

Can  
Distance  
Learning  
Meet the  
Needs of  
Gifted  
Elementary  
Math Students?



by Sylvia St. Cyr

I remember how nervous I was when I accepted the position as the teacher for gifted students in our building. The task seemed overwhelming—meeting the needs of students who could think faster, harder, and smarter than any of our regular learners. What could I possibly do to impact the lives and learning for this new arrangement of students I was about to educate?

These questions kept me focused and flexible as I prepared for my first year of gifted instruction. The newly created program I would institute involved facilitating general pull-out instruction to a select group of third- through sixth-grade students, as well as mathematics inclusion/independent study services for our mathematically gifted students. Our elementary school, in a low to moderate income suburban setting, had about 400 students, of which 21 were eligible for pull-out services. The format for providing services to my pupils seemed appropriate and manageable until I was presented with the following scenario regarding one of my students.

The first thing I learned about “Ryan” was that he had been accelerated in mathematics for both his second- and third-grade years. Ryan had been visiting higher grade levels at the time mathematics instruction occurred, and, through this simple method, he had been content accelerated. This meant that Ryan, when I began working with him, had already completed the fourth-grade mathematics curriculum even though he was commencing this grade level. I was further informed that I needed to enrich Ryan’s math learning because the district superintendent had decided we could no longer accelerate him. This decision was based on the straightforward fact that we were not in a position to transport him to the junior high school for seventh-grade instruction when he reached sixth grade.

As I had already mapped out Ryan’s schedule for continued mathematics acceleration, I felt that this decision was a clear impediment for him. My initial concern about Ryan was how to construct a program that would allow him to repeat the fourth-grade curriculum and yet still be engaged and challenged. This was no small task, and not one I took lightly, but Ryan and I managed to modify his learning by increasing the independent study

blocks. During our independent study time, we explored various patterns, such as the Fibonacci sequence; worked on complex mathematics problems; and reviewed for the sixth-grade state mathematics league competition. I am convinced that acceleration would have been the most appropriate alternative for Ryan; however, I also believe we rose to the challenge and completed this year with as much success as was allowed, given our parameters. Thereafter, Ryan was provided independent study and inclusion services for his fifth-grade term, which is the service provided for the average mathematically gifted students in our building.

Surely one can imagine my surprise and relief when, at our district’s gifted team meeting last spring, I was informed that Ryan would be mathematically accelerated during his sixth-grade tenure. I was notified that he needed to complete his sixth- *and* seventh-grade math program in our sixth-grade setting. Another challenge, no doubt! Our assistant superintendent recommended that Ryan take a distance learning mathematics course provided by a prominent university. This program had been specifically formulated to accommodate highly gifted elementary students. Ryan’s fifth-grade scores confirmed our belief that he was functioning at a higher level than our average gifted students because he scored a perfect 150 on his Otis Lennon exams and had a 99th percentile rank complete battery score for his fifth-grade Stanford Achievement Test, as well as the highest rank possible on the TOMA (Test of Mathematical Ability) I administered to him.

I was impressed that our district had finally come to realize Ryan’s needs could be better met. I was also incredibly relieved that a university would meet Ryan’s mathematical needs and that I would have instructional support because Ryan was exhausting my expertise at an exponential rate.

## Supporting Our Beliefs

Finding research to support our belief that Ryan should be math accelerated was not a problem. Gallagher and Gallagher (1994) expressed that

perhaps the simplest program modification emerges from the recognition that gifted students are performing two, three, or more grades beyond their expected grade level on achievement tests. From this observation comes the conclusion that they should be given content that matches their level of attainment rather than their age. (pp. 99–100)

Clark (1997) explained that “however acceleration is implemented, it will result in student completion of formal schooling in less time than is usually required. . . . Research has been almost uniformly positive in its results” (p. 205). Furthermore, Clark listed the advantages of acceleration:

- It can be used in any school.
- Acceleration allows capable students to enter their careers sooner, resulting in more productivity.
- A larger portion of students who are accelerated in primary and secondary schools attend highly selective colleges than gifted students who are not.
- Accelerated students do as well as, or often better than, the older students in their classes do.
- There is less boredom and dissatisfaction for bright students (pp. 205–206).

Clark cautioned that “although acceleration should not be used as the total plan for a gifted program, the literature shows very few disadvantages to this provision when used on an individual basis” (p. 207).

## Distance Learning

Mackey (1994) claimed we must consider that certain acceleration options allow students to modify not only their place—the *level* at which they are learning—but also their pace—the *rate* at which they are learning. Strategies that allow for the ongoing adjustment of pace, such as continuous progress, self-paced instruction . . . ensure that students are not merely jumping ahead, but also are advancing at an optimal rate. (p. 3)

Benefits for acceleration, listed by Southern and Jones (1991), include:

- increased efficiency;
- increased effectiveness;
- recognition;
- increased time for careers;
- increased productivity;
- increased options for academic exploration;
- exposure of the student to a new group of peers; and
- administrative economy (pp. 9–10).

### Is Technology a Tool for Acceleration?

It was clear to me that content acceleration was an appropriate choice for Ryan, but what did I know about distance learning programs for gifted students? How could we be sure that this was an appropriate tool to access Ryan's abilities? I wanted to be clear about what this program involved before presenting it to his parents.

I researched the program's Web site and discovered that each mathematical topic covered through the course was listed and that the list was wide-ranging. I was able to access a sample lesson through the Web site, and I felt that the

topic was adequately introduced. I also wanted feedback from someone in a school setting who had used this program, so I e-mailed a professor who uses this program for mathematics acceleration in her school district. She cautioned me about the program and said that it was only effective for her students if provided as an at-home enrichment model. Our assistant superintendent was firm in his belief that this would take place in our building during Ryan's mathematics instruction period, which required me to move forward in my decision about whether instituting this distance learning program would be an appropriate service option for him.

It was clear to me that content acceleration was an appropriate choice for Ryan, but what did I know about distance learning programs for gifted students?

It was challenging to find research that supported distance learning at an elementary level. Nugent (2001) stated that

it is imperative that empirical research be conducted to affirm the efficacy of the integrated technology practices that are being incorporated into gifted classrooms. In order to justify the cost and labor required to maintain and upgrade the technology already in place in our nation's schools, decisions based on research must be made in order to determine effective and ineffective uses of technology. (p. 42)

Questions posed by Nugent included "Are curricula that incorporate technology producing higher student educational outcomes than those that do not?" (p. 43), along with the demand that "as educators, we must evaluate the effectiveness of the practices we implement in order to adapt and adjust those practices to better address the varied needs of our gifted students" (p. 43).

After considering these comments, I decided that Ryan's journey could become a case study for me so that I could determine the effectiveness of this particular program for elementary gifted mathematics students. I found that, in our field, just as the Nugent (2001) had noted, we do not have a variety of research or documentation to evaluate the effectiveness, or ineffectiveness, of such programs in elementary settings. This would be an ideal opportunity for me to conduct a study on the process our district would undergo, along with Ryan's progress.

### Standards as Guidelines

This case study would connect to the following standards recommended by the National Educational Technology Standards (NETS) for teachers:

- I. Technology operations and concepts: *Teachers demonstrate a sound understanding of technology operations and concepts.*
- II. Planning and designing learning environments and experiments: *Teachers plan and design effective learning environments and experiences supported by technology.*
- III. Teaching, learning, and the curriculum: *Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning.*
- IV. Assessment and evaluation: *Teachers apply technology to facilitate a variety*

*of effective assessment and evaluation strategies.*

- V. Productivity and professional practice: *Teachers use technology to enhance their productivity and professional practice* (NETS, n.d., para. 3–7).

The following National Council of Teachers of Mathematics (NCTM) technology principle also supports the practices used to accelerate Ryan in mathematics: “Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students’ learning” (NCTM, n.d., The Technology Principle section, para. 1).

The following recommendations for using technology were specified by the NCTM:

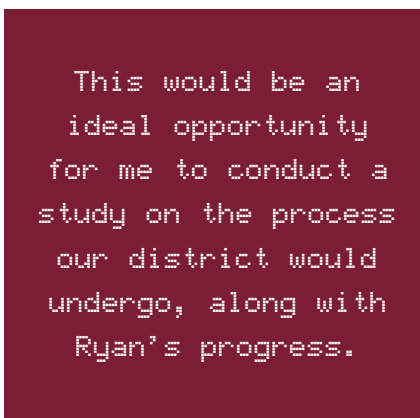
- Every student should have access to an appropriate calculator.
- Every mathematics teacher should have access to a computer with appropriate software and network connections for instructional and noninstructional tasks.
- Every mathematics classroom should have computers with Internet connections available at all times for demonstrations and students’ use.
- Every school mathematics program should provide students and teachers access to computers and other appropriate technology for individual, small-group, and whole-class use, as needed, on a daily basis.

Curriculum development, evaluation, and revision must take into account the mathematical opportunities provided

by instructional technology. When a curriculum is implemented, time and emphasis must be given to the use of technology to teach mathematics concepts, skills, and applications in the ways they are encountered in an age of ever increasing access to more-powerful technology. (NCTM, 2003, para. 4–5).

## Getting Started

I constructed an instrument to use in our district to determine eligibility for this service, which validated why Ryan



should be the forerunner for our new mathematics acceleration program (see Figure 1).

At a team meeting, our staff—comprised of the sixth-grade teachers, our counselor, principal, and myself—reviewed the completed mathematics acceleration recommendation form for Ryan. We agreed that, based on his demonstrated needs, we would proceed with Ryan’s acceleration using the distance learning program. A meeting with Ryan and his parents further confirmed that this was a suitable decision. Ryan’s parents were supportive of our recommendations, and they concurred that this would be a viable tool

to accelerate Ryan’s mathematics curriculum. We discussed the negative considerations, as well, including the notion that we had not previewed this program and that we would be embarking into unmapped territory. Ryan was excited about the prospect of trying something innovative, and he was ready to commit to the challenges we had discussed. At the end of the 2001–2002 school year, we had a clear vision of Ryan’s sixth-grade mathematics curriculum for the following year. We also charted the path for his mathematics acceleration through high school (see Figure 2).

Ryan would start with a technology course the first week of school, would finish the fifth/sixth-grade segment by winter break, and would begin on the seventh-grade curriculum in January. He would then be in a position to enroll in an eighth-grade algebra class when he reached junior high school.

I registered Ryan for the program the third week in August. I was informed that I would be receiving CD-ROMs that had the entire program’s content on them, and we would be ready to commence as soon as the discs arrived. We would be sending weekly e-mail reports of Ryan’s progress and work to his tutor at the university, to whom Ryan would have access online. Ryan would also be able to access his own Web page on the Internet, which would provide him with data regarding his progress and standing.

The CD-ROMs arrived 1 week after school had started (Ryan was included in the regular sixth-grade math class during this time). I wasted no time in arranging to have our technology support person download the discs onto the terminal in my room. I was excited and eager to find out what our district funds of approximately \$500 for each 3-month period had bought us. Ryan was also eager to embark on this innovative journey.

## Distance Learning

The first thing our technology specialist noticed when he tried to download the program onto my computer was a message that informed us the program was not compatible with Macintosh computers. I could not believe that we had overlooked this during the registration process. It was so frustrating to think that we had not considered the technical requirements as we were evaluating the program curriculum. What a ghastly oversight this was! I was now relying completely on the technology person, Terry, to problem-solve me out of this. Terry said that we could probably get a PC from somewhere. We notified my principal about our problem, and he agreed that we should try to locate a PC. Another district technology support person kindly offered to donate her PC for our purposes; however, we would have to wait until her husband had a chance to download everything from the hard drive. The waiting stretched out to 3 agonizing weeks. When the PC finally arrived in my classroom, Terry and I were filled with anticipation again.

Terry spent at least 7 hours that Saturday and some time on Sunday trying to get past the first page of the program. When I checked in on that particular Sunday, I was thrilled to see the home page for the program on the PC in my room. I experienced the same thing Terry did when I tried to log on, however, as there was an obvious malfunction because we could not access the program beyond the opening screen.

For the sake of brevity, I will condense the process that ensued. I will only caution that it took more than 2 months to correct the problems. The solution required buying a Virtual PC program to place on a Macintosh computer. The cost for this was approximately \$230. This also entailed numerous hours of labor for our technology person, who went through an arduous process of phone tag

Name of Student: _____	
Grade: _____	Homeroom Teacher: _____ Math Teacher: _____
Parents: _____	
Student is identified as Superior Cognitive (Continue only if "yes" is circled)	Yes
How and when was student identified?	
Grade: _____	Test: _____ Score/s: _____
*****	
<b>Current and Past Math Grades</b>	
_____	Recommended
	Yes No
Student Proficiency Math Scores: (List all Years and Off Grade Scores)	Recommended
Year: _____ Score: _____	Yes No
Year: _____ Score: _____	Yes No
Year: _____ Score: _____	Yes No
*****	
<b>Tests Administered for Acceleration Assessment</b>	
TOMA Score and Rating	Recommended
Score: _____	
Date Administered: _____	Yes No
Textbook Inventory Test (Current Grade Level)	Recommended
Score: _____ Grade: _____	
Date Administered: _____	Yes No
Textbook Inventory Test (Next Grade Level)	Recommended
Score: _____ Grade: _____	
Date Administered: _____	Yes No
*****	
Student Works well independently (1 = low, 5 = high)	1 2 3 4 5
Ranked by: _____	

**Figure 1**  
**Reading Community Schools**  
**Mathematics Acceleration Checklist**

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Math Teacher Recommendation	Yes	No
Accelerated Math Teacher Recommendation	Yes	No
Parent/s Recommendation	Yes	No
Gifted Specialist Recommendation	Yes	No
Psychologist Recommendation	Yes	No
Principal Recommendation	Yes	No

Effective Date of Acceleration: \_\_\_\_\_\*  
 \*(Using District Acceleration Services Guidelines)

Review Date: \_\_\_\_\_

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Signatures	
Student _____	Date: _____
Parent _____	Date: _____
Parent _____	Date: _____
Math Teacher _____	Date: _____
Accelerated Math Teacher: _____	Date: _____
Gifted Specialist _____	Date: _____
Principal _____	Date: _____
Psychologist _____	Date: _____

**Figure 1 continued**

with the university. We received several different discs at various times throughout this process. The time zone factor made communication with the university impractical and nonproductive. I will forever be indebted to Terry for his work ethic, and I know we would not have been able to manage this without his dedication and expertise. In fairness to the university, however, it must be mentioned that an extension on Ryan's tuition was awarded due to our difficulties with achieving technical stability.

During the interim, Ryan's math program was modified once again. I decided to include him in the American Math Competition. Preparation for this, along with regular mathematics classroom participation, kept him challenged, but it was disappointing to know that we had let him down again. My credibility with him was being stretched, and there were certainly moments when I underwent feelings of failure for not having had enough foresight about the technological requirements for this program.

**Finally Online**

At 10:15 a.m. on November 7th Ryan was able to complete the first 20-minute lesson using the distance learning program. The course allowed me to input the grade level at which he would commence. I started Ryan at the beginning of the fifth-grade level because I felt we needed to understand the format and content before adjusting things to a higher level. I deemed it safer to wait and see how the concepts were presented before modifying this in any way.

The session started with a math racing game that involved dividing four-digit numbers by two-digit numbers. It was wonderful to see a variation of the traditional flash cards Ryan had been exposed to, which involved games of

## Distance Learning

“Around the World” with math facts of one digit by one digit multiplication problems. Ryan loved competing with the computer. The program allowed him to choose a pace of slow, normal, or fast. I advised Ryan to start with slow, but his competitive nature compelled him to start with the normal setting. Ryan was accustomed to being the fastest and brightest student at all times, and he did not understand that this program was formulated for students who had even more capabilities than he did. After the first round at the normal level, Ryan realized that he would experience more success by choosing slow for his next race.

Ryan was extremely verbal while competing with the computer. He practically elevated himself out of his chair because he was enjoying the challenge so much. The final race he completed before beginning his first lesson showed a 95% accuracy along with a score of an average of 8.4 seconds to solve each of 24 problems. I appreciated the instant feedback about his scores. I already felt much better about the possibilities this might provide for him.

The next part of the session was a lesson that included improper fractions, pictographs, geometry, line graphs, bar graphs, renaming fractions, equalities and inequalities, and translating word problems into algebraic equations. The session took about 20 minutes to complete. Ryan’s comments included, “This is good math. We don’t do this much in our class” and “Okay. Good lecture” when the taped instructions of the professor had finished. Scores for this lesson were 62 problems correct and 3 incorrect. I did not want to accelerate Ryan’s level just yet, but I felt that the feedback would give me a complete picture of how he was performing so that I could adjust and modify at any time, if need be.

### Criterion

1. Student has been identified as Superior Cognitive according to Reading School District standards (127 or above S.A.I. and 95th percentile composite score on an achievement test).
2. Student is recommended by mathematics teacher and/or gifted specialist.
3. Parent(s) have been informed and have been interviewed by the designated building team.
4. Mathematics Acceleration Checklist, testing, and scoring are complete and specify acceleration recommendations.
5. Psychologist has interviewed student.
6. Written Education Plan and checklist forms are reviewed and signed by all participants at a final team meeting.

### Services

- Mathematics Acceleration in grades 3, 4, and 5.  
(Student participates in higher grade level mathematics sessions)
- Student works on independent study projects and distance learning program for sixth-grade term and completes the seventh-grade curriculum through distance learning requirements.
- During junior/senior high school, the student will be accelerated as follows:

7th Grade	Algebra I
8th Grade	Geometry
9th Grade	Algebra II
10th Grade	Precalculus
11th Grade	Calculus and/or Discrete Mathematics
12th Grade	Postsecondary Mathematics course/s

**Figure 2**  
**Reading Community Schools**  
**Criterion and Services**  
**for Mathematically Gifted Students**

## Preliminary Conclusions

Ryan has been working with this program for several months now. I compiled a schedule for him that includes one or more sessions daily. Ryan completes these sessions in my room in a controlled setting. Although our original goal was to have him work on his sessions in his classroom during his mathematics instruction, after seeing the challenges Ryan has encountered, I believe he needs more accountability than the regular classroom allows. Ryan also enjoys verbally interacting with his learning, which would make him a distraction to his classmates. Furthermore, he should be carefully monitored because he does not always take the time required to understand new concepts unless he is monitored.

The program provides a score for each lesson and the ability to access homework for concepts covered. Available, as well, is a section for teachers or parents that has helpful instructional suggestions. I find myself referring to this section frequently so that I can present these concepts to Ryan in the same manner he is being taught by the program. There have been several times when Ryan needed these verbal mini-lessons before he could understand a new concept. The curriculum moves at a very fast pace, always covering a wide variety of mathematical concepts, and each lesson begins with a mini-review lesson.

Ryan has not stopped verbalizing as he solves problems. He rarely uses scratch paper for the lessons. Although he is capable of solving almost every problem mentally, it does take him "think time" to get there. He has spent many moments rocking and frenetically moving about in his chair, which is the behavior he has historically exhibited when feeling challenged. It has been a pleasure watching him as he moves through the program, and I have been

impressed with the caliber of material with which he is presented.

Ryan's parents were able to observe him completing a lesson during our conferences this fall. They, too, were impressed with the content and pace. The timing of Ryan's demonstration was perfect because we had just completed a conference regarding our next mathematically accelerated student, a third grader who would be completing the same distance learning program when he reached sixth grade. The student and his parents stayed to preview the program and watch Ryan complete the session. They were impressed that their son, who had been assessed using the newly created eligibility form (see Figure 1), would be partaking in this program, as well. This student's acceleration was a direct result of the foundation we had established through Ryan's process.

Ryan has been continuing his independent studies and is now working on the seventh-grade accelerated curriculum. He had trouble taking his sixth-grade exit exam, which required a score of at least 85% before he was able to commence the seventh-grade curriculum. He would hasten through the test and choose his answers randomly instead of spending the time needed to concentrate on each question. I was impressed when his tutor phoned him at home to discuss his test scores with him. She suggested that he take a written exam that she would fax to our school. Ryan scored 92% on this test, which was considerably higher than his computer-generated scores. This allowed him to advance to the seventh-grade accelerated curriculum in April.

Ryan is not going to complete this curriculum before the end of the year, but I was able to compare the curriculum at our junior high school with the various concepts being covered through the distance learning program, and, as I suspected, Ryan has already been exposed to

more concepts through the distance learning program than the junior high students have covered in their textbooks. It was reassuring to know that this distance learning program would become a bridge for Ryan, and future qualified students, to the pathway of mathematical acceleration for the remainder of their tenure in our district.

This program is also helping me to understand better how to teach and reach gifted mathematics students. I try to listen to each lecture along with Ryan, and I always closely monitor the content so that I can stay abreast of his learning. He still weaves in and out of the regular sixth-grade mathematics instruction in his homeroom because he benefits from all mathematics-related learning and enjoys being with his classmates. He also seems to thrive on the affirmation he gets from being successful in a group setting.

Pitfalls with the distance learning program still prevail, including initial difficulty sending e-mail reports to the university. It took several months to establish a system of sending the e-mail reports and communicating with Ryan's tutor regularly. We now have a regular routine established, and Ryan has been utilizing this aspect of the service more appropriately, although he does need to be continually reminded to read these e-mails and review the information being transmitted by them. The information in these e-mails is extremely helpful because Ryan's tutor reviews any concepts he has struggled with during a session and presents them in a slightly different format than the lectures on the CD-ROM discs.

There have been some glitches in the system that I have not been able to work out. One example is the math race section that covers least common denominators. This section was improperly programmed because, upon entering the correct answer, the computer repeatedly marks it as incorrect. After explaining this



## Distance Learning

through e-mail to Ryan's tutor, I was informed that I could turn the math races off. This was disappointing because Ryan had enjoyed the competitive challenge of increasing his accuracy and speed through these activities; however, the math race program would not move beyond the least common denominator section, so we found we had no choice but to disable this function.

When reviewing this experience overall, I can see that providing this type of service is extremely beneficial for students with strong mathematical abilities. Distance learning is an exciting and potent tool for the use of extending learning, and this particular program has been professionally structured and does a remarkable job of meeting the needs of high-level learners.

## Final Thoughts

Wouldn't life be wonderful if we were always given second chances? As an educator, it is frightening to think of how often my learning curves have threatened the learning of my students. There is no way to recoup the opportunities that were taken from Ryan. Suffice to say he is laying the groundwork for other students who will follow in his footsteps.

What I have learned from this experience is to allow time for the unexpected when dealing with technology. I have further learned that you need a strong technological support system in your school to ensure that access can be restored. The physical setting for online learning is important, as well. Students need to have a place where they can respond to their learning. The regular classroom would not be the most appropriate environment for this type of independent study program. Funding must also be considered when dealing with distance learning programs. Finally, the small print—the kind that reads "System Requirements"—will always be

the first piece of information I review before considering any type of technology program for my students!

The use of distance learning in an elementary setting has truly just begun. I realize now how important it is for educators to have a full understanding of what is available for their students through the use of technology and, more importantly, how to access what is available. I think professional development regarding technology in our field is only in the infant stages. We, as teachers, need to find the time and resources to become proficient in this vast field. My professional development plan will always include goals on how to improve my knowledge in this area. To ensure that my students are provided with everything they deserve in an educational setting, it is my responsibility to pursue and move forward with my own learning in this vast virtual realm that provides such rich possibilities for exploration.

## Future Trends

Although data-specific to distance learning programs for gifted elementary mathematics students was not available, the following statistics, obtained from the report *Virtual Schools: Trends and Issues* (Clark, 2001), provide considerations for further research regarding distance learning in U.S. schools.

- Virtual K–12 education is a form of distance education.
- Virtual schools are defined as educational organizations that offer K–12 courses through Internet- or Web-based methods.
- The trend from virtual high schools to virtual K–12 schools continues.
- It was estimated that 40,000 to 50,000 K–12 students enrolled in an online course in 2001–2002.
- The most common tuition reported was \$300 per semester, but prices varied greatly.

- Calculus AB was the online AP course offered by the most schools.
- Almost 8 in 10 virtual schools indicated that they developed or codeveloped at least some of their own courses. Only about 12% of virtual schools said they relied entirely on external providers for their courses.
- At least 14 states have a planned or operational state-sanctioned, state-level virtual school in place. Other types of virtual school organizations include university-based virtual schools, virtual school consortia, virtual schools operated by schools and districts, virtual charter schools operated by state-chartered entities, and virtual schools operated by private school entities. **GCT**

## References

- Clark, B. (1997) *Growing up gifted: Developing the potential of children at home and school* (5th ed.). Upper Saddle River, NJ: Prentice-Hall.
- Clark, T. (2001) *Virtual schools: Trends and issues*. Retrieved May 16, 2003, from <http://www.dlrn.org/virtual-study.pdf>
- Gallagher, S., & Gallagher, J. (1994) *Teaching the gifted child* (5th ed.). Needham Heights, MA: Allyn and Bacon.
- Mackey, L. (1994). *In the balance: Acceleration: Evaluating the controversy over higher-speed education*. Retrieved January 12, 2003, from <http://www.jhu.edu/~gifted/pub-res/accel.html>
- National Council of Teachers of Mathematics (NCTM). (1987). *Providing opportunities for the mathematically gifted K–12*. Reston, VA: Author.
- National Council of Teachers of Mathematics (NCTM). (n.d.). *Overview of principles and standards*

for school mathematics. Retrieved March 18, 2003, from <http://www.nctm.org/standards/principles.htm>

National Council of Teachers of Mathematics (NCTM). (2003). *The use of technology in the learning and teaching of mathematics*. Retrieved January 30, 2004, from [http://www.nctm.org/about/use\\_of\\_technology.htm](http://www.nctm.org/about/use_of_technology.htm)

National Educational Technology Standards (NETS). (n.d.). *Curriculum and content area standards: NETS for teachers*. Retrieved March 18, 2003, from <http://cnets.iste.org/currstands/cstands-netst.html>

Nugent, S. (2001). Technology and the gifted: Focus, facets, and the future. *Gifted Child Today*, 24(4), 38–45.

Southern, T., & Jones, E. (1991) *The academic acceleration of gifted children*. New York: Teachers College Press.

## Appendix 1 Distance Learning Programs for Gifted Elementary Students

### Center for Talent Development (CTD) (<http://www.ctd.northwestern.edu>)

The LearningLinks Program (formerly LetterLinks) is designed for independent learning and offers students in 6th through 12th grades honors-level and Advanced Placement courses for high school credit. Northwestern University provides this program. The Web site lists other distance learning opportunities.

### Center for Talented Youth (CTY) (<http://www.jhu.edu/gifted/about>)

K-12 distance education programs through Johns Hopkins University provide academically challenging courses in writing, mathematics, computer science,

and physics, guided by CTY tutors. Uses online and CD-ROM formats to enable students to take accelerated courses year-round at home or school.

### Education Program for Gifted Youth (EPGY) (<http://www-epgy.Stanford.edu/overview/info.html>)

This program, provided by Stanford University, offers accelerated coursework for gifted students from kindergarten through high school. Presently, more than 3,000 students from around the world are enrolled in the EPGY program.

### The Internet Academy (<http://www.iacademy.org/IA/AboutUs/Welcome.html>)

The Internet Academy provides courses and teachers to students via the Internet. Washington State certified teachers provide instruction to students in grades K–12. The program allows for innovative uses of technology, customized learning environments, and access to skilled instructors. (not specifically for gifted students).

### The Gelfand Outreach Program in Mathematics (GOPM)

Rutgers University Center for Mathematics, Science, and Computer Education provides this program for middle and high school students. Students work at their own pace and enjoy the benefit of individual feedback from a GOPM mentor who reads all of their work and provides individual responses. For further information, call (732) 445-3491 or e-mail [gopm@math.rutgers.edu](mailto:gopm@math.rutgers.edu).

### Virtual School for the Gifted (VSG) (<http://www.vsg.edu.au/>)

The VSG is an online school that specializes in providing enrichment courses to complement and extend the

regular curriculum. The VSG works with schools and home schools to provide courses to challenge able students.

## Appendix 2 Web Resources

The following Web sites have comprehensive lists of distance learning programs.

### Hoagie's Gifted Education Page: Distance Learning ([http://www.hoagiesgifted.org/distance\\_learning.htm](http://www.hoagiesgifted.org/distance_learning.htm))

Programs for students of all ages

### Northwestern University Center for Talent Development Resources (<http://www.ctd.northwestern.edu:16080/resources>)

Programs for middle and high school students. This informative Web site includes a definition of distance learning, a list of the special characteristics required of the students, and recommendations for parents.

### Yahoo! Directory: Distance Learning K–12 ([http://dir.yahoo.com/Education/Distance\\_Learning/K\\_12](http://dir.yahoo.com/Education/Distance_Learning/K_12))

Courses listed are for all age ranges, but are not specifically for gifted students.

### Virtual Schools: Trends and Issues: A Study of Virtual Schools in the United States (<http://www.dlrn.org/virtualstudy.pdf>)

This study lists the trends for virtual schools and includes three pages of links to schools offering at least a partial K–12 curricula through Web-based courses. This site should be a starting point for educators and administrators considering Web-based instruction for their students. Included is an extensive list of recommendations, as well as survey results from participating virtual schools.