Student information systems; and
- Financial software.

However, there is rapid development and dissemination in the fields in the following areas as well:

- "Accountability" systems that allow educators to analyze data in new ways. Hallmark characteristics of these accountability systems include the ability to: (1) "warehouse" data over time instead of having volumes of isolated data from year to year; (2) disaggregate data at multiple levels and to compare data easily across subgroups and across time; (3) generate visualizations of this data in forms of charts, graphs, and tables; and (4) find trends and patterns (often referred to as "data mining") that would be very difficult to find via traditional analyses;
- Online standardized testing programs that greatly reduce the time frame between when students take the test and when results are made available; and
- Adaptive testing systems that adjust the difficulty level of the test items according to the students' performance as they answer questions.

For example, over the past several years, the National Center for Research on Evaluation, Standards, and Student Testing (CRESST)[2] has envisioned, developed, and evaluated a suite of assessment tools known as the Quality School Portfolio (http://qsp.cse.ucla.edu/). In January 2003, CRESST rolled out training and a full-functioning version of the software to school systems in 11 states. In April 2003, they began a second phase of implementation bringing the total number of school systems using the product/processes to over 1000 schools in 80 school systems located in all 50 states.

There is similar interest and activity surrounding online testing. In May 2003, Ed Week reported that 12 states and the District of Columbia will be administering computer-based state exams in 2002-03 and predicted that more would soon follow. However, the publication also noted that barriers to a full-scale, national implementation of online testing exist. First, while great progress has been made in the areas of access, it is clear that not all schools have enough modern computers connected to the Internet to support online assessment programs. Second, Ed Week also notes that "comparability," or controlling the testing environment to ensure that no student experiences variations that might affect his or her performance, is also an issue. Some educators are especially concerned about the variations of computer systems and networks and of students' skill and comfort levels with online assessments. Finally, although online testing promises to be cheaper in the long run, budget cuts have stifled development in several states at least temporarily.

Adaptive testing is also attracting great attention since they promise to identify students' grade-level performance more quickly. They might also allow more frequent and even more accurate testing. However, like other innovations, adaptive testing is not without obstacles. Federal law asks states to measure student performance by grade-level standards, while adaptive testing produces a grade-level equivalency for students' knowledge and skills.

This difference between what adaptive testing offers and what federal law requires has already posed a problem for two states. Idaho modified their 2002 plans for an online adaptive testing system and in January 2003, North Dakota made their statewide online adaptive testing program

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[2] With funding support from University of California, Los Angeles (UCLA), Joyce Foundation, Stuart Foundation, US Department of Education (US ED), North Central Educational Laboratories (NCREL), and Office of Educational Research and Improvement (OERI).

optional for school systems. Ed Week (2003) reports that such developments have "…clearly caused states to think twice about venturing into adaptive, online assessments" but they also report that adaptive testing is by no means stalled. Practitioners, researchers, and developers are quite intent on exploring how adaptive testing can meet requirements outlined in federal law and retain the highly-desired qualities of accuracy and speed.

While these efforts to develop, implement, and evaluate various administrative technology programs is still in early stages, there are two major arguments supporting the importance of successful administrative technology programs. The first argument, such as the one presented in NCREL's enGauge framework, centers on creating school cultures that are amenable to advanced technology use for instruction. Authors of the framework argue that, "In order for students to develop the knowledge and skills necessary to contribute to such creative environments, they and their teachers must be immersed in a culture of learning and innovation."

In the context of such arguments, administrative technologies set the tone for effective instructional technology use in several ways. First, on the most general level, school systems that integrate technology into their administrative activities send a message that technology is valued. Second, the presence of such technologies establishes a need for community members to acquire certain levels of technology literacy in order to participate in system activities. Finally, strong administrative technology programs also enable administrators to be good role models for other system members as they integrate technology into their daily work. In these ways, administrative technology use establishes strong support for effective instructional use.

Yet, others elevate the importance of administrative technology use beyond merely enhancing system readiness or support for effective instructional technology use. This especially occurs when the actual administrative applications of technology move closer to instructional issues. For example, by reducing the time between testing and results, online testing can actually help instruction be more responsive. Likewise, accountability systems also allow school systems to target instruction to specific need areas. In these arenas, administrative applications become critical mechanisms for advancing student achievement.

Access to Technology

Of course, effective uses of technology cannot be realized until computers, software, online resources, and Internet connectivity are available for instruction. Because of this fact, educational technology programs traditionally have been dominated by access-related goals. For example, in 1996, three out of four of the National Technology Plan goals focused on providing students and teachers with access to the following in every classroom:

- At least one modern multimedia computer for every five learners;
- A high-speed connection to the Internet, and
- Effective software and online learning resources.

Over the past seven years, progress toward these Internet and computer access goals in the nation's K-12 public schools has been significant (NCES 2002):

- The percentage of schools connected to the Internet grew from 65 percent in 1996 to 99 percent in 2001.

- In 2001, a high percentage of Internet-connected schools (approximately 90 percent) have high-speed, distributable access (56KB or greater) via a leased line, fiber/coaxial cable, or wireless connection.
- The percentage of classrooms connected to the Internet grew from 14 percent to 87 percent between 1996-2001.
- The ratio of students to modern, Internet-connected computers in schools moved from 35:1 in 1996 to 5.4:1 in 2001.

Yet, statistics related to computer access in classrooms also suggest that not all of the 1996 access goals have been met. According to Ed Tech Week's 2003 Technology Counts Issue, student to instructional computer ratios in the nation's classrooms equal 11.1 to 1. These figures imply that while the number of computers in *schools* is increasing, recommended ratios in *classrooms* have not been reached. This access gap is likely to stifle desired patterns of instructional technology use in schools. Ratios were set based upon the resources needed to fully integrate technology into the curriculum, and recent research confirms these assumptions. For example, Becker, Ravitz, & Wong (1999) found that teachers integrated technology into instruction more frequently when computers were available in their classrooms. This trend held true even when the teachers had access to computer labs elsewhere in their school. Frequency of use was highest in classrooms having at least one computer for every four students, and researchers noted that low student-to-computer ratios were especially important in secondary education classrooms where economy of instructional time is extremely important (pp.7-9).

Gauging national access to effective software and online learning resources is slightly more difficult than counting computers and Internet connections. However, there seems to be exponential growth in digital content for learning as well. For example, 16 states have established a virtual high school, three states have pilot programs, and one state will launch a program this year (Ed Week, 2003). Online resources for traditional school students also seem readily available. In 1999, Ed Tech Week summarized general opinion of education experts as follows:

> "There is certainly no lack of digital content available to teachers. Thousands of CD-ROMs and Web sites have been created specifically for educators and students. Many general purpose software tools, such as spreadsheets and desk-top publishing packages, can also be adapted for the classroom. And, the number of archives and reference materials that student can draw from is virtually limitless" (p. 6).

However, even though a multitude of digital content may be available, it is unclear if it is truly *accessible* to teachers. Statistics suggest that schools have been spending over three times as much on hardware than software, and only 12 percent of schools subscribe to online curriculum services (Ed Week, 2001). Some even worry that lack of time and training are preventing teachers from taking advantage of the abundance of free resources via the Internet (Fatemi, 1999). In any case, the balance of spending between hardware and software and the distinctions between availability and true accessibility of free online resources to teachers warrant attention in contemporary planning processes.

Sustaining current access levels, reaching 1996 goals for classroom computer access, and ensuring access to high-quality software and online resources for learning may be more challenging in the next few years. The first challenge is sustaining state funding for technology during an economic downturn. A recent Benton Foundation report, for example, reports that over 40 states have reported shortfalls of between $40-$50 billion to meet existing state budgets. In some of those states, funding for K-12 technology programs have been reduced or, in some extreme cases, even eliminated (Denton, 2003). Yet, in other states facing similar economic situations, technology funding for schools has remained stable. This suggests that state leaders' second challenge will be keeping technology on the forefront of educational agendas. It remains to be seen whether state and local education agencies/policymakers will follow the national lead of reducing spending in areas other than education and maintaining technology funding as a priority, or if technology programs will suffer.

On a more positive note, reaching access goals may become easier due to the declining costs of computing equipment. Also, the advent of smaller, more portable devices and the advances in wireless networking may make arranging classroom computers more convenient, as well. For example, many predict fewer "tethered-to-the-network" desktops and more "personalized, portable, and dynamic" technologies, such as laptops, tablets, personal digital assistants (PDAs), and wireless networks (Goldberg, 2002). In fact, models of these new environments have already emerged, mostly in the form of laptop computers and wireless networks in schools. Some have even achieved a one-to-one computer ratio with a laptop for each teacher and student, while others have only provided classroom sets of computers or a mobile lab in their buildings. While not yet pervasive, such models promise to provide the ubiquitous, flexible access that some claim is necessary to fully integrate technology into the curriculum (Goldberg, 2002), and only a few barriers seem to be restraining wide-scale adoption. Currently, smaller devices are still more expensive when compared to larger counterparts with similar functionality. Purchasing additional wireless networking devices and ensuring that wireless networks are secure also present additional expenses and concerns. However, dropping costs and advances in encryption technologies promise to minimize these obstacles in the near future.

While all access-related conditions provided so far have centered on the school environment, many also consider beyond-school access an important issue, as well. Some may argue that beyond-school access is outside a school system's realm of responsibility, but the authors of North Central Educational Laboratory's EnGauge framework offer an alternative view:

> "Since the vast majority of students with home computers and Internet access claim they use these resources for completing homework, students without comparable tools will likely experience academic disadvantages. Therefore, educators must carefully monitor the state of home access….[and] encourage home access through strategies, such as public awareness and education campaigns; home-buy programs; laptop or Internet appliance check-out; student laptop purchases; subsidized dial-up for community members; and centralized, online resources that are attractive and beneficial to the community" (http://www.ncrel.org/engauge/framewk/equ/soc/equsocpr.htm).

Given this view and data suggesting that significant gaps exist in this area, home access for students and their parents may well become a new frontier for action. US Census Reports (2000) suggest that 33 percent of households with school-age children (ages 6-17) do not have home access to computers and 47 percent do not have Internet access. While public access may be available to this segment, ease and frequency of access may become an issue when trying to fully scale technology programs. Without a critical mass of beyond-school access, school systems are unlikely to achieve "anywhere-anytime learning" that has always been a strong component of effective technology use and technology may not assume the vital, central role in education that most envision.

Educator Proficiency

Of course, access to technology alone does not ensure effective instructional or administrative uses of technology. Such outcomes also depend on a work force that is proficient and comfortable using technology *to support learning*. In the field of education, these technology-related proficiencies extend far beyond merely understanding and operating computers (NETS Project, 2002; Technology Standards for School Administrators Collaborative, 2001).

National standards for teachers and administrators also include the following performance objectives:

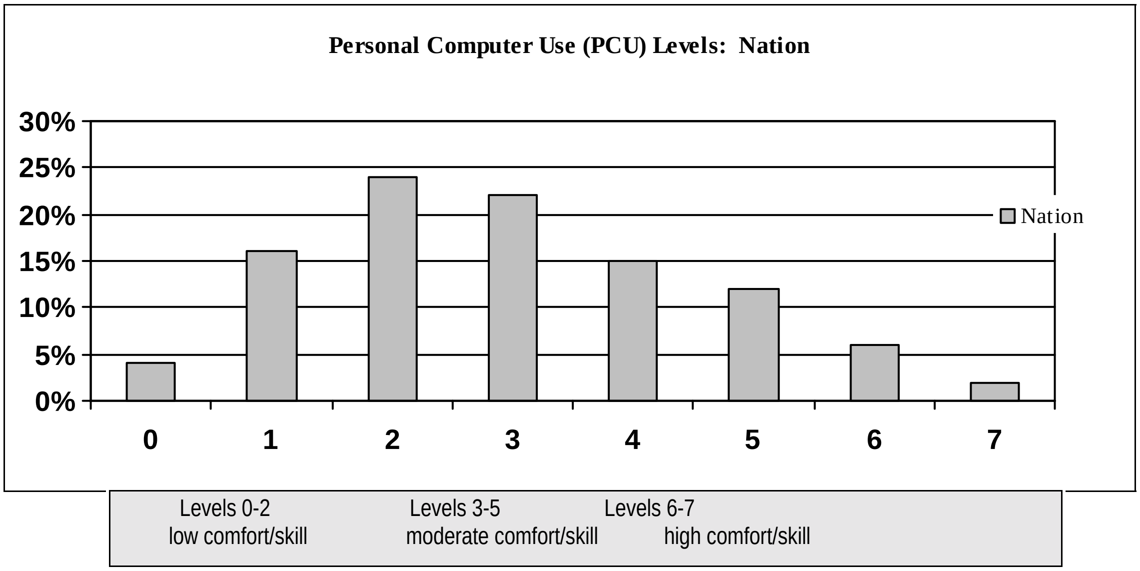
- Designing, implementing, supporting, and evaluating effective learning experiences supported by technology;
- Designing and implementing curriculum plans that include applying technology to maximize learning;
- Applying technology to facilitate a variety of effective technology-supported assessment and evaluation strategies at the classroom, school, and system level;
- Using technology to enhance professional productivity and practice; and
- Understanding the social, legal, and ethical issues related to technology use and applying that understanding to practice.

In addition, national standards for administrators include:

- Inspiring a shared vision for comprehensive integration of technology;
- Fostering a culture conducive to the realization of that vision; and
- Ensuring the integration of technology to support productive systems for learning and administration.

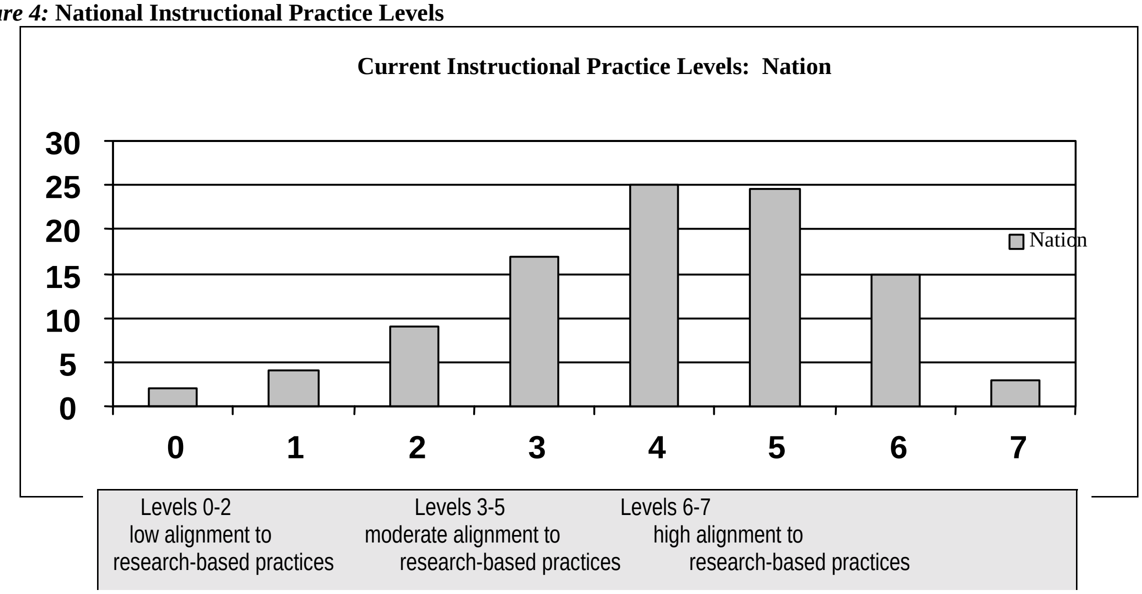
Today, nearly one-half of educators feel moderately comfortable using technology in their classroom and an additional eight percent report high levels of comfort and proficiency using technology (Moersch, 2001).

Figure 3: **National PCU Levels**



Even a higher percentage of teachers exhibit a strong pedagogical foundation for effective technology use. Today, 67 percent of teachers' instructional practices are best described as "moderately aligned" with research-based practices and an additional 18 percent are best described as "highly aligned." (Moersch, 2001).

Figure 4: **National Instructional Practice Levels**



While on one hand, these reports are encouraging, these national statistics also indicate that:

- 44 percent of teachers still report low skill and comfort levels related to technology use and nearly 15 percent report low alignment to research-based instructional practices.
- A majority of teachers, who exhibit only moderate performance levels in technology (49 percent) and pedagogy (67 percent), must continue to improve.

Such statistics suggest that educators' professional development needs have only begun to be met. Experts in the field encourage states to conduct new needs assessments, re-evaluate existing programs, re-target existing initiatives, and develop new strategies to sustain and "accelerate" educators' proficiencies (Honey, 2003). The federal government has provided strong support for these initiatives in Title IID "Enhancing Education Through Technology" which maintains that school systems will spend 25 percent of all funds from this program on high-quality professional development for teachers (see System Support section below).

Vision

Establishing and articulating a vision is essential for realizing objectives in any setting (enGauge, 2000; Keane, Gersick, Kim, & Honey, 2003; Porter, 2002). However, equally important is high-levels of commitment to that vision. Without commitment, other system readiness factors may not leverage movement toward goals (enGauge, 2000; Porter, 2002). For example, system members may have access to technology and even high-levels of proficiency using technology, but unless they *believe* that technology use can enhance practice, they are unlikely to act and may even actively resist an innovation (Rogers, 1995).

According to experts in systemic change and long-range planning, the best way to encourage high levels of commitment among system members is to involve them in construction a vision that is:

- Clear, convincing, and easily communicated;
- Forward thinking;
- Informed by research and best practice;
- Shaped by local needs and language;
- Highly visual in nature, allowing system members to "see" themselves in specific situations where the vision is being realized;
- Supported by a strong majority of system members; and
- Focused on issues of learning and student achievement, and not just access.

System Support

Incorporating technology effectively into instruction and administrative practices often requires changing long-standing beliefs and practices. Therefore, supporting technology programs becomes one of the most challenging types of tasks for leaders (Rogers, 1995). While there are many support strategies that system leaders use to encourage and enable the effective use of technology, the most common and perhaps the most critical, include:

- Monitoring progress of technology programs on regular basis;
- Providing technology support staff charged with keeping hardware, software, and networks functional for learning purposes;
- Providing high-quality professional development programs which build educators' proficiency levels;
- Establishing policies and/or incentives that encourage technology proficiency and effective use; and
- Engaging in high-quality long-range planning for technology programs.

Perhaps the first step toward supporting high-quality technology programs is knowing current conditions. By analyzing data from regular, meaningful collections, leaders can not only monitor progress, but craft more responsive support strategies.

More specifically, we know that one area to monitor includes technical support. Technology support staff are critical to school systems for many reasons. First, teachers have neither the time nor the expertise to fully support computers, software, and network connections. But, when technology is inoperable, teachers cannot use it for instruction. In fact, research indicates that low functionality may even cause teachers to dismiss technology as a primary learning tool (Ronnkvist, Dexter, & Anderson, 2000). Second, technical personnel are also needed to secure school networks from those who might compromise local school data or deploy the local network resources in a larger attack against another entity. Finally, technical staff are not only needed to maintain existing technologies, but also to plan and supervise future projects. Since technology changes rapidly, keeping a pulse on emerging developments is an important function.

Yet, in spite of their critical role, national statistics suggest there is a shortage of technical capacity in local systems. For example, a Market Data Retrieval survey reported in Ed Week (May 2003) suggests that less than 50 percent of schools have a full-time district or school-level computer maintenance/technical support person and only a third of schools have a full-time district or school level technology coordinator. According to the survey, most schools without technology coordinators provide for local needs in the following ways:

- 21 percent have a full-time teacher who also has the title of coordinator;
- 14 percent use library media specialists to coordinate technology needs;
- 9 percent have a teacher who informally provides technology leadership but does not have the official title of technology coordinator;
- 7 percent have no one to serve as this type of coordinator;
- 4 percent use a part-time teacher as technology coordinator;
- 4 percent use administrators to fill the technology coordinator role.

While many variables affect the type and number of technical staff needed in school settings, the Consortium for School Networking (2001) suggests that school systems consider providing “at least one support person for every 50-70 computers or one person for every 500 computers in a closely-managed networked environment” (p. 6). Of course, CoSN also suggests that school systems track the adequacy of tech support in various ways to more accurately determine local staffing needs. Records such as network down time, number of inoperable computers, length of service time, and client satisfaction surveys are listed as possible ways to gather pertinent information.

While technical staff can support the functionality of technologies, teachers still must be able to use technology effectively and to integrate it into the curriculum. Research in this area suggests that professional development does impact effective use in the classroom (Becker & Reil, 1999). Of course, certain types of professional development are more effective than others. For example, most teachers need both technical skill training, assistance with integrating technology into the learning process, and support from peers and mentors (Becker & Reil, 1999). Components in isolation is usually not enough to impact practice. Of course, technology-related professional development must also exhibit the general characteristics of high-quality professional development, as well. The most commonly-accepted standards of professional development suggest that effective professional development standards are:

- Based on theory, research, and best practice;
- Centered on specific goals for student learning;
- Focused on promoting effective student assessment;
- Situated in actual practice;
- Experiential;
- Collaborative;
- Directed by participants' interests, questions, and needs;
- Integrated to local, regional, and state school improvement programs and goals; and
- Adequately supported by organizational conditions, materials, human resources, and funding.

While providing technical support and professional development opportunities form the basis of most system support programs, researchers agree that policy and/or incentives to support participation in professional development and changes in practice are also useful (Dede, 2001; enGauge, 2000; & Porter, 2002). The most common policy/incentive actions include:

- Establishing and adopting educator and student standards for technology use;
- Mandating technology training aligned to standards as a condition for initial licensure and recertification of educators; and
- Integrating student standards into state and local curriculum.

Other frequent, but slightly less common, methods of engineering system support include testing student achievement of technology-related learning standards. In other cases, systems have provided educators with financial or material incentives for participating in professional development programs or for engaging in actual technology use. Of course, in all situations, system support includes budgeting for and funding selected strategies.

Given the current levels of technology use in America's schools, examining the support strategies that are being deployed emerges as especially critical.

According to results from Market Data Retrieval's Technology in Education (2002) and Survey of State Departments of Education (2003), schools have strong support from state-level education agencies in the following areas:

- establishing technology standards for students (42 states);
- establishing technology standards for teachers (34 states);
- establishing technology standards for administrators (31 states); and
- requiring preservice teachers to complete coursework related to these standards before initial licensure (23).

While establishing these standards seems to be a good start, evidence related to educators' technology proficiency and students' technology use suggests that not many educators are meeting these standards. Results from Market Data Retrieval surveys suggest only 14 percent of public school teachers have had more than eight hours of training (in service or professional development programs) in the area of educational technology, and many professional development opportunities were in the form of one-time seminars insufficient to bring the teaching profession up to speed with emerging technologies. Currently, data collection results also suggest that only 14 percent of school's technology funds are allocated toward professional development and there is no projected increase in the foreseeable future (Ed Week, 2003).

Perhaps weak state-level policies and procedures related to teacher recertification and administrative licensure also contribute to this lack of professional development. For example, only 12 or fewer states currently require the following:

- technology-related professional development for teachers;
- technology training for initial administrator licensure; and
- technology-related professional development for administrators.

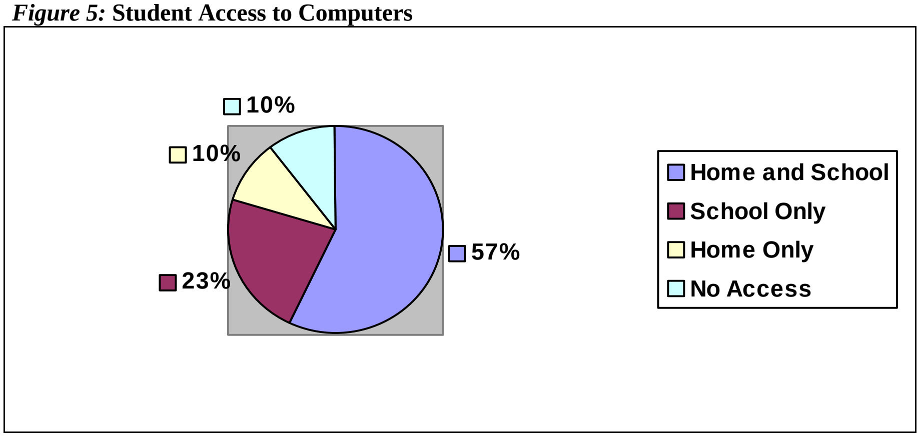
Such data suggest that states consider policies, procedures, and resources directed to technology-related staff development and improving technology support.

Equity

While technology has traditionally been seen as a positive influence on education, many have also noted the potential dangers of inequitable access, as well. If students cannot have access to the same tools and become as fluent in using those tools as their peers, technologies may actually deepen rather than relieve social disadvantages (enGauge, 2000).

For these reasons, equitable access to technology has been closely monitored over the past decade (Children's Partnership, 2000; Hoffman & Novack, 1999; US Census, 2000; US Department of Commerce 1998; US Department of Commerce, 1999; Williams, 2000) and results show that schools are great equalizers—at least for nearly one quarter of America's K-12 students. According to a US Census Bureau report on school and home access (2000), 57 percent of students ages 6-17 had access to computers at both school and at home. However, the next largest group (22.8 percent) had access <u>only</u> at school. (see Figure 5)

Figure 5: **Student Access to Computers**



Source: US Census Bureau, Current Population Surveys, August 2000

Recent data also indicate that there is a reasonable pattern of equitable access across all schools. For example, Market Data Research Survey results (2002) suggest while access levels in high-poverty or high-minority schools may lag slightly behind national averages, the differences are not great (see Table 4).

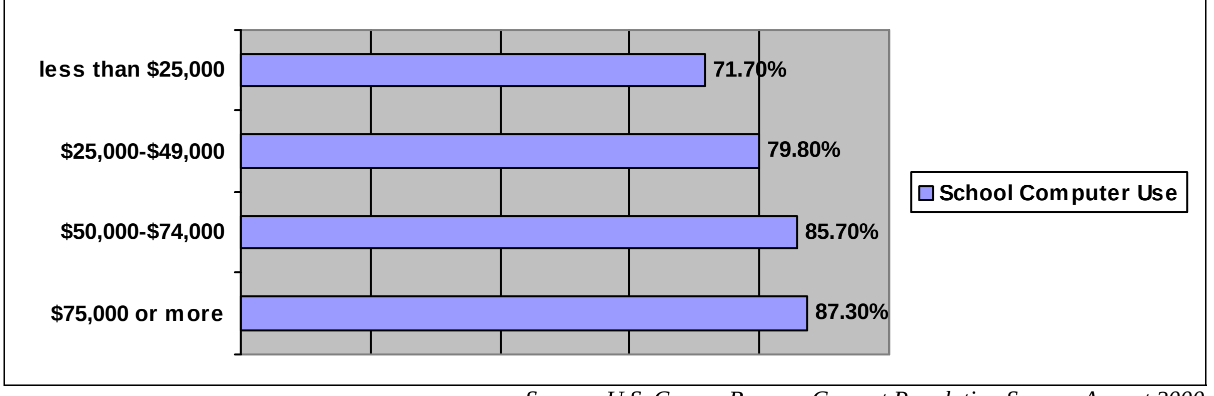
Table 4
School Access to Technology

	National Average	High-poverty Schools	High-minority Schools
Student per Internet-connected computer	5.6	6.3	6.7
% of schools with Internet Access	94%	94%	92%
% of schools with Internet access from one or more classrooms	90%	85%	84%
Among schools with Internet access, the percent that connect through a "high-speed" connection (T1, T2, digital satellite, or cable modem)	76%	73%	75%

Source: Market Data Retrieval Survey, 2000-2001

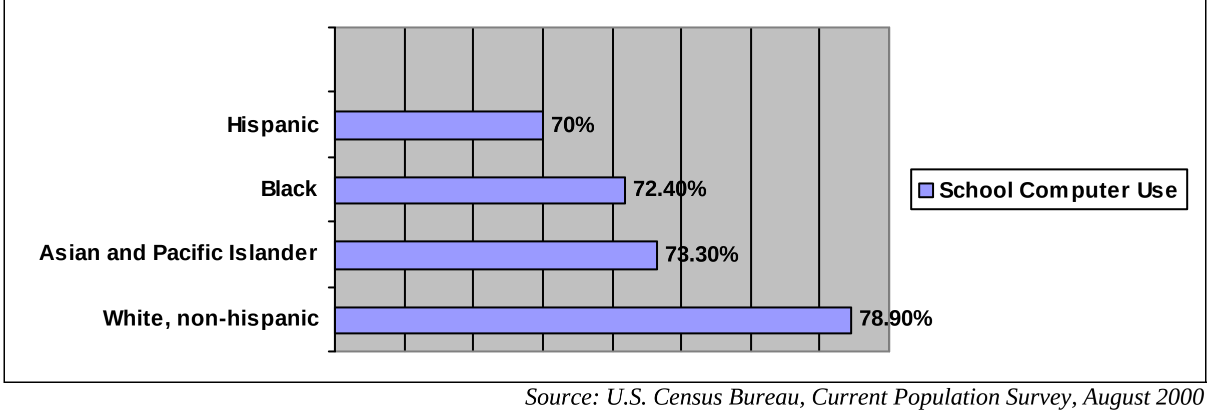
The differences among how these school computers are actually *used* among these subgroups, however, are slightly more pronounced in some reports. For example, the US Census Bureau reports that white, non-Hispanic children and children living in families earning $75,000 or more lead their lowest-earning counterparts in computer use at school by over 15 percentage points (see Figure 6). Similar discrepancies in school use patterns also exist among racial origin groups (See Figure 7).

Figure 6: **School Computer Access by Children (ages 6-17) by family income**



Source: U.S. Census Bureau, Current Population Survey, August 2000

Figure 7: **School Computer Access Among Children (ages 6-17) by Race and Hispanic Origin**



Source: U.S. Census Bureau, Current Population Survey, August 2000

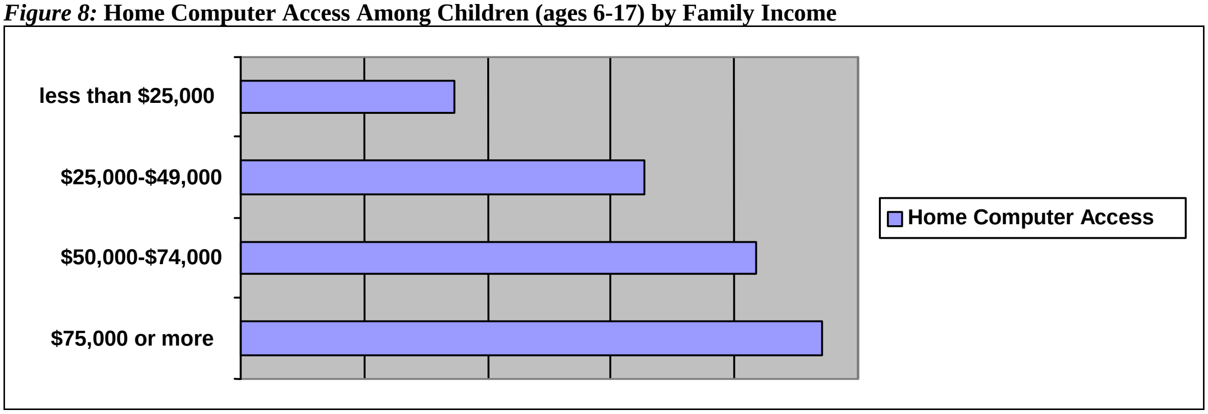
Furthermore, findings from the National Teaching, Learning, and Computing Studies (Ronnkvist, Dexter, and Anderson, 2000) suggest the following:

- Teachers in high-poverty elementary and middle schools are more likely than others to select "remediation of skills" and "mastering skills just taught" as their primary objectives for student computer use.
- Secondary teachers in poorer communities are more likely to see computers as valuable for teaching students to work independently rather than collaboratively.
- Teachers in high-income area are more likely to analyze information presented.
- Elementary teachers serving higher-income populations are more likely to use computers to teach students written expression than to teach computer skills.

These differences imply that students from different socio-economic backgrounds may actually be using technology differently and that these differences may either be an advantage or disadvantage to a child. While no listed technology uses are totally undesirable, each encourages different types of cognitive skill acquisition. Certainly, school system leaders must ensure that students from all demographic groups have similar opportunities to use computers in academically-rigorous ways that support problem solving and higher order thinking.

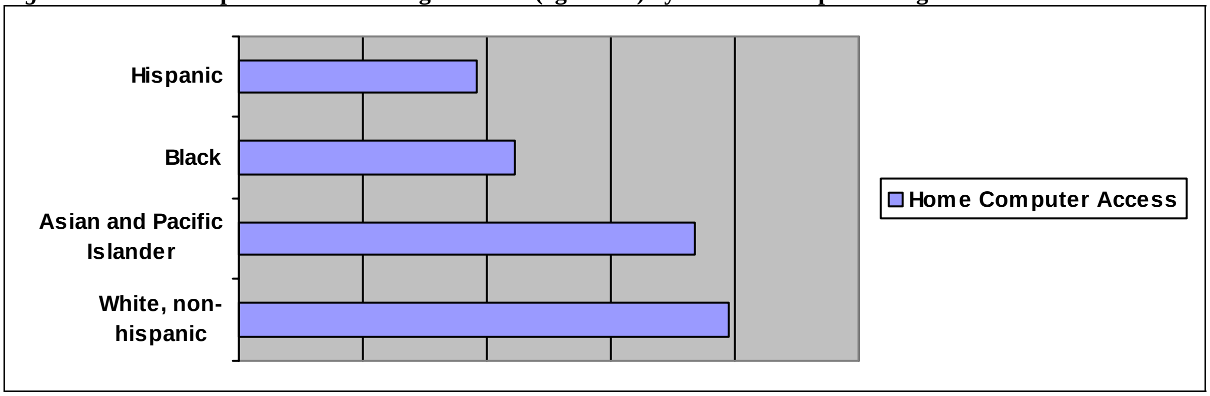
Home access for school-age children is another area attracting national attention (U.S Census Bureau, 2000). While school access levels across populations are more equitable, home access patterns have greater discrepancies across subgroups. For example, children ages 6-17 from families earning more than $75,000 a year are nearly three times as likely to have home access to computers than their counterparts in families earning less than $25,000 (See Figure 8).

Figure 8: **Home Computer Access Among Children (ages 6-17) by Family Income**



Source: U.S. Census Bureau, Current Population Survey, August 2000

Figure 9: **Home Computer Access Among Children (ages 6-17) by Race and Hispanic Origin**



Source: U.S. Census Bureau, Current Population Survey, August 2000

Disaggregated data on school access to technology, technology use at school, and home access data are perhaps the most popular ways to gauge equity across subgroups. However, disaggregated data on other issues, such as administrative uses, educator proficiency, and system support may also prove to be useful. Identified subgroups recommended for study include students from various socio-economic status, race/origin groups, and students with special learning or physical needs that require individualized educational plans or IEP's (see equity sections in enGauge framework, 2000; and data elements section in National Leadership Institute Toolkit, 2003). As technology use matures, studying use patterns across gender may also be an important concern, as well (enGauge, 2000). NCREL's enGauge framework also identifies "system-wide" equity as a variable worth considering. For state education agencies, monitoring system-wide equity would require looking beyond state averages to examine the range of data across the whole system and striving to understand and improve the situation of those lagging behind on access, use, or system readiness indicators. Local education agencies would use the same process to locate patterns among their schools or grade levels within their schools

Summary to National Scan

As this National Scan suggests, technology planning is complex and broad in scope. It includes many more variables than simply equipping the nation's schools, and, as the field matures, new variables emerge. This scan provides a cursory overview of some of the most critical pillars of technology planning processes that hope to improve student learning. They include:

- Effective Technology Use;
- Effective Administrative Use;
- Adequate Access to Technology;
- Educator Proficiency;
- Vision;
- System Support; and
- Equity.

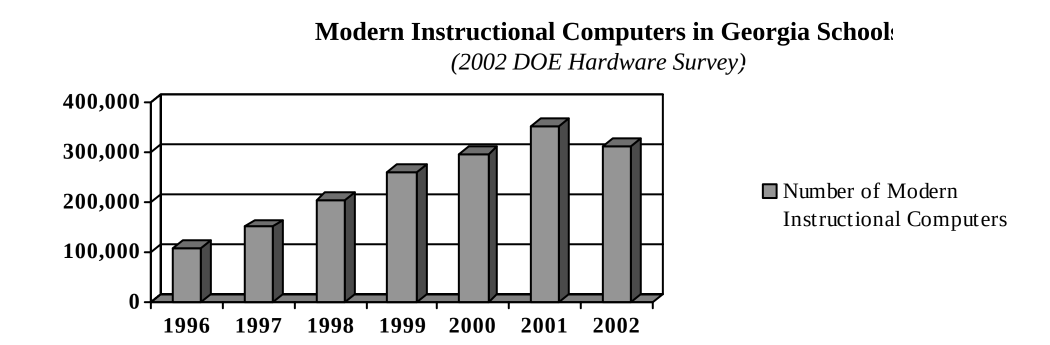
These pillars will serve as an organizing framework for the state of Georgia's technology plan. The next section, Georgia's Current Reality and Needs Assessment will document Georgia's progress in related areas and identify gaps that must be addressed within the next three years.

Section Two: Georgia's Current Reality and Needs Assessment

Access to Technology

As experienced in the rest of the nation, some of the greatest gains in Georgia include increased access to instructional computers in schools. For example, in December 2002, the statewide inventory of modern computers[3] had more than tripled in the past seven years. The number of modern computers available for instruction in Georgia's K-12 public schools currently tops 300,000 or approximately one modern computer for every five students in the state.

Figure 10: **Modern Instructional Computer s in Georgia**



Despite these remarkable gains in inventory, several challenges remain in the areas of computer access in schools. While state averages are helpful in some respects, they can also disguise the actual conditions existing in some settings. For example, while student to modern computer ratios have reached 1:5 statewide, 47.5 percent of schools in Georgia still have student to modern computer ratios ranging between 1:6 and 1:36. Thirty-four percent of these schools (or 16 percent statewide) still have ten or more students per modern computers.

Table 5
Student to Instructional Computer Ratios

Percentage of FTE reporting schools with five or fewer students per each modern, instructional computer.	Percentage of FTE reporting schools with more than five students per instructional computer.
52.5% (1051 schools)	47.5% (952 schools)

(2002 DOE Hardware Survey)

When compared to the rest of the country, Georgia's student to computer ratios are near the national average, but the state still ranks 34th out of 50 states (Market Data Retrieval, 2002). This means that 33 states have more desirable student-to-instructional computer ratios in their public schools than Georgia does.[4]

[3] Modern computers are defined on the 2002 Hardware Survey as "Equal to or better than a Pentium III or comparable Celeron or Athlon processor OR equal to or better than a Macintosh G3 (PowerPC 750) 333MHz. None of these machines would have entered system inventories before 1999.
[4] These comparisons are based on the total of instructional computers, both modern and older, in Georgia and in other states. The comparison is based on comparable devices.

Access in Georgia's classrooms still falls far below national goals, as well. According to the 2002 Hardware Survey, 22 percent of Georgia's classrooms still have no modern instructional computers, and over half (57 percent) are best described as one-computer classrooms. With 79 percent of classrooms having zero or only one modern instructional computer, only 21 percent of Georgia's classrooms could possibly be *achieving* or even *approaching* national standards of five or six computers per classroom (CEO Forum, 2001; National Technology Plan, 1996).

Table 6
Modern Computers in FTE Reporting Schools

Number and Percent of Classrooms in FTE reporting schools with Modern Computers									
No Computers		1-2 Computers		3-5 Computers*		6-9 Computers*		10+ Computers*	
21,199	22%	55,065	57%	14,738	15%	2,148	2%	3,633	4%

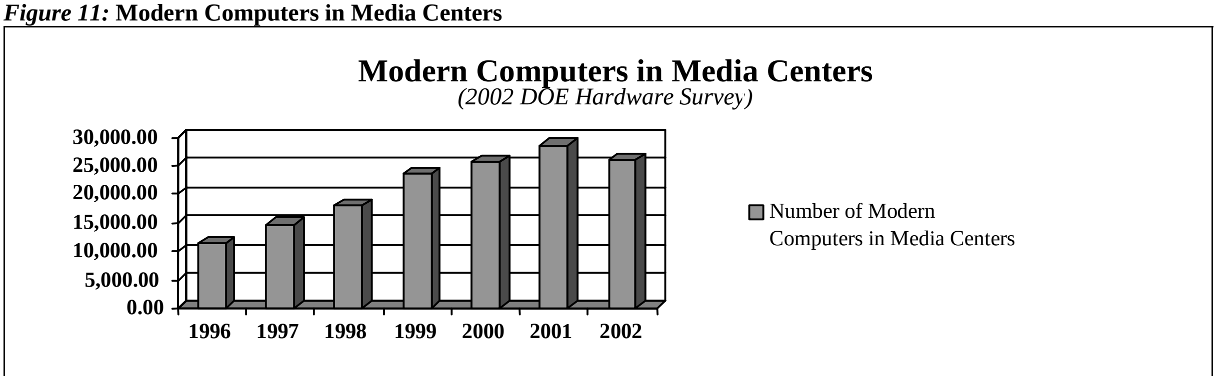
(2002 DOE Hardware survey)

*Classrooms with access levels meeting National Goals of five to six computers or 1:5 student to modern computer ratios would fall in these categories.

As highlighted in the National Scan, classroom computers play a significant role in promoting technology use in instruction. The presence of computers significantly impact how they are used for learning. Perhaps the data presented in this section explain one reason why 16 percent of teachers involved in Georgia Department of Education's Statewide Study of Technology Use (2002) reported their primary barrier to effective technology use is access to the technology.

Georgia Department of Education hardware inventories also suggest that the number of computers in media centers has grown over the past six years, although at a slower rate than computers in classrooms or labs.

Figure 11: **Modern Computers in Media Centers**



Student to computer ratios in media centers currently fall 10 percent below national averages. Nationally, there is an average of 78.7 students per instructional computers in media centers. Georgia ranks 37 out of 50 states and the District of Columbia with 95.3 student to instructional computers (Ed Week, 2003).

Instead of student to computer ratios, Georgia media specialists conceptualize their computer access goals differently. Georgia media specialists expect to have at least enough modern, Internet-connected computers in their centers to accommodate a full class with approximately two students per computer. Based on this logic, most suggest a minimum of ten computers in elementary school media centers; 12 in middle schools; and 15 in high schools. According to the

Georgia Department of Education's Annual Technology Hardware Survey, to date, approximately half of Georgia's media centers meet these standards.

Table 7
Media Centers Meeting Minimum Standards for Modern Computer Access

Percent of Media Centers Meeting Minimum Standards for Modern Computer Access		
Elementary Schools (ten or more modern computers)	Middle Schools (12 or more modern computers)	High Schools (15 or more modern computers)
44%	47%	63%

(2002 DOE Hardware Survey)

When considering these data, the current computer access needs for Georgia K-12 schools are clear:

- All schools must maintain their current inventory of modern instructional computers (which means upgrading equipment every three to five years).
- Inventories must continue to increase until all *schools* and *classrooms* have at least one modern computer for every five students - and - all *media centers* have between 10-15 modern computers based on the grade levels they serve.

Certainly programs such as online testing and advances in effective technology use hinge on meeting these objectives. While Georgia schools have made great strides in building their inventories of modern computing equipment, there is still an insufficient number of computers in most schools to provide the daily experiences students need to master the QCC Technology Integration Standards approved by the State Board of Education in February 2002, or to implement statewide, technology-based instructional assessment programs.

Meeting these objectives given current economic situations, however, seems quite challenging for the following reasons:

- Many systems report declining local funds for technology during an economic downturn.
- Between 1994-2002, State Lottery funds have provided an average of 60 million dollars, or approximately $44 per FTE, annually to schools for purchasing classroom computers and assistive technology. However, in Fiscal Year 2003, those Lottery funds were diverted entirely to cover growing costs associated with Hope Scholarship and Pre-K program leaving the K-12 "Computers in the Classroom" program and the "Assistive Technology" program unfunded. Unless another funding source is found, it is unlikely that schools will be able to continue trends toward national student to computer ratios in schools and classrooms.
- In FY03, state media center program funds were reduced from $19.54/per FTE to $9.77/per FTE. The proposed FY04 budget continues funding at a reduced level, which means a loss of approximately $14 million annually from previous years. While the media center program funds a broad range of activities and materials, it is also an important source of funding for technology in media centers and technology available for centralized video and data distribution throughout the school.
- While Federal Title IID "Enhancing Education Through Technology" (Ed Tech) Funds provides approximately $17.6 million annually to Georgia schools, these competitive and formula funds are not likely to have a significant impact on technology inventories for all schools across the state. First, these funds are earmarked only for schools with high economic and academic needs, and, while all systems receive funds from this program,

some receive as little as $1,500. Second, the scope of the program, wisely so, is much broader than only providing computers. For example, legislation directs 25 percent of funds toward professional development and many Georgia school systems are choosing to exceed that percentage to meet local needs. Finally, provisions in the legislation also allow school systems to transfer as much as 50 percent of their Title IID program funds to other Title programs where they have local need. Although funds transferred out of Title IID are currently less than $50,000 in this first year of the program, the potential for reduced funding exists. Given all of these variables, the GA DOE projects that approximately seven million dollars in Ed Tech program funds will actually be spent annually on modern computers.

On the positive side, continuing declines in the cost of equipment; the increase of smaller, more mobile computers; and the advent of wireless technologies may eventually help school systems increase their inventories and make progress toward desired classroom and media center access levels.

Internet Access in Schools

Largely due to the development and maintenance of the State of Georgia K-12 Network and the efforts of local districts, nearly every modern computer in K-12 schools also has a high-speed connection to the Internet. Since e-Rate funding became available in 1997, the Georgia Department of Education has applied for and received funding discounts, enabling the state to provide Internet access for all 180 public school districts as well as three state schools. Currently, the statewide network delivers bandwidth equaling 256-512K per school to each system, and school systems have managed to connect 94 percent of their instructional buildings to this high-speed network.

Since very few schools remain without high-speed Internet access parity seems achievable. In the next three years, the state's primary focus will be improving and expanding the statewide network where critical needs exist. First, many school systems' bandwidth needs overextend the network's current capacity. Second, while some network security measures are in place, the level is by no means adequate to support the types of data transfer activities that are quickly emerging or to protect the network from potential attacks or breaches. Finally, the network must be maintained and upgraded to keep pace with technological advances and industry standards for information management. Therefore, over the next three years, GA DOE network staff will direct their attention to the following tasks:

- Providing sufficient bandwidth for each school systems' growing needs and evolving Internet-based applications, such as video streaming and teleconferencing.
- Ensuring that the network reflects modern standards for transferring and securing information.
- Purchasing, installing, and using network monitoring software to measure bandwidth use and to promote maximum use and security.
- Connecting schools to Internet II.

Since state and federal funding support for the statewide network is currently stable, the likelihood of achieving these objectives is high.

Access to Instructional Resources

During Georgia's Study of Technology Use (2002), school site visitors' and technology coordinators' reports suggested that Web browsers and productivity suites such as word processors, presentation software, and spreadsheet applications are the most commonly available technology resources to teachers and students. Database applications, concept mapping tools, e-mail software, drawing software, and other multi-media authoring tools, drill/practice titles (especially in the early grades), and CD-ROM reference materials were also prevalent. Several systems are also using Integrated Learning Systems. More specialized content software or productivity tools that tend to be associated with one discipline were occasionally seen, but were very rare for the most part. These include simulations, modeling software, probes, Geographic Information Systems (GIS), Global Positioning Systems (GPS), Computer Assisted Design (CAD) tools, and music composition tools.

In general, these preliminary findings suggest that there is a significant base of instructional resources for teachers and students to use in schools. When asked about expanding the availability of tools in schools, technology coordinators in schools expressed interest, but noted that they hoped that currently available tools would be utilized more before expanding. Most also noted that teachers' technology use and curriculum integration skills also played a role in their purchasing decisions. Apparently, technology coordinators feel that as teachers master the basics, new tools can be added. Other plans, they felt, may overwhelm teachers and result in under-utilization of expensive software titles. A third concern, of course, was cost. Investing in basic software tools that can be implemented across the district on every machine seemed to be the highest priority, and after these costs were absorbed, there was sometimes little money left for other titles. Time to research available software and meet individual content needs was a fourth reason mentioned by several.

At the State Department of Education, there are two major programs to enhance the instructional resources available to teachers and students: The Georgia e-Learning initiative and Georgia Learning Connections.

The Georgia e-Learning initiative delivers online courses to high school students and educators. One purpose of providing online courses to is to ensure equitable access to academic courses and professional learning opportunities across the state. The Georgia e-Learning program offers several courses that many schools cannot offer, such as courses in multiple foreign languages, advanced math, and Advanced Placement (AP) courses. For example, approximately 77 of Georgia's high schools (22 percent) offer no AP courses at all, and 19 of them offer online one AP course. Of the 257 students who registered for an online course in the spring of 2003, 81 of them (31 percent) stated they were taking the course online because that course was not offered at their school.

Professional Learning Online courses are also presently available to educators throughout Georgia. These online courses began in pilot stages in Spring 2003 with State Department of Education Information Technology personnel taking and developing online courses through a cooperative effort with Southern Regional Educational Board (SREB), Educational Development Center (EDC) and six SREB states; Maryland, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. This effort was rolled out to the states through the EdTech Leaders

Online program whose mission is to build capacity to provide effective online professional development for educators and to integrate technology into the K-12 curriculum. Georgia participated in two capacity-building programs: *K-12 Technology Integration Program* and the *Online Course Design Program*.

Through this participation, GDOE Information Technology personnel experienced online teaching and learning and gained the experience necessary to build strong local online professional development programs.

Presently GDOE department staff, Educational Technology Training Center staff, and school district administrators/educators throughout Georgia are participating in the following online courses that are being facilitated by GDOE Information Technology staff:

- Using Technology to Support Research and Presentation
- Transforming the Classroom with Project-Based Learning
- Finding the Best Educational Resources on the Web
- Planning for Curriculum Integration of Technology
- Using GDOE Interactive Reports & Georgia Learning Connections to Affect School Improvement
- Teaching Online: The Road to Success

A committee of Georgia administrators and educators proficient in online course development and facilitation are working collaboratively with the GDOE to develop standards for online courses and standards for online teachers. The projected completion date of the standards is October 2004 at which time a concerted effort will be initiated to develop online courses.

Georgia Learning Connections is Web-site designed to provide educators with easy access to information to enhance teaching and learning in Georgia. The site houses the state Quality Core Curriculum online, plus acts as a dynamic education portal that connects educators directly to resources correlated to the QCC standards. Thousands of Web sites, lesson plans, WebQuests, and activities can be accessed from this one site, plus the Lesson Plan Builder is an online tool teachers use to build quality lesson plans and share with their peers via GLC. The site averages more than 200,000 visits per month, with users staying an average of 18 minutes per visit. In 2002, GLC was awarded the national Best of the Web award from Converge magazine and The Center for Digital Education.

Beyond-school Access for Students, Parents, and Teachers

It is currently difficult to determine how many students have home access or adequate public access to modern computing equipment or to the Internet. However, if current conditions parallel national census statistics, we can conclude that a significant number of students—especially those from the lower socio-economic strata—do not have the same level of home access or technical support as their peers in better economic situations. Since this can be a significant barrier to a full implementation of “anywhere-anytime” learning initiatives, Georgia schools must be able to demonstrate that all students have sufficient access to beyond-school technology. For example, home access seems critical for students who participate in Georgia’s e-Learning courses. In a recent survey of Georgia students who took online AP courses, 20 out of 21 who completed the survey reported that using computers at home was essential for course completion.

Therefore, at this stage in statewide program development, initial tasks must center on collecting information, analyzing it, and targeting programs to close any beyond-school access gaps.

To encourage home connectivity, the Georgia Department of Education continues to post an increasing amount of public information for parents, students, and educators via the World Wide Web. In addition to Georgia Learning Connections and Georgia's eLearning initiative, information including the School Report cards and results of all data collections are available online.

Like the GA DOE, some school systems and schools also have highly evolved information exchanges with the public. The most innovative programs include online registration, information on homework, frequent updates on student academic progress, and postings of student work. A few systems provide users with remote access to learning resources on the school's network, allowing teachers to access important files from home and allowing students to pursue their academic tasks day or night.

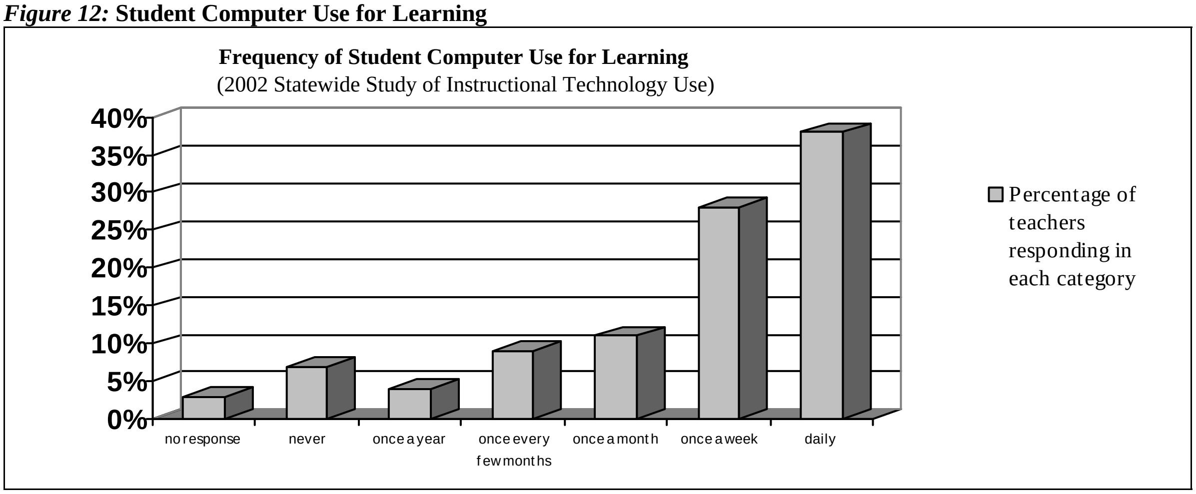
Yet, most schools have not reached this level of sophistication. Twenty-nine percent of schools still do not have local Web sites, and most of the existing Web sites are understandably simple. Often constructed by volunteer teachers and/or parents with limited time and Web development skills, these sites primarily post calendars, menus, staff contact information, and basic public relations materials. While establishing a wide-spread Web presence is an important first step, state and local education agencies all must learn to maximize the interactive nature of Internet to support student learning.

Disseminating models of high-quality content attractive to students, parents, and teachers seems critical at this juncture.

Instructional Uses of Technology

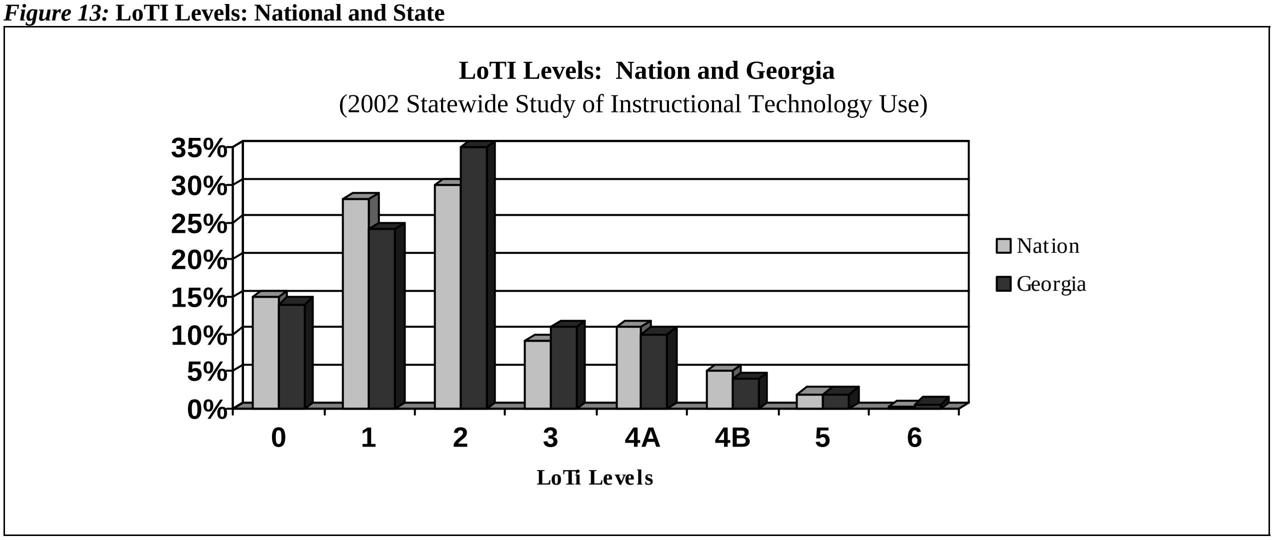
Results from Georgia's Statewide Study of Instructional Technology Use (2002) indicate a rather high frequency of computer use in Georgia schools. Thirty-eight percent of teachers surveyed reported that students in their classes use computers for learning purposes on a daily basis. Approximately 28 percent reported using the computer at least once a week.

Figure 12: **Student Computer Use for Learning**



Yet, the descriptive data on *how* students are using instructional computers presented a slightly less encouraging picture. According to teachers' reports, 73 percent of technology use is best described as Level of Technology Implementation (LoTI) Levels 0-2, which range from no computer use at all (Level 0) to the use of computers to support acquisition of lower-level cognitive skills at the knowledge/comprehension level (Levels 1-2). In these LoTI levels, teachers often use technology to "present" material to students in a passive format, or students use skill-based drill & practice software or games to acquire and practice basic skills. Only six percent of the participants completing the LoTI survey assessed themselves at Level 4B or above, the levels that: (1) address the Process Skills Standards currently structuring the current QCC revisions; and (2) reflect the major characteristics of effective teaching with technology as defined by the CEO Forum on Education and Technology (2001), NCREL's enGauge framework (2000), and the National Educational Technology Standards for Teachers (NETS Project, 2002).

***Figure 13:* LoTI Levels: National and State**



DRAFT BROAD-BASED PROCESS SKILLS STANDARDS FOR

GEORGIA'S QUALITY CORE CURRICULUM

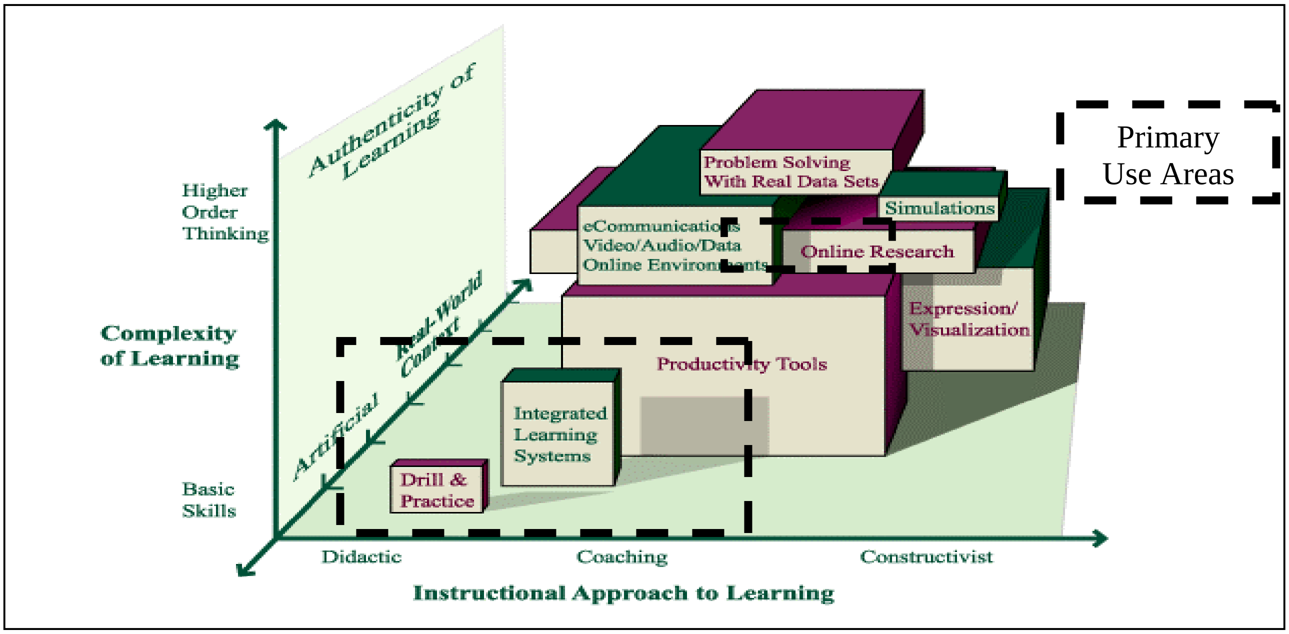
(Process skills standards are to be integrated during the development of specific learning objectives for each grade or course in each content area.)

Instructional programs from Pre-K through 14 should enable all students to:

COMMUNICATION	CONNECTIONS	ANALYTICAL REASONING	INQUIRY AND RESEARCH
• Use oral, written, and visual communication to interpret and synthesize information from multiple sources. • Use oral, written, and visual communication to express knowledge and understanding of concepts to a variety of audiences.	• Recognize and apply connection among concepts and processes across the content areas. • Apply knowledge and concepts in interdisciplinary/real world contexts.	• Build new content knowledge through analytical problem solving. • Apply and adapt appropriate skills and strategies to solve routine and non-routine problems.	• Generate questions and/or hypotheses worthy of systematic inquiry. • Apply appropriate inquiry and research methodologies.

Data from the 2002 Statewide Study of Instructional Technology Use also suggest that the range of technology use is rather limited in Georgia's schools, as well. For example, drill and practice software, integrated learning systems, Web browsers, and basic productivity tools such as word processing were found to be the most frequently-used applications. Internet use was almost entirely defined as an avenue for electronic information gathering. Communicative and collaborative uses of the Web for learning; use of advanced or specialized productivity tools; and use of simulations and visualization software did exist, but these uses were extremely rare.

Figure 14: **Summary of Georgia's Primary Instructional Technology Uses**



Certainly, the frequency, levels of technology implementation, and range of use in 1996 were far below where they are now. Yet, current conditions also clearly illuminate the need to accomplish several new objectives – especially given the focus of the QCC revision process. Certainly data show that increasing the *frequency* of technology use in schools is simply not enough to target the most important student achievement goals. Instead, the focus should be improving the *quality* of technology-enhanced instruction as well as the *quantity*. At this juncture, Georgia's greatest challenges in the area of instructional technology use are:

- To expand the current range of use to include available and emerging technologies which are not used often in schools, but offer great potential for promoting the state's new curriculum process standards;
- To move technology use from the periphery of the learning process to a central, vital role across all grade levels and content areas; and
- To encourage technology uses that support: (1) student-centered learning, (2) the acquisition of higher-order thinking skills as represented in the new QCC Process Skills Standards; (3) the mastery of QCC Technology Integration Standards; and (4) relevant, meaningful tasks for students.

Administrative Uses of Technology

Georgia has a long history of supporting administrative technologies. Currently, all required school and system-level data collections are online processes, and there is a technology help desk to provide technical assistance to educators in local systems.

The state is also moving forward with online testing and accountability systems. The Research and Testing Division is expecting to launch a pilot online testing program in 2004-2005.

In 2002, the Georgia DOE also launched its Interactive Report project, which is quite similar to CRESST's Quality School Portfolio (QSP) discussed in the National Scan. Interactive Reports are Web-based information tools developed by the GA DOE that allow users to manipulate and explore education data in real time. Using this tool, users can both examine trends in education data across several years and benchmark groups of similar schools for comparison purposes. Customized tables and graphs can be constructed by selecting which variables to include in an analysis. Once the initial report is constructed, the user can then alter its dimensions by either choosing new variables or drilling into the data to get more/less detail. At any point in this process, the user can download the selected data into an Excel file for further analysis. The types of data currently available for analysis in these Interactive Reports include:

- Student enrollment counts
- Dropout rates
- Revenue and expenditures for education
- CRCT scores
- Certified personnel data
- School nutrition breakfast and lunch costs

Finally, the state is currently in the process of helping school systems convert to one of six, state-approved student information systems in order to sharpen schools' ability to collect, report, and use data for school improvement.

Such efforts should establish technologically-advance cultures that not only understand and support technology, but also use technology to produce actionable data targeted at school improvement.

Educator Proficiency

Training educators to use technology effectively was a primary component of previous Georgia K-12 Technology Plans, and the results of these efforts are clear. While levels of proficiency are not yet optimal, progress is being made.

For example:

- Nearly half (46 percent) of inservice teachers have already met the Professional Standards Commission's 2006 Technology Proficiency requirement for re-certification (Professional Standards Commission Information, March 2003);
- Nearly half (48 percent) of educators feel "moderately" comfortable using computers for instruction and eight percent report a high level of comfort with instructional technology (Personal Computer Use Levels, Statewide Study of Instructional Technology Use, 2002); and

- Over half (63 percent) of educators report that their current instructional practices are "somewhat" aligned and 15 percent are "highly" aligned to research-supported models for effective technology use that will best support the new QCC Process Skills Standards (Georgia's Statewide Study of Instructional Technology Use, 2002).

Yet, to see instructional use patterns shift toward higher levels of technology implementation, as described by levels 4, 5, and 6 on the LoTI scale, a continued emphasis on professional development must remain. In spite of the progress, the following also remains true:

- Nearly half (44 percent) of educators report low levels of comfort using technology for instruction;
- Nearly a quarter (22 percent) of educators report low levels of alignment to research-supported instructional practices; and
- The large number of educators report only moderate levels of comfort with technology (48 percent) and only partial alignment with research-based instructional models (63 percent) must continue to improve.

Figure 15: **Personal Computer Use (PCU) Levels: Nation and Georgia**

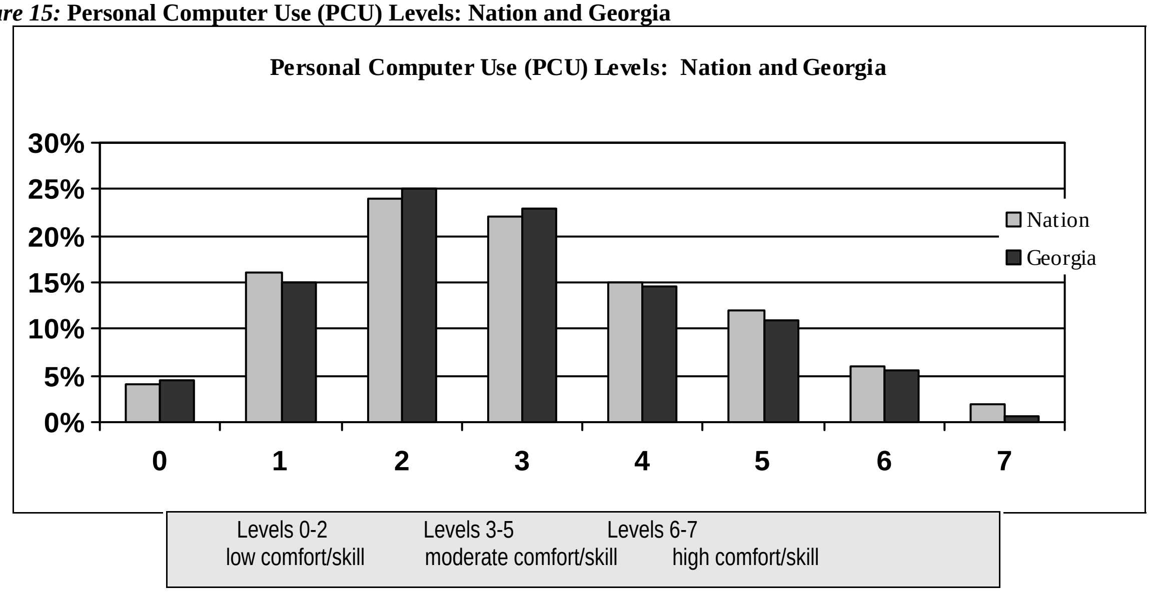
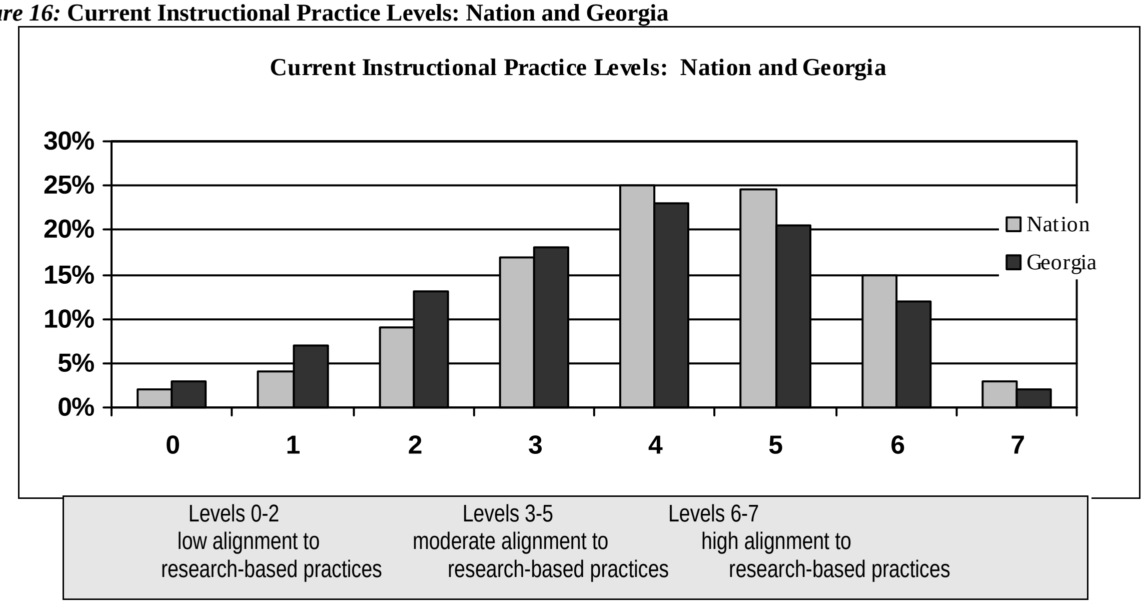


Figure 16: **Current Instructional Practice Levels: Nation and Georgia**



Vision

The State of Georgia collaboratively constructed and established a vision for technology use in the 1996 Technology Plan. Central components of this vision included a desire for ubiquitous access to technology resources that would strengthen students' academic achievement and technology literacy. It is clear that GA DOE staff, many business education partners, and system-level technology staff have a high degree of ownership of and commitment to this vision. Yet, it is unclear how well other audiences understand and adopt these vision statements. As Georgia strives to achieve a full implementation of technology goals across all settings, it will be necessary to more tightly assess the commitment to the vision across a broader community.

Those that reviewed the 1996 plan recommended the vision be updated and specifically suggested the following strategies:

- Refocus the vision to include the use of technology as well as the access to technology.
- More clearly define what types of technology uses are expected.
- Focus on technology uses that exemplify research-based instructional practices.
- Extend the vision farther into the future.
- Consider new applications of technology that have emerged in recent years and that have great potential for improving learning.
- Make the vision as specific as possible.
- Ensure that the language of the vision mirrors the DOE vision and the principles guiding the QCC Revision Process.

System Support

As discussed in National Scan, successful instructional technology programs can only emerge and thrive within state and local systems that *support* effective technology use. Traditionally, Georgia's support initiatives have focused on the areas of technology planning, program evaluation, and professional development. In these areas, Georgia has experienced great progress. For example, all school systems in Georgia currently have high-quality technology planning components in place, including program evaluation measures. Many high-quality professional-development programs are also offered on the state, regional and local level.

However, according to recent data collections, system support may need to be strengthened in the following areas:

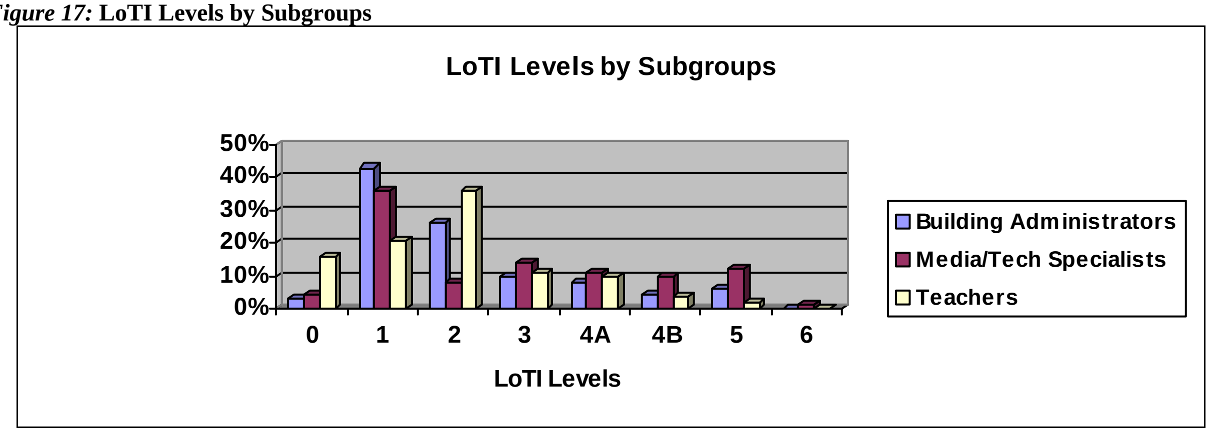
- *Administrative support* for the effective use of technology in classrooms; and
- *Technical support* to maintain highly functional hardware, software applications, and networks for instruction.

Administrative Support

In the Statewide Study of Instructional Technology Use (2002), teachers reported "lack of time to learn/practice/plan (30 percent)" and "lack of time to use technology with student in class without neglecting the required curriculum (28 percent)" as the top two barriers to effective technology use in their classrooms.

During the same study, data also suggest that many instructional leaders are supporting technology practices that lag behind what teachers are actually doing. For example, while the predominant LoTI level for teachers was Level Two (35 percent), the highest percentage of building administrators (43 percent) and technology coordinators/media specialists (36 percent) were supporting/promoting technology practices at a Level One.

Figure 17: **LoTI Levels by Subgroups**



Furthermore, another recent study suggests that only two percent of Georgia's school systems consider technology integration in the process of evaluating teachers. Less than 38 percent of principals address technology integration in school-level evaluations, and only a small portion of those principals included the technology-related information on district-level reports (Cearley, 2003).

Such findings may imply the following:

- Teachers—and perhaps administrators in the systems in which they work—see technology as an "add-on" activity that is not fully integrated into local culture. For example, technology resources may not be infused into state and local curriculum/material guides and, therefore, locating and integrating technology-based instructional resources are probably laborious and time-prohibitive for many teachers, even though they may wish to use technology more.

- The incentives and expectations for effective technology use in the classroom, including those embedded into teachers' formal evaluation processes, are likely too weak to encourage wide-spread use.

Strategies to alleviate these tensions might include:

- Emphasizing the student Technology Integration Standards that were officially adopted into the QCCs by the State Board of Education in February 2002 is an important component of student achievement and an important component for Georgia's economic future.
- Finding reasonable and effective ways to assess these QCC Technology Literacy standards.
- Integrating the QCC Technology Integration Standards into the QCC content standards to better communicate how technologies can mediate content knowledge and skill acquisition.
- Reviewing current evaluation processes and publishing samples of how technology integration might be added to current evaluation instruments.

Technical Support

In many respects, technical support in Georgia's K-12 schools is strong. Since 1994, the state has provided one teacher's base salary for every 1100 FTE to school systems to hire educational technology staff. Georgia also ranks above national averages in the areas of technical support. While only one-third of schools in the nation report having a full-time district or school-level technology coordinator at the district or school level, 44 percent of Georgia schools report having such a staff member. Similarly, only 49 percent of the nation's schools report having a computer maintenance/technical support person on staff at the district or school level, while 66 percent of Georgia's schools report having the same type of staff person. This places Georgia among the top five states for technology coordination staff and the top three for technical support staff in the nation.

Educational Technology Training Centers have also been instrumental in developing the skills these technical staff need to support instructional technology at a local level.

Perhaps as a result of these efforts, teachers currently seem to be fairly satisfied with the level of technical support they receive. On the Statewide Study of Instructional Technology Use (2002), only five percent of teachers indicated that technical support was their greatest obstacle to effective use. "Time to use technology in the class without neglecting required curriculum (30 percent)," "Time to learn/practice/plan (28 percent)," and "Access to computers (16 percent)" were more frequently chosen as a primary barrier than technical support.

Yet, as inventories and technology use increase, the delivery of high-level technology support will become more critical. While no quantitative data is available currently to confirm this assumption, school system leaders frequently express concern that the number of school system technical staff is not keeping pace with growing inventories and use.

School systems' capacity to provide high-level technical support for networks seems even more questionable. Recently, there have been security threats or breaches to the state network caused by inadequate security practices at the local school level. Such occurrences might indicate that the size and complexity of school networks are often exceeding the technical ability of local technology staff to design, implement, and manage these networks.

If so, a renewed emphasis on professional development for highly technical staff in local systems is necessary.

In any scenario, technical support in schools will continue to be a critical foundation for the actions and outcomes outlined in this plan. Therefore, continuing to support technical staff in school systems and finding more detailed ways to monitor status in this area will be a high priority in this plan.

Equity

Disaggregated data from the Statewide Study of Technology Use (2002) and the most recent Hardware survey (2002) suggest the following:

- Students have equitable access to computers across various income levels (Title I/non Title I schools); geographic regions (rural/urban); instructional programs (alternative/non-alternative schools); and grade levels (elementary/middle/high schools).

Table 8
Comparison of Access to Modern, Internet-connected Computers at School (2002 Hardware Survey)

	Income		Geography		Alternative vs. Traditional		Grade Level			
Access Levels	Title I	Non-Title I	Rural	Urban	Alternative Schools	Non-Alternative Schools	Elem.	Middle -Junior High	High School 86%	K-12
% of schools with five or fewer students per modern, Internet-connected computer	52%	53%	53%	52%	Not Available*	Not Available*	47%	53%	68%	100%
% of classrooms with at least one modern, Internet-connected computer	78%	78%	80%	77%	70%	78%	78%	80%	76%	96%
% of classrooms with at three modern, Internet-connected computers	25%	18%	22%	21%	28%	21%	22%	20%	20%	43%

*Alternate programs are often extensions of an FTE reporting school, for example, a high-school evening program. Therefore, their equipment is not reported individually on the annual hardware survey. Doing so would result in double-counting computers.

- Students have equitable access to computers across core content areas (mathematics, language arts, science, social science, special education, and ESOL).

Table 9
Comparison of Access to Computers Across Instructional Programs (2002 Statewide Study of Instructional Technology Use)

Access Levels	Math	Language Arts	Science	Social Science	Special Education	ESOL
% of classrooms with five or fewer students per instructional computer	30%	27%	27%	26%	44%	31%

- Students use instructional technology in much the same ways across income levels (Title I/non-Title I), geographic regions (rural/urban), grade levels (elementary/middle/high school), and content areas/special programs (mathematics, language arts, science, social science, special education, and ESOL).

Table 10
Comparison of LoTI levels (2002 Statewide Study of Instructional Technology Use)

	Income		Geography		Grade Level			Core Content Areas					
LoTI Level	Title I	Non-Title I	Rural	Urban	Elem.	Middle-Junior High	High School	Math	Lang. Arts	Science	Social Science	Special Education	ESOL
3 or above	25%	27%	23%	27%	25%	35%	30%	30%	27%	27%	26%	27%	25%
4A or above	15%	16%	13%	16%	14%	22%	19%	16%	16%	16%	15%	17%	17%
4B or above	4%	5%	4%	4%	11%	15%	8%	4%	4%	5%	5%	7%	8%

- Students have equitable access to educators with moderate and high comfort/skill levels related to using technology for instruction across income levels (Title I/non Title I), geographic regions (rural/urban), grade levels (elementary/middle/high school), and content areas/special programs (mathematics, language arts, science, social science, special education, and ESOL).

Table 11
Comparison of Educators' Personal Computer Use levels (2002 Statewide Study of Technology Use)

	Income		Geography		Grade Level			Content Areas					
PCU Level	Title I	Non-Title I	Rural	Urban	Elem.	Middle-Junior High	High School	Math	Lang. Arts	Science	Social Science	Special Ed.	ESOL
3-5 Moderate Comfort/Skill	45%	49%	43%	51%	44%	52%	52%	53%	50%	54%	45%	57%	42%
6-7 High Comfort/Skill	4%	5%	5%	5%	5%	6%	5%	7%	5%	6%	4%	7%	9%

- Students have equitable access to educators whose instructional practices are moderately or highly aligned to research across income levels (Title I/non Title I), geographic regions (rural/urban), grade levels (elementary/middle/high school), and content areas/special programs (mathematics, language arts, science, social science, special education, and ESOL).

Table 12
Comparison of Educators' Current Instructional Practices Levels (2002 Statewide Study of Instructional Technology Use)

	Income		Geography		Grade Level			Content Areas					
CPI Level	Title I	Non-Title I	Rural	Urban	Elem.	Middle-Junior High	High School	Math	Lang. Arts	Science	Social Science	Special Ed.	ESOL
3-5 Moderate Alignment to Research-based Practice	73%	73%	74%	73%	72%	73%	77%	73%	73%	78%	75%	65%	63%
6-7 High Alignment to Research-based Practice	12%	13%	10%	14%	12%	15%	11%	12%	17%	11%	13%	21%	25%

These strong patterns of equity are likely attributed to the strong funding support and distribution methods that have been pervasive in Georgia. State funds for buying hardware ("Computers in the Classroom") and for subsidizing local technology staff have been distributed on an FTE basis to all schools. This distribution method has complemented the federal formula and competitive funds that are usually targeted toward systems in poverty.

Section Three: Vision

Frequent uses of research-based instructional and administrative technologies will help Georgia lead the nation in improving student achievement in core academic areas; enhancing the technology literacy of students, parents, and educators; and developing a highly-qualified workforce for the 21st century.

Technology use in schools will be:

- Frequent;
- Transparent;
- Diverse, using the full range of appropriate tools that can enhance learning;
- Appropriately integrated into all grade levels and content areas to support learning;
- Focused on QCC Technology Integration and core academic standards, especially in areas which promote higher-order thinking and problem solving;
- Reflective of the way professionals and practitioners use technology in the field to pursue work in their disciplines; and
- Central to the learning process.

Students will use technology to:

- Find, synthesize, analyze, represent, apply, and share information in new ways;
- Collaborate and communicate with others for the purposes of learning; and
- Connect to learning activities that are meaningful, interesting, relevant, and challenging to them.

Educators will use technology to:

- Enable new ways of implementing instruction and assessing learning;
- Develop instructional strategies targeted toward needs; and
- Enhance their professional skills and knowledge.

Parents will use technology to:

- Conduct basic business operations, such as registration and consent transactions, with the school;
- Communicate with local educators, and
- Monitor their children's academic progress.

Other community members will use technology to:

- Bring valuable learning resources, such as mentors, content, and tools, to the learning process.

Section Four: Goals & Objectives

STATE OF GEORGIA TECHNOLOGY INTEGRATION GOAL

Technology will contribute to increased student achievement of core academic and technology integration standards in the Quality Core Curriculum (QCC).

Objectives

1. Increase effective ***instructional uses*** of technology to address QCC learning standards in elementary and secondary schools.
2. Increase effective ***administrative uses*** of technology to monitor student achievement of QCC learning standards and to manage business operations in school systems.
3. Increase ***access*** for students, educators, parents, school board representatives, and other community members to information technology resources that can enhance student learning.
4. Increase ***educators' proficiency*** to use technology effectively to enhance student learning and business operations in elementary and secondary schools.
5. Increase broad-based community support for Georgia's ***vision*** for effective technology use in schools.
6. Increase the capacity of school systems to provide the high-quality ***system support*** necessary to realize effective technology use, especially in the areas of administrative support for effective instructional technology use; professional development; technical support for hardware, software, and network infrastructure; technology planning; and program evaluation.
7. Achieve and/or maintain ***equitable access to high-quality technology programs*** for all students.

Section Five: Strategies

State of Georgia's Technology Integration Goal:

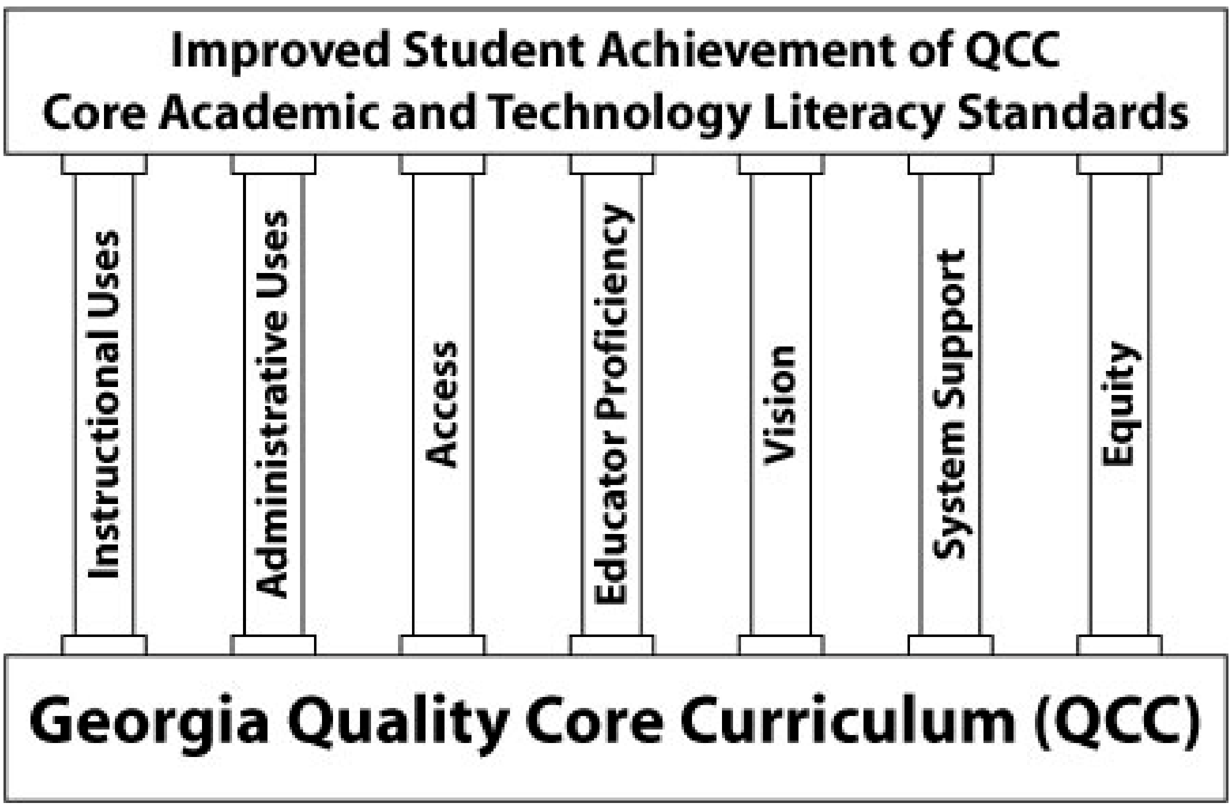
Technology will contribute to increased student achievement of core academic and technology integration standards in the Quality Core Curriculum (QCC).

Strategies:	Instructional Uses	Administrative Uses	Access	Educator Proficiency	Vision	System Support	Equity
1. Establish stable funding source for previously-funded "Computers in the Classroom" and the "Assistive Technology" programs for modern instructional technology in Georgia public schools.	X		X		X		X
2. Fund one local technology specialist in each LEA for each 1100 FTE.	X		X	X	X	X	X
3. Provide Title IID (Ed Tech) Formula Funds to LEAs for use in Title I schools.	X		X	X			X
4. Provide Title IID (Ed Tech) Competitive Funds for use in Title I needs-improvement schools in LEAs with high economic and academic needs.	X		X	X	X	X	X
5. Provide grant-writing assistance and information on available funding for technology.	X		X	X	X	X	X
6. Provide Title IVB (21st Century Community Centers) Competitive Funds for use in LEAs with high economic and academic needs.	X	X	X	X	X	X	X
7. Maintain and upgrade state network for Internet access.	X	X	X				X
8. Fund a full-time DOE position for management and development of statewide network and e-rate administration.			X			X	X
9. Fund staff and programs at 13 Educational Technology Training Centers (ETTCs).	X	X	X	X	X	X	X
10. Fund four Assistive Technology Specialist positions at VSU, AAU, CSU, and UWG ETTCs.	X		X	X	X	X	X
11. Fund, promote, and expand existing Georgia Learning Connections content (including lessons adapted for special education learners) and professional development programs.	X	X	X		X	X	X
12. Expand Georgia Learning Connections content to include a database of technology-based learning resources (i.e., online projects, software titles, etc.) aligned to the QCCs.	X		X		X	X	X
13. Promote use of statewide online resources, such as GALILEO and Georgia Public Broadcasting digital content.	X		X	X	X	X	X
14. Support and monitor Professional Standards Commission's existing technology proficiency requirements for certification and re-certification.	X			X	X		X
15. Promote technology integration criteria in teacher evaluation documents/procedures.	X	X			X	X	X
16. Integrate technology into QCC content standards.	X			X	X	X	X
17. Develop, promote, and provide technical assistance for administrative applications for technology including: interactive reports, online standardized testing, e-grants program, student information systems, online data collections, and Web-enabled consolidated application for funding.	X	X	X	X	X	X	X
18. Develop and promote online learning opportunities for school system personnel and secondary students through Georgia's e-Learning Project.	X		X	X	X	X	X
19. Provide technical support and tools to enhance system-level technology planning processes and products.	X	X	X	X	X	X	X
20. Providing technical support and tools to enhance program evaluation at the local and state levels.	X		X	X	X	X	X
21. Collect and disseminate information on emerging technologies.	X		X	X	X	X	X
22. Disseminate research-based frameworks for effective technology use, such as National Business Alliance's Level of Technology Implementation (LoTI) framework and NCREL's Engaged Learning Indicators.	X			X	X	X	X
23. Collect and disseminate scenarios of effective instructional technology use by all Georgia teachers, including special education.	X	X		X	X	X	X

Section Six: Evaluation Plan

In order to determine progress as outlined the State of Georgia Technology Integration Plan, a three-part evaluation plan is described in the following sections.

- Part One will focus on measuring progress for the seven major objectives of the plan: instructional uses, administrative uses, access, educator proficiency, vision, system support, and equity.
- Part Two will monitor equitable growth in these major seven objectives for all students in Georgia.
- Finally, Part Three will focus on measuring technology's contribution toward student achievement in settings where the seven objectives are being met.



Part One: Monitoring the essential conditions for successful technology programs

Objective One: *Increase effective* ***instructional uses*** *of technology to address QCC learning standards in elementary and secondary schools.*

2006 Success Indicators	Current Status	2004 Benchmark	2005 Benchmark	Data Sources
The instructional practices of Georgia's inservice teachers will be best characterized as follows: ♦ 80 % at **Level 3 or above on National Business Alliance's Level of Technology Implementation (LOTI) scale**. (At this level, tool-based applications such as graphing, concept mapping, etc., are used for analyzing data, making inferences, and drawing conclusions.) ♦ 40% at LOTI **Level 4A or above**. (At this level, outside resources and/or interventions aid the teacher in developing challenging learning experiences using computers.) ♦ 20% at LOTI **Level 4B or above**. (At this level, teachers are independently designing learning experiences that empower students to identify and solve authentic problems using technology.)	*The current instructional practices of Georgia inservice teachers are best characterized as follows:* ♦ 30% at Level 3 or above. ♦ 18% at Level 4A or above. ♦ 8% at Level 4B or above. *(2002 Georgia Statewide Study of Instructional Technology Use)*	*The instructional practices of Georgia's inservice teachers will be best characterized as follows:* ♦ 45% at LOTI Level 3 or above. ♦ 25% at LOTI Level 4A or above. ♦ 12% at LOTI Level 4B or above.	*The instructional practices of Georgia's inservice teachers will be best characterized as follows:* ♦ 65% at LOTI Level 3 or above. ♦ 33% at LOTI Level 4A or above. ♦ 16% at LOTI Level 4B or above.	♦ Annual LoTI survey ♦ Interviews ♦ Classroom observations ♦ Analysis of In-tech, GLC, and Ed Tech Competitive Grant lesson plans
100% of Georgia's schools will utilize a broad range of learning technology applications including, but not necessarily limited to: productivity tools e-communication/ video/Audio/Data Online environments; online research resources; simulations; real data sets; expression/visualization software.	Drill and practice software; Integrated Learning Systems and limited use of productivity tools, such as word processing, are prevalent in schools. Other applications are rare. *(2002 Georgia Statewide Study of Instructional Technology Use-Site Visits)*	Use of readily available productivity tools such as spreadsheets and databases; online resources; online data sets; simulations; and e-communication tools will increase in all Georgia schools.	Use of expression and visualization software will increase in appropriate instructional areas and use of productivity tools such as spreadsheets and databases; online resources; online data sets; simulations; and e-communication tools will continue to increase in all Georgia schools.	♦ Annual enGauge Range of Use survey ♦ Interviews ♦ Classroom observations ♦ Analysis of In-tech lesson plans
Average monthly use reports will indicate that school systems are using 80% of their available, state-provided bandwidth AND 100% of that bandwidth is most likely targeted toward educational purposes.	Not known	♦ Identify baseline data ♦ Establish 2005 benchmark ♦ Revise 2006 Success Indicator if necessary	To be determined	♦ State Network Use logs

Objective One (continued): *Increase effective **instructional uses** of technology to address QCC learning standards in elementary and secondary schools.*

2006 Success Indicators	Current Status	2004 Benchmark	2005 Benchmark	Data Sources
Searches performed in GALILEO databases will exceed one million annually and the number of full-content items viewed will exceed one million annually.	612,400 searches were performed and 489,921 full-content items viewed in GALILEO databases in 2002. *(GALILEO Vendor Database Usage Report, Jan.-Dec. 2002)*	At least 750,000 searches will be performed and at least 750,000 full-content items viewed in GALILEO databases.	At least 850,000 searches will be performed and at least 850,000 full-content items viewed in GALILEO databases.	♦ Annual GALILEO Vendor Database Usage Reports

Objective Two: *Increase effective **administrative uses** of technology to address QCC learning standards and to manage business operations in school systems.*

2006 Success Indicators	Current Status	2004 Benchmark	2005 Benchmark	Data Sources
The administrative practices of Georgia's school systems will be best characterized as follows: ♦ 80% of school systems will be best characterized as "exploration" on NCREL's enGauge "Administrative Processes and Operations" continuum. (At this level, schools have moved beyond basic demographics to include information on student performance, needs, and interventions. Access may not be pervasive throughout the system.) ♦ 20% of school systems will be best characterized as "transformation" on the enGauge "Administrative Processes and Operations" continuum. (At this level, all administrative processes that lend themselves to paperless processes have been converted and readily adopted by school personnel and board members. Appropriate information about student achievement is readily available to all system members who need this information in order to design targeted learning activities.)	Not Known	♦ Identify baseline data ♦ Establish 2005 benchmark ♦ Revise 2006 Success Indicator if necessary	To be determined	♦ Annual *Engauge* Administrative Process and Operations Survey ♦ School and district office observations ♦ Interviews ♦ Analysis of DOE usage/ reports for Consolidated Application, Interactive Reports, Student Information System, and Data Collections

Objective Three: Increase ***access*** for students, educators, parents, and other community members to information technology resources that can enhance student learning.

2006 Success Indicators	Current Status	2004 Benchmark	2005 Benchmark	Data Sources
100% of schools will have a high-speed connection to the Internet.	94% of schools have high-speed connection to the Internet. *(2002 Hardware Survey)*	96% of schools will have high-speed connection to the Internet.	98% of schools will have high-speed connection to the Internet.	♦ Annual Hardware Survey
The state network will provide each school system in Georgia with bandwidth equaling at least one T-1 (1.5Mb) line for each elementary and middle school and at least DS3 (4.5Mb) for each high school.	The state network provides bandwidth equaling 256 K – 512 K/per school to each school system. *(State Network Information)*	The state network will provide bandwidth equaling 512 K/per school to all school systems.	The state network will provide bandwidth equaling a T1 line (1.5Mb)/per school to all school systems.	♦ State Network Documents
Each school system will provide bandwidth equaling at least a T-1 (1.5 Mb) to each school in the system.	92% of schools have bandwidth equaling at least a T-1 (1.5 Mb). *(2002 Hardware Survey)*	95% of schools will have bandwidth equaling at least a T-1 (1.5 Mb).	98% of schools will have bandwidth equaling at least a T-1 (1.5 Mb).	♦ Annual Hardware Survey
100% of schools will have five or fewer students per each modern, Internet-connected computer.	72% of schools have five or fewer students per each modern, Internet-connected computer. *(2002 Hardware Survey)*	80% of schools will have five or fewer students per each modern, Internet-connected computer.	90% of schools will have five or fewer students per each modern, Internet-connected computer.	♦ Annual Hardware Survey
The GA DOE and 100 % of school systems will be connected to Internet II through the state network.	Neither the GA DOE nor any K-12 school systems are currently connected to Internet II. *(State Network Documents)*	An RFP for statewide network services will include connecting GA DOE and K-12 schools to Internet II.	The statewide e-Rate application will include a funding request to connect GA DOE and K-12 schools to Internet II.	♦ State Network Documents
100% of classrooms will have at least one modern computer connected to the Internet.	78% of classrooms have at least one modern computer connected to the Internet. *(2002 Hardware Survey)*	85% of classrooms will have at least one modern computer connected to the Internet.	92% of classrooms will have at least one modern computer connected to the Internet.	♦ Annual Hardware Survey
At least 50% of classrooms will be equipped with three or more modern computers connected to the Internet.	21.3% of classrooms are equipped with three or more modern computers connected to the Internet. *(2002 Hardware Survey)*	30% of classrooms will be equipped with three or more modern computers connected to the Internet.	40% of classrooms will be equipped with three or more modern computers connected to the Internet.	♦ Annual Hardware Survey

Objective Three (continued): Increase ***access*** for students, educators, parents, and other community members to information technology resources that can enhance student learning.

2006 Success Indicators	2003 Status	2004 Benchmark	2005 Benchmark	Data Sources
100% of schools will have at least ten modern computers in elementary media centers; 12 modern computers in middle school media centers; and 15 modern computers in high school media centers.	♦ 44% of elementary school media centers have ten or more modern computers. ♦ 47% of middle school media centers have 12 or more modern computers. ♦ 63% of high school media centers have 15 or more modern computers. *(2002 Hardware Survey)*	♦ 65% of elementary school media centers will have ten or more modern computers. ♦ 65% of middle school media centers will have 12 or more modern computers. ♦ 75% of high school media centers will have 15 or more modern computers.	♦ 85% of elementary school media centers will have ten or more modern computers. ♦ 85% of middle school media centers will have 12 or more modern computers. ♦ 85% of high school media centers will have 15 or more modern computers.	♦ Annual Hardware Survey
100% of Georgia students and their parents will have home or free, public access to the Internet and to useful learning resources and information relevant to student achievement of QCCs.	Not known	♦ Identify baseline data ♦ Establish 2005 benchmark ♦ Revise 2006 Success Indicator if necessary	To be determined	♦ Annual Hardware Survey ♦ Interviews ♦ Observations at Community Learning Centers

Objective Four: Increase ***educators' proficiency*** to use technology effectively to enhance student learning and business operations in elementary and secondary schools.

2006 Success Indicators	2003 Status	2004 Benchmark	2005 Benchmark	Data Sources
100% of certified school personnel will meet the Professional Standards Commission 2006 Technology Proficiency requirement for re-certification.	46% of certified school personnel have met 2006 Technology Proficiency requirement for re-certification. *(PSC Certification Statistics)*	65% of certified school personnel will meet 2006 Technology Proficiency requirement for re-certification.	85% of certified school personnel will meet 2006 Technology Proficiency requirement for re-certification.	♦ PSC certification statistics
Educator's Personal Computer User (PCU) ranking, which describes individuals' comfort and proficiency levels with technology will be best characterized as follows: ♦ 10% at Levels 0-2 (Low levels of comfort/proficiency). ♦ 60% at Levels 3-5 (Moderate). ♦ 30% at Levels 6-7 (High).	Educator's Personal Computer User (PCU) ranking are best characterized as follows: ♦ 44% at Levels 0-2 (Low). ♦ 48% at Levels 3-5 (Moderate). ♦ 8% at Levels 6-7 (High). *(2002 Georgia Statewide Study of Instructional Technology Use)*	Educator's Personal Computer User (PCU) ranking will be best characterized as follows: ♦ 33% at Levels 0-2 (Low). ♦ 52% at Levels 3-5 (Moderate). ♦ 16% at Levels 6-7 (High).	Educator's Personal Computer User (PCU) ranking will be best characterized as follows: ♦ 22% at Levels 0-2 (Low). ♦ 56% at Levels 3-5 (Moderate). ♦ 24% at Levels 6-7 (High).	♦ Annual LoTI survey
Educator's Current Instructional Practices (CIP), which describes the extent to which individuals adopt and implement student-centered instruction that promotes higher-order thinking and problem-solving, will be best described as: ♦ 10% at Levels 0-2 (Little or no alignment to student-centered instruction). ♦ 55% at Levels 3-5 (Moderate alignment). ♦ 35% at Levels 6-7 (High alignment).	Educator's Current Instructional Practices (CIP) are best described as: ♦ 22% at Levels 0-2 (Little or no alignment to student-centered instruction). ♦ 63% at Levels 3-5 (Moderate alignment). ♦ 15% at Levels 6-7 (High alignment). *(2002 Georgia Statewide Study of Instructional Technology Use)*	Educator's Current Instructional Practices (CIP) will be best described as: ♦ 18% at Levels 0-2 (Little or no alignment to student-centered instruction). ♦ 60% at Levels 3-5 (Moderate alignment). ♦ 22% at Levels 6-7 (High alignment).	Educator's Current Instructional Practices (CIP) will be best described as: ♦ 14% at Levels 0-2 (Little or no alignment to student-centered instruction). ♦ 57% at Levels 3-5 (Moderate alignment). ♦ 30% at Levels 6-7 (High alignment).	♦ Annual LoTI survey

Objective Five: Increase broad-based community support for Georgia's ***vision*** for effective technology use to support student learning.

2006 Success Indicators	2003 Status	2004 Benchmark	2005 Benchmark	Data Sources
100% of teachers, administrators, tech/media specialists, school board members, parents, and key community stakeholders will be able to communicate the State of Georgia's vision for instructional technology.	Not known	♦ Identify baseline data ♦ Establish 2005 benchmark ♦ Revise 2006 Success Indicator if necessary	To be determined	♦ Survey ♦ Interview ♦ Observation
100% of teachers, administrators, tech/media specialists, school board members, parents, and key community stakeholders will be able to express support for the state of Georgia's vision for instructional technology.	Not known	♦ Identify baseline data ♦ Establish 2005 benchmark ♦ Revise 2006 Success Indicator if necessary	To be determined	♦ Survey ♦ Interview ♦ Observation

Objective Six: Increase the capacity of school systems to provide the high-quality system support necessary to realize effective technology use, especially in the areas of administrative support for effective instructional technology use; professional development; technical support for hardware, software, and network infrastructure; technology planning; and program evaluation.

2006 Success Indicators	2003 Status	2004 Benchmark	2005 Benchmark	Data Sources
The leadership activities of building administrators will be best characterized as follows: ♦ 100% at LOTI **Level 3 or above**. (At this level, administrators are supporting the use tool-based applications such as graphing, concept mapping, etc., are used for analyzing data, making inferences and drawing conclusions.) ♦ 80% at LOTI **Level 4A or above**. (At this level, administrators are supporting the use of outside resources and/or interventions to aid the teacher in developing challenging learning experiences using computers.) ♦ 40% at LOTI **Level 4B or above**. (At this level, administrators are encouraging teachers to independently design learning experiences that empower students to identify and solve authentic problems using technology.)	*The leadership activities of building administrators are best characterized as follows:* ♦ 27% at LOTI **Level 3 or above**. ♦ 17% at LOTI **Level 4A or above.** ♦ 10% at LOTI **Level 4B or above.** *(2002 Georgia Statewide Study of Instructional Technology Use)*	*The leadership activities of building administrators will be best characterized as follows:* ♦ 50% at LOTI **Level 3 or above**. ♦ 40 % at LOTI **Level 4A or above**. ♦ 20% at LOTI **Level 4B or above.**	*The leadership activities of building administrators will be best characterized as follows:* ♦ 75% at LOTI **Level 3 or above**. ♦ 60% at LOTI **Level 4A or above.** ♦ 30% at LOTI **Level 4B or above**.	♦ Annual LoTI Survey
The leadership activities of media and technology specialists will be best characterized as follows: ♦ *100% at LOTI **Level 3 or above**.* ♦ *80% at LOTI **Level 4A or above**.* ♦ *40% at LOTI **Level 4B or above**.*	*The leadership activities of media and technology specialists are best characterized as follows:* ♦ 51% at LOTI **Level 3 or above**. ♦ 37% at LOTI **Level 4A or above.** ♦ 25% at LOTI **Level 4B or above.** *(2002 Georgia Statewide Study of Instructional Technology Use)*	*The leadership activities of media and technology specialists will be best characterized as follows:* ♦ *70% at LOTI **Level 3 or above**.* ♦ *55 % at LOTI **Level 4A or above**.* ♦ *30% at LOTI **Level 4B or above**.*	*The leadership activities of media and technology specialists will be best characterized as follows:* ♦ 80% at LOTI **Level 3 or above**. ♦ 65% at LOTI **Level 4A or above.** ♦ 35% at LOTI **Level 4B or above**.	♦ Annual LoTI Survey

Objective Six: Increase the capacity of school systems to provide the high-quality system support necessary to realize effective technology use, especially in the areas of administrative support for effective instructional technology use; professional development; technical support for hardware, software, and network infrastructure; technology planning; and program evaluation (continued).

2006 Success Indicators	2003 Status	2004 Benchmark	2005 Benchmark	Data Sources
All Title IID and ETTC professional development programs meet the ten criteria outlined in NCREL's enGauge framework (based on National Council of Staff Development goals) and are marked by a high-degree of client satisfaction. <u>Qualities of Successful Professional Development Programs</u> ♦ Based on theory, research, and best practice; ♦ Centered on specific goals for student learning; ♦ Focused on promoting effective student assessment; ♦ Situated in actual practice; ♦ Experiential; ♦ Collaborative; ♦ Directed by participants' interests, questions, and needs; ♦ Integrated to local, regional, and state school improvement programs and goals; ♦ Adequately supported by organizational conditions, materials, human resources, and funding; and ♦ Guided by quality evaluation.	Not known	♦ Identify baseline data ♦ Establish 2005 benchmark ♦ Revise 2006 Success Indicator if necessary	To be determined	♦ Survey ♦ Interview ♦ Observation

Objective Six (continued): Increase the capacity of school systems to provide the high-quality system support necessary to realize effective technology use, especially in the areas of administrative support for effective instructional technology use; professional development; technical support for hardware, software, and network infrastructure; technology planning; and program evaluation.

2006 Success Indicators	2003 Status	2004 Benchmark	2005 Benchmark	Data Sources
There will be no preventable state network security threats or breaches caused by inadequate school-level practices.	Security breaches to the state network have occurred. *(2002 DOE Abuse Call Log)*	Records of security threats or breaches will be maintained and classified.	The number of security threats or breaches caused by inadequate local practices will be reduced.	♦ DOE Abuse Call Log
Teachers will report that computer equipment in labs, classrooms and media centers function at appropriate levels to support frequent, effective technology use targeted toward student achievement of the QCCs.	Not known	♦ Identify baseline data ♦ Establish 2005 benchmark ♦ Revise 2006 Success Indicator if necessary	To be determined	♦ Survey ♦ Interview ♦ Observation
No teachers will report technical support as a barrier to using technology for instruction.	Only 5% of teachers reported that technical support was a primary or secondary barrier to using technology for instruction. (2002 Statewide Study of Instructional Technology Use)	Reports of technical support as a barrier to using technology for instruction will fall below 5%.	Reports of technical support as a barrier to using technology for instruction will fall below 3%.	♦ Annual LoTI survey
All school systems have a 3-5 year Technology Plan that meets State of Georgia Technology Planning guidelines. 2006 success indicators will be met for the 2003-2006 State Plan and the plan will be extended for another three years.	All school systems have a 3-5 year Technology Plan that meets State of Georgia Technology Planning guidelines. The State Technology Plan will be approved and implemented.	All school systems have a 3-5 year Technology Plan that meets State of Georgia Technology Planning guidelines. The State Technology Plan will be evaluated and updated. 2004 benchmarks will be met.	All school systems have a 3-5 year Technology Plan that meets State of Georgia Technology Planning guidelines. The State Technology Plan will be evaluated and updated. 2005 benchmarks will be met.	♦ GA DOE Technology Plan Records ♦ State Tech Plan Evaluation Reports

See Part Two of the Evaluation Plan, next page, for measurement plan connected to equity.

Part Two: Monitoring Equitable Access to High-quality Technology Programs for All Students (Objective Seven)

As established in the *National Scan* chapter of this document, national, statewide, and even system-level averages can hide many inequities. Therefore, no evaluation of technology programs can be complete without monitoring progress for subgroups—especially those who traditionally have the highest need for resources and interventions. Fortunately, as summarized in the *Current Reality* section, Georgia has managed to maintain a reasonable degree of equity for nearly all subgroups as the progress toward state national goals.

In efforts to sustain equity as schools progress toward 2006 success indicators, this evaluation plan calls for monitoring the three critical variables across five different educational settings.

Variable	Educational Setting	Data Sources
♦ Student, educator, and parent access to **technology resources,** including computing equipment, high-speed connectivity, and Internet-based resources for student learning. ♦ Student access to effective **instructional uses** of technology. ♦ Student access to **highly-qualified teachers** who are able to integrate research-supported technology uses into the learning process.	♦ Income Levels (Title I/Non-Title I schools) ♦ Geographic Regions (Rural/Urban) ♦ Grade Levels (Elementary/Middle/High School) ♦ Alternative /Non-alternative Education Programs ♦ Content Areas (Mathematics, Language Arts, Science, Social Science, Special Education, ESOL)	♦ Annual Hardware Survey ♦ Annual LoTI Survey

Data will be analyzed on an annual basis and should provide Georgia educators with the information they need to monitor equity and, if necessary, to modify programs in a timely manner when and if inequities begin to emerge.

Modifications may include:

- Setting new benchmarks for schools or school systems who are falling below ten percentage points of their counterparts in other income levels, geographic locations, instructional programs, grade levels, or content areas.
- Designing support programs for groups who need assistance.

Part Three: Determining Technology's Contribution to Increased Student Achievement of Core Academic and Technology Literacy Standards in the QCCs

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Evaluating the impact of any innovation in an overall educational system is difficult at best. This has been especially true in attempting to assess the impact of technology in education. We are only now beginning to move beyond measuring merely *access* to technology, to measuring *literacy* in technology. We still have some distance to go before we are prepared to assess technology fluency, and then finally effective use of technology.

It stands to reason that if we are unable to determine whether technology is being used effectively, it is impossible to judge in any practical sense what kind of impact technology has on learning. We know from small-scale, controlled studies that technology can be very effective in education. Fortunately, we are making good progress. Our efforts moving forward will help insure that all Georgia teachers will be prepared to use technology for instruction. We will then be in a position to make real strides in assessing the impact of technology on learning.

In the meantime, we can begin to evaluate the impact of technology in broad strokes, with targeted pilot studies such as the Enhancing Education Through Technology Grant Program (Ed Tech). At its most basic level the purpose of technology in education is to improve student learning. Therefore as a part of the technology integration plan pilot evaluation, we will monitor overall changes in student learning as assessed by the Iowa Test of Basic Skills (ITBS), and valid Criterion Referenced Competency Test (CRCT) data. While we realize that many extraneous factors influence test scores, and that there still much debate about the extent to which test performance actually measures learning, we will attempt to correlate score changes (or lack thereof) with use of technology across the state. We will closely monitor districts implementing Ed Tech grants, and other districts in which exemplary use of technology for education is occurring, for changes in performance on these tests.

To assess technology literacy, we will develop an instrument, the Technology Literacy Assessment Tool (TLAT) based on the State of Georgia Technology standards for students as found in the QCCs. We will initially pilot this instrument with the school districts participating in the Ed Tech program. After we have revised the instrument to acceptable standards of reliability and validity we will begin employing it statewide.

Purposes:

As discussed above, the major purposes of this evaluation are to provide accurate and reliable information to be used broadly as a tool for making decisions about the role of technology in the classroom, and for determining specifically:

- the comprehensive impact of the Ed Tech program on student learning and achievement in Georgia
- the impact of specific program activities, to include recommendations for "best-practice" activities
- the efficiency of program implementations by individual grantee schools and school systems.

Implicit in the evaluation purposes is that the results and recommendations developed will be widely available to all stakeholders and interested parties via electronic distribution.

Stakeholders:
The stakeholders in the evaluation process are the school systems, both administrators and teachers, to assist in decision-making, as well as students and parents.

Additional stakeholders are the US and Georgia Departments of Education, who must assess critically the relative merits of the technology integration efforts, and develop national and statewide strategies moving forward, community educational groups and agencies, community leaders, state and local business and law enforcement, and other groups and individuals who have vested interests in improving student education in the Information Age, and the ramifications of that improvement.

Questions:
The specific questions developed to guide the evaluation are a reflection of the pilot program goals as defined by the US Department of Education in section A-1 of the document "Guidance on the Enhancing Education Through Technology (Ed Tech) Program," and reiterated by the Georgia Department of Education in the document "Program Guidance: Title IID, Enhancing Education Through Technology (Ed Tech) Competitive Grant."

Goal 1: *To improve student academic achievement through the use of technology in elementary and secondary schools.*

- What variation in student academic achievement occurred during the course of the program?
- How and to what extent did the Ed Tech program impact this variance?
- Which activities in the Ed Tech program had the greatest impact on student academic achievement?

Goal 2: *To assist every student in crossing the digital divide by ensuring that every student is technology literate by the time the student finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location, or disability.*

- What variation in student technology literacy occurred during the course of the Ed Tech program?
- How and to what extent did the Ed Tech program impact this variance?
- Which activities in the Ed Tech program had the greatest impact on student technology literacy?
- To what extent did any variation in student technology literacy impact the digital divide I Georgia?

Goal 3: *To encourage the effective integration of technology resources and systems with teacher training and curriculum development to establish research-based instructional methods that can be widely implemented as best practices by other local school systems.*

- What variation in integration of technology resources occurred during the course of the Ed Tech program?
- How and to what extent did the Ed Tech program impact this variance?

- Which activities in the Ed Tech program had the greatest impact on technology integration and can be implemented as best practices?

Decisions:
The information collected during the evaluation process will be used to assist stakeholders in the decision-making process. The following are basic decisions that must be made, armed with the evaluation data:

- What levels of improvement, and over what period of time can validate program strategies and objectives?
- What changes, if any, should be made in the focus, administration, or execution of the technology initiative?
- What activities should be promoted or discouraged throughout the state both inside and outside the scope of the technology initiative?

Samples:
The samples encompass the entire affected populations of schools receiving the Ed Tech Competitive grant, with data gathering targeting three distinct groups: school instructional technology and/or technical coordinators, teachers, and students, defined in the grades and subjects of the individual proposal responses. We will define a control group based upon the guidelines set forth by the US DOE regarding evaluation to allow for more effective correlation analysis.

Methods:
One of the primary activities of the evaluation will be to examine disparate approaches to employing technology in the classroom. With such a wide variety of individual programs, the major efforts of the evaluation will be threefold:

1. Collect and categorize baseline data of the participating schools
2. Observe and track attitudes, skill levels, and performance of teachers and students
3. Compare teacher and student progress with non-eligible/non-participating populations

The specific methods for evaluation include baseline data collection, observation, surveys, interviews, and questionnaires where interviews are impractical or inconvenient. The baseline data will be generated from individual school technology hardware inventories, LoTI surveys and standardized test scores, and will provide a basis for comparison with data collected throughout the grant period. A matrix of school system proposal response information will also assist in determining additional data collection opportunities, based on activities, policies, and evaluation tools of the individual schools.

Primary observational data will be the responsibility of the local school's grant project technical coordinator. An online portal will be available to all schools to record periodic observation of teachers and students, as well as record significant implementation phases and details. Secondary observation, surveys and interviews will be administered by the evaluation plan development team. Teachers will also track students' progress with the TLAT developed by the evaluation team, based on state Quality Core Curriculum benchmarks. This will be available as a web-based tool, and will encourage collaboration among teachers and departments.

For comparison purposes, a control group analysis will be undertaken which will involve evaluation of the Ed Tech program using a method that allows for comparison of groups such as the needs-based grant recipients and equivalent non-eligible/non-participating populations. The comparison will employ pre-implementation and post-implementation test scores; because a major goal/assumption of the Ed Tech program is that effective use of technology in the classroom will have a positive effect on learning and technology literacy, we have a strong basis to use improved test scores as a measure of observed success.

Instruments:
The instruments for data gathering and analysis include:

Hardware and Technology Inventories
Implementation/Observation Logs
Interview Protocols
Iowa Test of Basic Skills (ITBS) test data
Criterion Referenced Competency Test (CRCT) data
Levels of Technology Integration (LOTI) and enGauge Surveys
Georgia QCC Technology Literacy Assessment Tool (TLAT)
Instruments developed by the school (i.e. grades, portfolios, etc.)

Limitations:
While the evaluation plan is intended to represent a comprehensive approach, and the samples and instruments chosen for their variety and to increase result reliability and validity, unexpected and unforeseen issues may arise.

The diversity of school systems and demographics may complicate an attempt to impose uniform analysis. A related issue is that, in an attempt to disaggregate samples into closely related populations, the samples may prove too small to be reliable. To mediate this possibility, we have chosen statewide standardized tools as our primary instruments, as well as the entire affected population as the data source, rather than a sample.

Each school may have policies and procedures that interfere with data collection, or introduce non-uniformity of participation. Individuals may be more or less willing to cooperate in some activities, and responses can vary in reliability. The size of the data source however should provide some confidence in determining trends and averages.

It also may prove difficult to reliably correlate any improvement in student achievement with the specific introduction of technology in the classroom, as opposed to other factors such as student enthusiasm, maturity of student population, or increased attendance. The attempt to follow students over an extended period of time should lessen this possibility.

There is also an opportunity to improve data collections and analysis during the course of the evaluation. When coupled with the variety and sources of data types, and length of study, ongoing enhancement to the evaluation process should promote increased confidence in the reliability and validity of the collected data and resulting conclusions.

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Appendix B: Acknowledgements

Thank you to the following who participated in the State of Georgia K-12 Technology Planning process between November 2001 and June 2003.

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