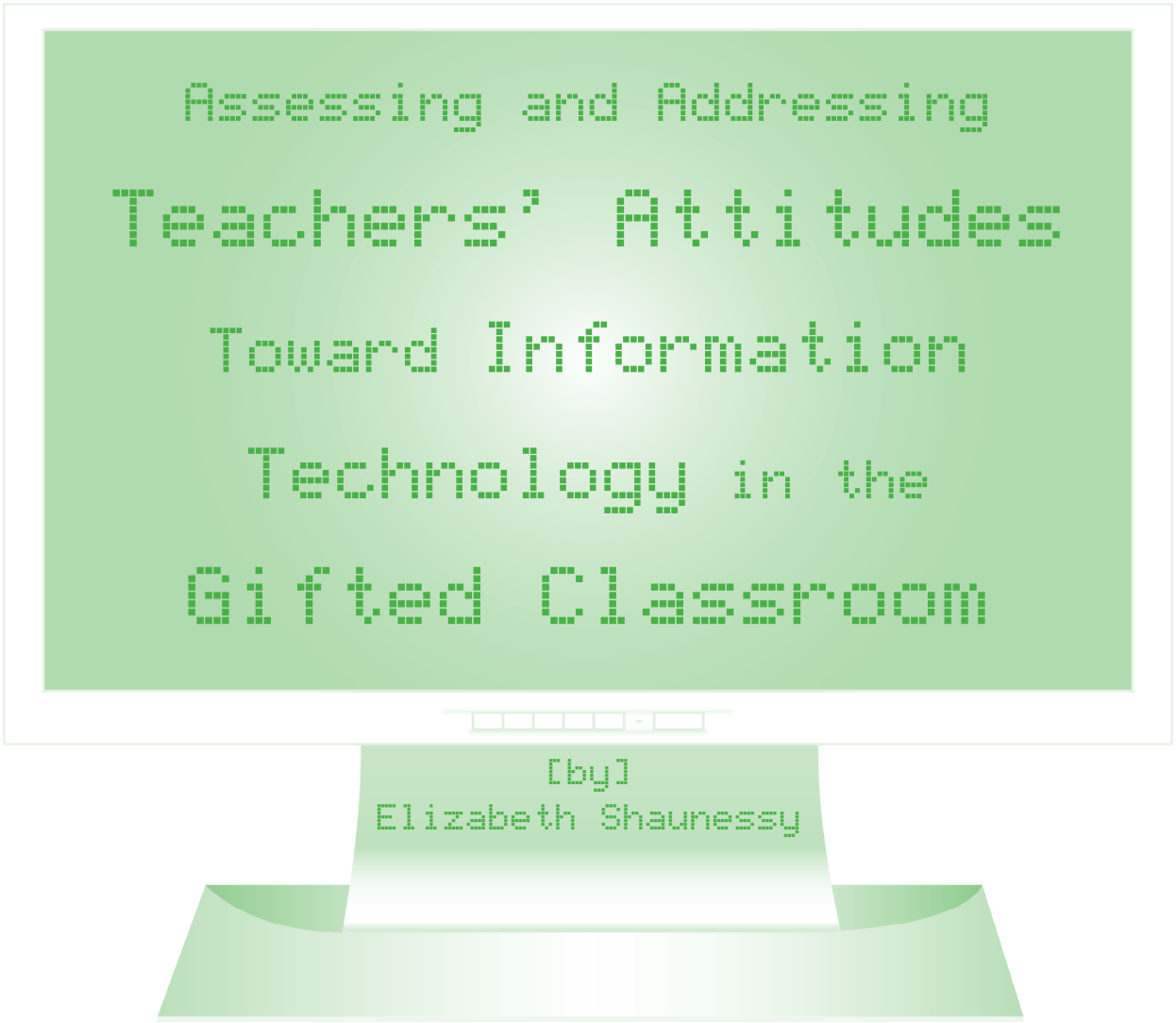

With the increasing complexity and rate of change, self-directed learning and problem-solving become vital, along with interpersonal and team skills. It is evident that new ways of teaching and learning must be devised if our children are to be prepared for the 21st century.

—Hirumi, 2002, p. 500

For the last two decades, policymakers, administrators, and the public have been encouraging the use of information technology in the K–12 classroom. Additionally, standards in technology performance for both teachers and students have echoed the public's interest in seeing technology adopted and utilized in America's classrooms (International Society for Technology in Education, 1998a, 1998b). Furthermore, the No Child Left Behind Act of 2001 has provided funding for efforts to integrate technology into the curriculum by 2006. The National Association for Gifted Children (NAGC) has also addressed the role of technology in gifted programs, as technology standards in programs for gifted students in pre-K through grade 12 have been developed (Landrum, Callahan, & Shaklee, 2001). While the new standards recommend that technology should be available to gifted learners as a tool for learning, no research has been published related to teachers' attitudes toward information technology and the gifted or how programming for these learners has been altered to meet this charge.

During the past decade, U.S. schools have allocated large sums of money for technology acquisitions for classrooms. The overriding belief among those supplying these technologies was that technology would be needed in this ever-evolving, technology-rich society and that students must learn to manage these tools and use them for complex purposes in tomorrow's jobs. Other edu-

cational supporters have touted the computer as a necessary step in increasing student achievement and motivation.

The educational landscape has now evolved to include computers in most U.S. classrooms. Although this rapid purchasing of computers and related equipment has altered the look of schools, the move toward adopting these technologies appears to be moving at a much slower pace (Albion & Ertmer, 2002; Becker, 1999; Smerdon et al., 2000). National studies of K–12 educators indicate that most of them are not adopting technology for meaningful learning purposes, nor do they feel adequately prepared to design experiences that engage students in purposeful learning with technology (Becker; U.S. Department of Education).

Other reports indicate that teachers' attitudes toward and uses of technology vary greatly, as was noted in a study of the district directors of technology in 27 states (Solmon & Wiederhorn, 2000). When asked to rate their views toward technology, 61.7% indicated that teachers considered technology a "powerful tool for helping them improve student learning," as opposed to perceiving technology as a fad (p. 14). Sixty-three percent of respondents in this same study indicated that the most frequently used technology items were software applications, followed by cooperative group learning processes (43.7%), project-based learning (42.1%), student products created using technology (37.9%), inquiry-based learning projects (34.4%), and adjusting teaching practices using technology to meet the individual needs of students (25.3%).

These figures, while not specific to gifted education, provide some indication of how gifted students served in regular classrooms may be utilizing technology. While all facets of technology use listed in the survey are of potential value to gifted learners, the field of gifted education would likely prioritize the uses of technology so that inquiry-based learning processes, student products, and project-based learning would receive greater emphasis. The item with the lowest percentage of use overall, individualization of teaching using technology, may not be a surprise to teachers and leaders in gifted education, as these results bear a striking resemblance to the findings from a national study of third- and fourth-grade classroom practices (Archambault et al., 1993) showing that little attention is given to modifications based on individual student needs. This may also indicate to advocates of the gifted that the individual needs of gifted learners in regular classrooms are not being addressed through technology.

While policymakers have readily adopted the calls from technology groups and educational decision makers to move toward a more well-connected, technology-friendly classroom, a similar effort to consider the beliefs and attitudes of teachers toward these emerging technologies has not been undertaken. The role of teachers' attitudes is central to understanding their integration of technology (Albion & Ertmer, 2002), yet consideration of how teachers perceive instructional technology has largely been omitted from the attention given to encouraging teachers to integrate technology into their teaching. Before acquiring additional hardware and software expenditures, the human element must be evaluated to determine how to move forward in the quest to assist teachers in effectively integrating technology into their classrooms.

How Attitudes Shape Teaching Practice

Attitudes play a prominent role in the daily instructional decisions of educators. Teachers' beliefs shape the content selection, delivery methods, interaction styles, and evaluation techniques that drive curricula and instruction on a daily basis (Albion & Ertmer, 2002; Pajares, 1992).

Attitudes are complex beliefs that individuals construct based upon a myriad of personal, educational, and social experiences (Rokeach, 1972). These beliefs may become firmly embedded in individuals and, thus, may be difficult to alter. Attitudes and beliefs have also been found to be stronger predictors of behavior than knowledge in planning and executing tasks and decisions (Pajares, 1992). Thus, long-standing, deeply entrenched pedagogical beliefs likely influence educators' attitudes and decisions regarding instructional technology. These attitudes and beliefs about pedagogy, including technology integration, are less easily altered than are districtwide decisions about spending, access, and training. Teachers' attitudes toward technology are the most critical variables in predicting technology use (Ravitz, Wong, & Becker, 1999). Recognition of the strength of these beliefs can assist educational leaders in understanding how to approach the transformational process if change is to occur (Albion & Ertmer, 2002).

Most classroom teachers practicing today were not educated in classrooms with technology, and those who were probably did not see technology used in meaningful ways to engage learners. Thus, younger educators, while often indicating a higher comfort level with technology and use of technology for professional

preparation (Becker, 1999; Chu, 2000), are not as advanced in their infusion of technology into the curriculum in purposeful ways as their peers with 6 or more years experience teaching (Russel, Bebell, O'Dwyer, & O'Connor, 2003). These younger educators have also been found to believe that technology use is detrimental to students even though surveys of elementary, middle, and high school students have more positive beliefs about technology in school (Russel et al.). The challenge continues for teacher educators and schools to address the views and beliefs of teachers in their consideration of constructivist practices and connect these with rich learning experiences that involve students in engaging with technology appropriately.

What Affects Teachers' Attitudes Toward Technology?

Teachers' beliefs and attitudes have been strongly linked to instructional uses of technology (Ravitz, Wong, & Becker, 1999; Russel et al., 2003). Many teachers, however, do not have positive attitudes toward technology, "even when it is viewed as an effective instructional strategy" (Clark, 2000, p. 4). Several variables have been correlated to teachers' attitudes toward information technology among general education teachers, including teaching models within their school building, authority figures' level of support for using technology, undergraduate teaching preparation (Becker, 1999), access to technology, grade level, teaching experience, the district's allocation of funds toward technology acquisitions, and access to technology training (Russel et al.; Saye, 1998). Other research indicates that other prerequisites must be met before a teacher accepts and uses technology: resources (leadership, information, materials) and a sense of obligation to prepare his or her students for the demanding challenges of a workplace rich with technology (Saye).

Training can significantly impact how a teacher views technology. Several studies have documented the positive relationship between technology training and teachers' attitudes (Becker, 1999; Chu, 2000; Dirksen & Tharp, 2000; Shaunessy, 2003; Smerdon et al., 2000). Professional development efforts in instructional technology have also been linked to student achievement. Wenglinsky's (1998) national study of more than 6,000 fourth-grade students and more than 7,000 eighth-grade students indicated that students who used computerized simulations and higher order thinking software gained up to 15 weeks above grade level on a math assessment and that students whose teachers received professional development in using higher order thinking software achieved similar gains. Investigations of the impact of such training on teachers of the gifted would assist educators, researchers, and teacher educators in future professional development efforts.

While training for teachers in using technology has increased with district spending on hardware, the funding for these efforts has been minimal, thus it has not fully addressed the needs of educators in learning how to adapt these resources to their teaching. When training does take place, a one-size-fits-all approach is usually employed to prepare trainees, with little or no consideration given to the age or ability level of the teachers' students.

To address the attitudes of teachers of the gifted more appropriately, specialized training must be developed that is based upon teachers' individual learning needs; the content area(s) affected; and the age level(s), cognitive needs, and individual characteristics of the students they teach. Without these considerations, technology training for teachers of the gifted becomes an isolated, add-on activity that has little relevance to the intellectual or socioemotional needs of gifted learners. Additionally, exposure to models, strategies, and research about gifted learners engaged in meaningful educational pursuits would greatly enhance the knowledge and vision of what a technology-infused classroom looks like and how it operates. Currently, literature about using technology with the gifted is emerging (Belcastro, 2002; Dove & Zitkovich, 2003; Siegle, 2005), but few empirically based publications address this need.

The design of the staff development in technology for teachers of the gifted must also be given great consideration if the learning is to be meaningful and if true changes in attitudes and technology use are to be attained. Long-term, ongoing professional development is highly recommended (Ball & Cohen, 1999). Teachers should also be afforded the opportunity to discuss their thinking as they develop their understanding of how to integrate technology into the curriculum. Opportunities for journaling, discussing, reflecting, and planning should be built into these professional development sessions. Thus, follow-up meetings where educators share their attempts, findings, student reactions, challenges, and successes should be provided, with opportunities for teachers to receive individual guidance in their growth as technology users.

A supportive, encouraging network of teachers of the gifted experi-

encing similar technological challenges, successes, and models may significantly impact the attitude of the emerging technology users and sustain their long-term growth. One-day, one-shot workshop approaches are quick-fix strategies that undermine serious attempts to assist educators in making significant changes in their attitudes toward technology (Russel et al., 2003); thus, such short-term, low-budget efforts should be avoided if the goal of staff development is to provide educators the opportunity to become more familiar, comfortable, knowledgeable, and purposeful users of technology (Ball & Cohen, 1999).

Teachers may have more positive attitudes toward using computers for professional purposes than for engaging students in meaningful learning with technology, particularly those new to the teaching profession (Russel et al., 2003). Teachers of the gifted in a statewide study in Mississippi (Shaunessy, 2003) had positive attitudes toward using computers for professional purposes, such as word processing, researching lesson plans, and communicating with parents, but less positive attitudes toward using other applications, such as e-mail, with students. Similarly, Zhao and Frank (2003) found that teachers reported using technology for these same instructional preparation purposes, but also found that computers were much less frequently used for active learning by students in the classroom, which confirmed their hypothesis that educators are more likely to use technology for simple tasks that require little change in behavior or expense of time and energy. Prior to technology's emergence in the educational landscape, teachers were planning instruction, communicating with parents, and researching lesson ideas. Now computers can assist with these instructional tasks, but they have not, for the most part, been utilized meaningfully in instructional settings by students (Zhao & Frank).

The Role of Constructivism

The continuum of teaching practices ranges from instructive practices, or those that value teacher-centered classrooms, to constructivist practices, which foster student-centered learning and decision making (Grabe & Grabe, 1996). The importance of constructivist, student-centered classrooms is relevant to the practice of teachers of the gifted; prior research has demonstrated that exemplary teachers of the gifted establish more learner-centered classrooms (Bishop, 1968). A student-centered approach centers around "(a) enhanc[ing] a learner's ability to search for, access, retrieve, interpret, synthesize, organize, transfer, and communicate information; and (b) promot[ing] the development of metacognitive strategies and self-regulatory skills associated with life-long learning" (Hirumi, 2002, p. 500). Current literature suggests that "exemplary technology-using teachers (do or should) reside on the constructivist side of the continuum" (Ertmer, Gopalakrishnan, & Ross, 2001, p. 2; see also Becker, 1994; Dede, 1998; Dexter, Anderson, & Becker, 1999; The President's Panel on Educational Technology, 1997).

Pedagogical beliefs supportive of constructivist philosophies have been correlated with technology adoption (Albion & Ertmer, 2002; Becker, 2001). Furthermore, Russel et al. (2003) found that teachers who have been teaching for 6 to 15 years agreed more strongly with statements supporting such constructivist practices than did their peers who were newer to the profession or those who had taught more than 15 years. Educators with constructivist attitudes toward education have been found to view technology as a valuable component of instruction and to use information technology more frequently, in sophisticated ways, and with greater technical proficiency than their peers with more teacher-centered approaches to instruction (Becker).

Assisting teachers in developing more student-centered attitudes and practices is certainly a worthy charge for district leaders and teacher educators, but this, like the process of adopting more positive attitudes toward information technology, is not a task that is easily accomplished, as many deeply rooted beliefs about the teaching profession likely contribute to an educator's practices. These teacher beliefs are often shaped by individual educational experiences, which, for the most part, were likely grounded in the more traditional, teacher-centered classrooms today's teachers experienced when they were students. However, recent research has found that, even among educators who highly value technology integration within a student-centered, constructivist classroom, actual technology integration may not be achieved if the instructor does not view him- or herself as capable of effecting such change in pedagogical practice (Bandura, 1997).

Content Areas, Grade Levels, and Teachers' Attitudes Toward Technology

Just as educators may view technology positively for instructional

preparation purposes, so too may an educator's attitude toward technology, as well as his or her use, be influenced by grade-level assignment or content area.

Grade-level differences in teachers' attitudes have been reported in the literature. Barron, Kemkar, Harmes, and Kalaydjian (2003) found elementary teachers to be twice as likely as high school teachers to utilize instructional technology for the purposes of problem solving or communication. This finding is consistent with previous findings by Becker, Ravitz, and Wong (1999) that showed elementary teachers to be more likely to use computers regularly with their students.

In terms of content area, several studies have reported upon the use of technology in English classes. In an investigation of the use of technology in Chicago's public schools, Hart, Allensworth, Lauen, and Gladden (2002) reported that English teachers assigned technology less frequently than their peers who taught math. Furthermore, this same study reported that science teachers were much more likely than English teachers to utilize technology as a tool for research or to use a computer as a problem-solving tool. However, another study of a large urban school district (Barron et al., 2003) indicated that 24% of English teachers frequently incorporated computers into their coursework, while only 11–17% of math, social studies, and science teachers frequently assigned computers for student work.

Technology is a natural fit in content areas such as mathematics and science. New and exciting uses of handheld devices present teachers and students the opportunity to engage individually with technology to introduce graphics, connect to the Internet, and think in new ways about mathematics concepts:

> School mathematics in the future will be far more technologically enhanced, richer, more interesting, and more applicable than in the past. Business and industry want employees who can think, read, and understand problem situations; work cooperatively in groups; understand and use technology; and communicate effectively with others. The appropriate use of technology in mathematics teaching and learning helps build these important skills in students. (Waits & Demana, 1996)

Teachers may have more positive attitudes toward using computers for professional purposes than for engaging students in meaningful learning with technology, particularly those new to the teaching profession.

Beyond the Assessment of Attitudes

While the assessment of teachers' attitudes toward information technology can offer great insight into how they feel about the use of computers either personally or in teaching, further investigation of pedagogical practice is needed to understand fully how teachers of the gifted integrate technology into their students' learning process. A single self-assessment of technology integration may give some indication of how teachers of the gifted infuse technology into the curriculum, but

data from multiple sources will give a more accurate picture. These data might include student products, student interviews, teacher interviews, and observations of teachers and students engaging with technology in the classroom. Such an undertaking would no doubt be time-consuming, but well worth the effort because it would provide a greater understanding of the practices of teachers of the gifted and provide a starting point for addressing the staff-development needs and appropriate follow-up opportunities for these training sessions.

Many leaders in technology have emerged over the last several years, particularly organizations that have created technology standards and publications for teachers and students (International Society for Technology in Education [ISTE], 1998a, 1998b), conducted research related to technology and learning (North Central Regional Education Laboratory [NCREL], 1997; Texas Center for Educational Technology [TECT], 2003), considered technology infusion issues (State Educational Technology Directors Association [SETDA], 2003), and provided access to instruments for evaluating technology use and attitudes (ISTE; NCREL; SETDA; South Central Regional Technology in Education Consortium [SCRTEC], 2004). The products, instruments, and research produced by these organizations offer useful ideas and resources that may offer guidance to the field of gifted education in addressing technology integration among teachers of the gifted.

Addressing Attitudes Toward Technology in Schools

Coordinators of gifted programs, administrators, and other lead personnel are charged with addressing the attitudes and practices of teachers, many of whom are struggling with the effective, purposeful integration of technology into the curriculum. Facilitating a change in attitude is an ambitious goal, as many of the attitudes held by practitioners have been developed over many years, perhaps even lifetimes. However, it is evident from the research that staff-development workshops that are brief, lacking in follow-up or coaching, and "intellectually superficial, disconnected from deep issues of curriculum and learning, fragmented, and noncumulative" (Ball & Cohen, 1999, cited in Phillips, 2003, p. 241) do not result in significant changes in teacher attitude or practice (Hord, 1997; Joyce & Showers, 1982; Spillane, 2000).

To facilitate change in attitudes effectively, professional development for teachers must be transformed to provide long-term, teacher-driven investigations that are framed within the school culture, supported by district leaders (Louis & Kruse, 1995), and rich in resources (McLaughlin & Talbert, 1993). A new paradigm of professional development, especially for technology, must be embraced. The action research model of individual professional development may be helpful in assisting educators in their attitudinal growth and understanding of how to incorporate new technologies into the curriculum (Calhoun, 1994; Palombo, 2003; Phillips, 2003). This professional development model encourages the formation of learning communities within schools. The learning communities, or teams, determine areas on which to focus (Darling-Hammond, 1996), perhaps inviting consultants to share expertise in the area of targeted growth. Teams design collaborative investigations of selected areas to include regular meetings of participants, discussion of ideas, reactions, findings, reflections, relationship to student performance, and issues of transferring theories to everyday practice. Ultimately, "to create inquiry-

Readings in Action Research in Schools

Burbank, M. D., & Kauchak, D. (2003). An alternative model for professional development: Investigations into effective collaboration. *Teaching and Teacher Education, 19*, 499–514.

Calhoun, E. (2002). Action research for school improvement. *Educational Leadership, 59*(6), 18–24.

Keith, A. (2001). Action research brings results. *Science and Children, 39*(3), 32–35.

Phillips, J. (2003). Powerful learning: Creating learning communities in urban school reform. *Journal of Curriculum and Supervision, 18*, 240–258.

Palombo, M. (2003). A network that puts the net to work. *Journal of Staff Development, 24*, 24–28.

Pedretti, E. (1996). Learning about science, technology, and society (STS) through an action research project: Co-constructing an issues-based model for STS education. *School Science and Mathematics, 96,* 432–440.

Senese, J. (2002). Energize with action research. *Journal of Staff Development, 23*, 39–41.

based environments for their students, teachers themselves need experience with learning in inquiry-based environments. Only then can they internalize its aims and transform the ways in which they teach their students" (Grant, 1996, Beyond the Prevalent Training Paradigm section, para. 7).

An example of a learning community focused on infusing information technology into the curriculum may be composed of a small study group of four to six teachers within a school or school district. The teachers would identify regular meeting times, preferably once or twice per week, to convene; identify a plan of action for self/group study; discuss self-selected readings, reflections, and implementation of ideas; and identify other means of professional growth for the purposes of the study group, such as bringing in consultants or workshops at local colleges and universities. This group would meet regularly for a minimum of one school year, reviewing their initial goals and redirecting efforts as needed based upon individual needs and student performance.

The learning community established to investigate K–12 applications of technology may select from many avenues of self-study, including teachers' understandings of how technology fits within their understanding of active learning; how it may impact motivation, retention, and achievement; how the field of gifted education conceptualizes technology as a tool for learning; appropriate applications of technology for gifted education; how specific technological applications can be aligned with the strategies for achieving learning objectives for content areas; how to extend the current knowledge base of technologically proficient gifted learners; and a host of other literature-based investigations to inform the educators.

Following the identification of the targeted area of study, the group may conduct reviews of appropriate literature, which can serve as the focal point for subsequent readings and discussions. Educators should approach this study from a critical analysis perspective, noting similarities, differences, and gaps in the recent publications (last 5–7 years), as well as deducing the implications for practice from the literature. Following this information and discussion step, educators may then seek support from the district's technology team for guidance in acquiring specific technology skills, use of various tools in the classroom, and organizing investigations or action research, either as individuals or as small groups according to grade level, content area, or shared interest. During and following the action research step, educators are encouraged to continue to meet regularly to reflect upon the process together, bouncing ideas off each other and providing support, feedback, questions, and encouragement to each other as they consider the implications of their findings and how the process has impacted their understanding of teaching and learning.

Taking Action

Russel et al. (2003) recommend that teachers receive opportunities "to see and experience the positive effects of technology on teaching and learning . . . [by] exposing teachers to examples of technology integrated into the curriculum and classroom" (p. 308). Training is needed on how to use specific technology, such as Webquests, PowerPoint presentations, scanners, digital cameras, and handheld devices, but as important in the training of how to use the specific technologies is professional development that models "how these products can be used to support instructional objectives," (Russel et al., p. 308). Specific to teachers of the gifted, consideration of the unique curricular needs of gifted students and how technology can be utilized to meet these needs is warranted. Furthermore, an action plan for how teachers may begin to consider the multiple content-area standards, precepts of gifted education, and how to infuse technology into teaching and learning is needed.

Data-collection efforts focused upon the effectiveness of these steps and the impact on the learning, achievement, and motivation of gifted students should be undertaken, and the results should be used to reshape the initial action plan and design appropriate professional development for teachers of the gifted. Through these efforts to gain a better understanding of the attitudes and practices of teachers of the gifted and the effects of using information technology in the teaching/learning process, gifted students are one step closer to realizing the educational goal of being well prepared for the demands of the 21st century. GCT

References

Albion, P. R., & Ertmer, P.A. (2002). Beyond the foundations: The role of vision and belief in teachers' preparation for integration of technology. *TechTrends, 46*(5), 34–38.

Archambault, F. A., Jr., Westberg, K. L., Brown, S. W., Hallmark, B. W., Emmons, C. L., & Zhang, W. (1993). *Regular classroom practices*

with gifted students: Results of a national survey of classroom teachers (Research Monograph 93102). Storrs: National Research Center on the Gifted and Talented, University of Connecticut.

Ball, D. L., & Cohen, D. K. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional development. In L. Darling-Hammond & G. Sikes (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 3–32). San Francisco: Jossey-Bass.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Barron, A., Kemker, K., Harmes, C., & Kalaydjian, K. (2003). Large-scale research study on technology in K–12 schools: Technology integration as it relates to the National Technology Standards. *Journal of Research on Technology in Education, 35*, 489–507.

Becker, H. J. (1994). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. *Journal of Research on Computing in Education, 26*, 291–321.

Becker, H. J. (1999*). Internet use by teachers: Conditions of professional use and teacher-directed student use*. (Teaching, Learning, and Computing: 1998 National Survey. Report #1). (ERIC Document Reproduction Service No. 429564)

Becker, H. J. (2001, April). *How are teachers using computers in instruction?* Paper presented at the annual meeting of the American Educational Research Association, Seattle, WA.

Becker, H. J., Ravitz, J. L., & Wong, Y. T. (1999). *Teacher and teacher-directed student use of computers and software.* Irvine, CA: Center for Research and Information Technology and Organizations, University of California, Irvine & University of Minnesota.

Belcastro, F. (2002). Electronic technology and its use with rural gifted students. *Roeper Review, 25*, 14–16.

Bishop, W. E. (1968, January). Successful teachers of the gifted. *Exceptional Children,* 317–325.

Calhoun, E. (1994). *How to use action research in the self-renewing school*. Alexandria, VA: Association for Supervision and Curriculum Development.

Chu, J. L. (2000). Assessment of the integration of technology into the curriculum by middle and high school teachers. *Dissertation Abstracts International, 61*(08), 3130A. (UMI No. 9963692)

Clark, K. D. (2000). Urban middle school teachers' use of instructional technology. *Journal of Research on Computing in Education, 33*, 178–193.

Darling-Hammond, L. (1996). The quiet revolution: Rethinking teacher development. *Educational Leadership, 53*(6), 4–10.

Dede, C. (Ed.). (1998). *Learning with technology: The 1998 ASCD Yearbook.* Alexandria, VA: ASCD.

Dexter, S. L., Anderson, R. E., & Becker, H. J. (1999). Teachers' views of computers as catalysts for changes in their teaching practice. *Journal of Research on Computing in Education, 31*, 221–238.

Dirksen, D., & Tharp, D. (2000). *Goals 2000: Initial evaluation. Moving beyond the crossroads: Teachers as agents for change*. (ERIC Document Reproduction Service No. 444453)

Dove, M., & Zitkovitch, M. (2003). Technology driven group investigations for gifted elementary students. *Information Technology in Childhood Education Annual,* 223–41.

Ertmer, P. A., Gopalakrishnan, S., & Ross, E. M. (2001). Technology-using teachers: Comparing perceptions of exemplary technology use to best practice [Electronic version]. *Journal of Research on Technology Education, 33*(5).

Grabe, M., & Grabe, C. (1996). *Integrating technology for meaningful learning.* Boston: Houghton Mifflin.

Grant, C. M. (1996). *Professional development in a technological age: New definitions, old challenges, new resources*. Retrieved May 11, 2005, from http://ra.terc.edu/publications/TERC_pubs/tech-infusion/prof_dev/prof_dev_frame.html

Hart, H. M., Allensworth, E., Lauen, D. L., & Gladden, R. M. (2002). *Educational technology: Availability and use in Chicago's public schools.* Chicago: Consortium on Chicago School Research.

Hirumi, A. (2002). Student-centered, technology-rich learning environments (SCenTRLE): Operationalizing constructivist approaches to teaching and learning. *Journal of Technology and Teacher Education, 10*, 497–537.

Hord, S. (1997). *Professional learning communities: Communities of continuous inquiry and improvement*. Austin, TX: Southwest Educational Development Laboratory. Retrieved May 11, 2005, from http://www.sedl.org/pubs/change34/plc-cha34.pdf

International Society for Technology in Education (ISTE). (1998a). *Technology foundation standards*

for all students. Retrieved May 11, 2005, from http://cnets.iste.org/students/s_stands.html

International Society for Technology in Education (ISTE). (1998b). *Educational technology standards and performance indicators for all teachers.* Retrieved May 11, 2005, from http://cnets.iste.org/teachers/t_stands.html

Joyce, B., & Showers, B. (1982). The coaching of teaching. *Educational Leadership, 40*(1), 4–10.

Landrum, M. S., Callahan, C. M., & Shaklee, B. D. (2001). *Aiming for excellence: Annotations to the NAGC pre-K–grade 12 gifted program standards*. Waco, TX: Prufrock Press.

Louis, K. S., & Kruse, S. D. (1995). *Professionalism and community: Perspectives on reforming urban schools.* Thousand Oaks, CA: Corwin.

McLaughlin, M. W., & Talbert, J. E. (1993). *Contexts that matter for teaching and learning.* Stanford, CA: Center for Research on the Context of Secondary School Teaching, Stanford University.

No Child Left Behind Act, 20 U.S.C. §6301 (2001).

North Central Regional Education Laboratory (NCREL). (1997). *Learning with technology profile tool*. Retrieved May 11, 2005, from http://www.ncrtec.org/capacity/profile/profile.htm

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research, 62*, 307–332.

Palombo, M. (2003). A network that puts the net to work. *Journal of Staff Development, 24*, 24–28.

Phillips, J. (2003). Powerful learning: Creating learning communities in urban school reform. *Journal of Curriculum and Supervision, 18*, 240–258.

President's Panel on Educational Technology. (1997). *Report to the President on the use of technology to strengthen K–12 education in the United States.* Washington, DC: U.S. Government Printing Office.

Ravitz, J., Wong, Y., & Becker, H. (1999). *Teaching, learning and computing: 1998: Report to participants.* Irvine, CA: Center for Research on Information Technology and Organizations. Retrieved May 11, 2005 from http://www.crito.uci.edu/tlc/findings/special_report/index.htm

Rokeach, M. (1972). *Beliefs, attitudes, and values.* San Francisco: Jossey-Bass.

Russel, M., Bebell, D., O'Dwyer, L., & O'Connor, K. (2003). Examining teacher technology use: Implications for preservice and inservice teacher preparation. *Journal of Teacher Education, 54*, 297–310.

Saye, J. W. (1998). Technology in the classroom: The role of dispositions in teacher gatekeeping. *Journal of Curriculum and Supervision, 13*, 210–234.

Shaunessy, E. (2003). Attitudes of teachers of the intellectually gifted in Mississippi toward information technology. *Dissertation Abstracts International, 64*(03), 860. (UMI No. 3084216)

Siegle, D. (2005). *Using media & technology with gifted learners*. Waco, TX: Prufrock Press.

Smerdon, B., Cronen, S., Lanahan, L., Anderson, J., Ianotti, N., & Angeles, J. (2000). *Teacher's tools for the 21st century: A report on teachers' use of technology* (NCES 2000–102). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

Solmon, L. C., & Wiederhorn, J. A. (2000). *Progress of technology in the schools: 1999: Report on 27 states*. Retrieved May 11, 2005, from http://www.mff.org/pubs/Progress_27states.pdf

South Central Regional Technology in Education Consortium (SCRTEC). (2004). *Instrument library*. Retrieved May 11, 2005, from http://insight.southcentralrtec.org

Spillane, J. P. (2000). *District leaders' perceptions of teacher learning: CPRE occasional paper*. Philadelphia, PA: Consortium for Policy Research in Education, University of Pennsylvania.

State Educational Technology Directors Association (SETDA). (2003). *SETDA National Leadership Institute toolkit.* Retrieved May 11, 2005, from http://ali.apple.com/ali_media/Users/1000040/files/others/eet.pdf

Texas Center for Educational Technology (TCET). (2003). *Publications*. Retrieved May 11, 2005, from http://www.tcet.unt.edu/publications

Waits, B., & Demana, F. (1996). A computer for all students—revisited. *Mathematics Teacher, 89*, 712–714.

Wenglinsky, H. (1998). *Does it compute? The relationship between educational technology and student achievement in mathematics*. (ERIC Document Reproduction Service No. 425191)

Zhao, Y., & Frank, K. A. (2003). Factors affecting technology uses in schools: An ecological perspective. *American Educational Research Journal, 40*, 807–840.