Gifted Adolescents' Talent Development Through Distance Learning

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This study involved 99 students who took honors-level courses and 87 students who took Advanced Placement courses through a gifted distance-learning program. Data showed that students' interests in the subject areas, the desire for enriching and accelerating themselves, and the unavailability of the courses in their home schools were the major reasons for enrolling in the distance-learning program. Overall, students were satisfied with the quality of communications with instructors or classmates, but the lack of interactions with teachers was a source of dissatisfaction for some students. Students reported that the classes prepared them well for their AP examinations and that challenge and enjoyment were the most important and beneficial aspects of the courses. Findings also showed that most students wanted to use computer technologies that grant them easy access to teachers, other students, and course information, but still desired to have traditional textbooks and written course materials.

Introduction

Need for Distance Learning

Distance learning is now widespread, especially at the college level. It is being utilized for transmitting instruction across geographic boundaries and extending unique educational opportunities nationally and internationally (Timpson & Jones, 1989). Researchers and educators assert that distance education enables schools to expand their standard curricula and offer courses for different levels of learners (Ravaglia & Sommer, 2000). Distance learning transcends the constraints of time and space by using such media as computer- or Internet-based programs, which allow educators and learners to interact, but not necessarily in face-to-face situations (Accessing Distance Learning, 1995; Hofmeister, 1994; Washington, 1997). Researchers and educators emphasize that distance-learning programs may not replace existing classrooms and schools, but can be used to compensate for educational deficits and lack of advanced

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coursework in regular schools (Adams & Cross, 1999/2000; Ravaglia & Sommer, 2000; Washington, 1997; Wilson, Litle, Coleman, & Gallagher, 1997/1998) or as part of a home-schooling program (Ravaglia & Sommer; Washington).

The idea of distance education has existed for more than a century in the format of paper-based correspondence courses (University of Plymouth, 2002); however, historically, distance learning was designed primarily for students who were not succeeding in a traditional school setting or were unable to attend a regular school (Olszewski-Kubilius & Limburg-Weber, 2002; Timpson & Jones, 1989). As a result, studies on the effectiveness of distance learning have been limited to these groups of students (Adams & Cross, 1999/2000; Belcastro, 2001; Lewis, 1989; McBride & Lewis, 1993; Ravaglia & Sommer, 2000; Threlkeld, 1991). Due to the lack of literature or research regarding the role and effectiveness of this type of program for the gifted, there are only a few distance-learning programs designed specifically for the gifted population (Adams & Cross).

Gifted educators continuously indicate their interest in distance education and believe that distance-learning programs can potentially increase their ability to serve gifted learners who can particularly benefit from technologically mediated instruction. Researchers and educators also assert that distance-learning programs can be helpful to gifted students who want to accelerate their learning or supplement and enrich existing educational resources (Adams & Cross, 1999/2000; Olszewski-Kubilius & Limburg-Weber, 2002), thereby enabling them to learn at a level commensurate with their capabilities (Adams & Cross; Threlkeld, 1991; Timpson & Jones, 1989; Washington, 1997). Distance-learning programs may be a good option for a variety of types of gifted students, including students who attend rural schools where advanced courses and gifted programs are limited, students who cannot obtain early access to advanced courses, students who want to take additional advanced courses but cannot fit them into their school schedules, students who are not thriving in a typical school setting (Goodrich, 1994; Lewis, 1989; Lewis & Talbert, 1990; McBride, 1991b; McBride & Lewis, 1993; Ravaglia & Sommer, 2000; Savage & Werner, 1994; Wilson et al., 1997/1998), and homebound learners (Ravaglia & Sommer).

Assumptions of Distance Learning

Contrary to most people's beliefs that distance learning is passive, distance-learning programs depend on the premise that students are

active participants and collaborators (McLoughlin, 1999) who actively construct their own knowledge (Hull, Bull, Montgomery, May, & Overton, 2000). Hull et al. contend that distance education, such as online courses, is based on authentic problem solving, which assumes the learners' own capabilities to transform given information into knowledge. It is comparable to a student-centered learning approach, which presumes that learners are central to the learning process and take responsibility for their own learning. Teachers assist learners as an educational resource and encourage students to engage in learning activities as active participants (Wilson et al., 1997/1998). Students enrolling in distance education must be independent problem solvers and take initiative and responsibility for their academic activities (Accessing Distance Learning, 1995; University of Plymouth, 2002; Wilson et al.). Indeed, research has shown that students are more likely to challenge their teachers in a distance setting where geographic distance and lack of face-to-face contact may alleviate their concern about actively questioning their teachers (McBride, 1991a).

Technology in Distance Learning

Distance-learning courses have not been common in the last decades in the U.S. despite the widespread availability of radio- and television-based courses in schools since the 1960s (Ravaglia & Sommer, 2000). However, with the development of various forms of communication technologies, such as global computer networks, satellite links, interactive virtual classrooms, electronic bulletin boards, online libraries, CD-ROMs, e-mail, fax machines, and so forth, distance education has spread in the past few years (Accessing Distance Learning, 1995). At present, there are multiple venues and delivery modes for distance education, including e-mails, discussion lists, interactive databases (Gallagher, 2001; Mansfield University, Rural Services Institute, Epler Enterprises, & Hummelstown, 1993), televised lectures, Web-based courses with graphics (Gallagher), streaming audios and videos, and electronic field trips (Adams & Cross, 1999/2000).

One often thinks of distance education as a lonely or a solitary type of experience, but this is not necessarily the case with current technologies. By posting discussions or participating in real-time class discussions online, students can actively engage with others. The issues surrounding the use of computer- and network-mediated instruction and its potential contribution to educational outcomes have come to the forefront in a variety of educational fields.

Although researchers (see Glennan & Melmed, 1996) allege that the drawbacks of limited access to and use of computers and other educational technologies are still a problem, they also suggest that technologies that provide active and engaging learning experiences benefit learners in various ways.

According to Belcastro (2001), electronic technologies, such as e-mail, the Internet, CD-ROMs, audio- and videotapes, instructional television, and two-way television, can enrich students' learning, particularly gifted students in rural areas. The technologies enable students to have virtual field trips to museums, industries, governmental agencies, or institutions; provide them with an opportunity to communicate and collaborate with other schools, teachers, or prospective mentors; offer various cultural experiences in the areas of the visual, creative, and performing arts; and cultivate an understanding of multicultural perspectives from interactions with diverse peers through networked classrooms (see Cifuentes, Murphy, & Davis, 1998).

Types of Distance-Learning Programs for Gifted Students

Some university-based gifted centers have distance-education programs specifically for gifted students of precollege age. The Center for Talented Youth (CTY) program at Johns Hopkins University, in partnership with the Education Program for Gifted Youth (EPGY) at Stanford University, offers computer-based multimedia courses in mathematics, physics, computer programming, and expository writing for students at the elementary, secondary, and college levels (Gilbert-Macmillan, 2000). The CTY math and science courses are self-paced and accelerative in nature, and most students complete them in 3 to 6 months. Students interact with their instructors using e-mail, telephone, or by means of an interactive Internet-based whiteboard.

The Talent Identification Program (TIP) at Duke University offers CD-ROM enrichment courses for motivated and gifted students, such as "Switched on Sound: Movements in 20th Century Music," "Clues in Crime: The Role of Forensic Science in Criminal Investigation," and "Peace and Protest." These courses consist of a combination of video lessons, interactive exercises, lab demonstrations, critical-thinking exercises, and hands-on activities.

The Center for Talent Development (CTD) at Northwestern University has offered a distance-education program, LearningLinks, for gifted students for more than 20 years. The LearningLinks program has served thousands of gifted students in the 6th–12th grades

with by-mail and online courses, including high school honors-level and Advanced Placement (AP) courses. Students in 4th–6th grades enroll in LearningLinks for the Young program, which offers enrichment courses on a 3-month time frame. This program is described in more detail later in this paper.

The Effects of Distance-Learning Programs

Empirical research about the effectiveness of distance-education programs specifically about gifted students is sparse. Despite little actual data on how successful gifted students are in distance education, researchers have documented evidence about the positive effects of distance-learning programs on gifted and talented students academically and socially. Lewis (1989) studied a telelearning program at the Louisiana School for Math, Science, and the Arts (LSMSA) in which classes were offered to gifted students in rural areas via computers, electronic blackboards, modems, and phone lines. During 1987 and 1989, the Louisiana School program offered such courses as Pre/Calculus, Survey of the Arts, and Trigonometry to about 200 students. Surveys showed that student participants in the program became more independent learners and took more responsibility for their academic experience. The study also found that relationships with fellow peers in the program became closely knit through small-group learning assignments and a shared experience of becoming active explorers in a new learning area. In a later study, McBride and Lewis (1993) utilized the distance-learning program to provide special classes for gifted and high-achieving students from more than 100 rural locations. Using audiographic computer technology for advanced-level courses in the areas of math, foreign language, science, and the arts, surveys showed that the academically gifted high school students became more independent and interactive with other students by not having teachers for their courses. The distance-learning courses also enabled some students to take such advanced-level classes as Calculus, thereby making them more attractive college candidates.

Wilson and her associates (1997/1998) found benefits for distance-learning programs for high school students at the North Carolina School of Science and Math (NCSSM). With the use of multiple sources of data, such as student and teacher questionnaires, interviews with students and distance-learning staff, focus groups, observations, document review, and student products (e.g., journal entries, videos, computer communications, essays, and test scores), the distance-learning program was extensively evaluated

over 3 years. Findings revealed that the program enabled the mathematically and scientifically talented students to develop independent study and thinking skills and to better prepare for college. Students commented that they learned a great deal and more in-depth; learned and experienced more than in their regular classes; developed better study skills; learned new means of communication; and developed better skills at using graphing calculators. Other benefits perceived by students were challenging and interesting coursework, improved communication skills, and opportunities for interactions with other intellectual peers from different geographic regions. Students also expressed that they obtained an idea of where they stood in comparison to other students from different schools, a common finding for gifted students when placed in appropriately challenging courses.

Combining multimedia resources with communication networks, the Superhighways Teams Across Rural Schools (STARS) program was developed in northern Scotland. Ewing, Dowling, and Coutts (1997) studied 127 STARS students, most of whom were gifted, from 18 primary and 2 secondary rural schools and found that the distance-education program increased students' problem-solving abilities, logical thinking skills, and collaborative-learning skills by enhancing their interactions with peers from different schools. Results also demonstrated that the program promoted students' motivation, task commitment, leadership ability, and responsibility for learning.

McLoughlin (1999) implemented a *telematics* classroom, defined as teaching contexts using audiographic technology and computer graphics, as a way to enrich the learning experience of gifted students. This study involved five teachers who had 8 to 10 years of teaching experience and 30 secondary gifted students from Western Australia. It examined the effectiveness of audiographic conference technology on the development of gifted students' cognitive thinking skills in the areas of math, science, English, Italian, and social science and on the promotion of communicative interactions between learners. Based on classroom observations and discourse analyses, data revealed that, as a result of the teachers' use of technology to support verbal and visual expression (e.g., presenting and discussing ideas, resolving problems, etc.), students' collaborative and higher order thinking skills, such as logical explanation, critical inquiry, interpretation, and reflection, increased over three phases of intervention. In this electronic classroom, teachers became less controlling, but more focused on students' written responses, while the gifted students became more involved in col-

laboration and discussion in their learning. The author noticed that the role of technology changed from a tool for displaying and introducing new concepts to a tool for achieving collaborative dialogue among or between learners and instructors.

Although Miller and Kumari's (1997) study was not specifically designed for gifted learners, a dozen teachers from grade three to high school participated in an electronic community named OWLink. The purpose of the program was to provide better education to students in grades K–12 using videoconferencing and Internet technologies. By linking Rice University to five schools in Texas, an electronic community was developed using two-way audio or video and high-speed Internet connectivity. Examples of courses offered to students and teachers in grades K–12 included writing, *Macbeth*, algebra, AP Statistics, viruses, preventive medicine, reptiles, and "local heroes." Positive outcomes found in this study were that students not only enriched their learning in the subject areas they studied, but they also gained interdisciplinary, historical, and cultural perspectives across various subjects and took more initiative and responsibility for their learning. For instance, some students created after-school Internet clubs and classes on their own and contributed to operating the OWLink site voluntarily.

In summary, research studies on the effects of distance learning for gifted students are inspiring. Across studies, positive effects for students include better cognitive skills, increased personal responsibility for learning, and exposure to a greater diversity of people and perspectives. There are also concerns about distance learning, which include the inability to use students' body language as an indication of engagement and understanding (Gallagher, 2001) and unexpected technological problems (Lewis & Talbert, 1990). Lack of contact with other students, potential for isolation and separation, and lack of emotional support from peers and tutors in person are other concerns about distance-education programs (University of Plymouth, 2002).

Purpose of the Study

Despite the challenges, the use of technology-based distance-learning programs for gifted students both on their own at home and within schools is growing (Glennan & Melmed, 1996). Because of gifted students' characteristics, such as independence and desire to move at their own pace, they may benefit greatly from the interac-

tive, immediate, and individualized instruction of a distance-learning program. The present study was designed to investigate how academically talented students use a university-based distance-learning program, its role in their education and talent development, and their experience with distance education. To fulfill these goals, the following questions were examined:

1. Why do talented students take distance-learning courses, and for what do they use distance education? Do they take courses to supplement their school program? To accelerate? For personal enrichment?
2. Were students satisfied with their distance-education course? What were sources of satisfaction and dissatisfaction?
3. How do students perform in the distance-learning classes and on subsequent AP examinations?
4. How are distance-education courses received by students' schools? Do the students receive high school credit for them? Do they appear on high school transcripts? Are their grades factored into their GPAs?

Methods

LearningLinks Program

The LearningLinks (LL) program at the Center for Talent Development (CTD) is designed for students in the 6th–12th grades who need early access to advanced courses, wish to enrich their school programs with home study, need to take courses outside of school due to scheduling difficulties, or are homeschooled. As a distance-learning format, the program offers academically talented students honors-level and Advanced Placement courses for high school credit. Teachers proficient in their respective subject areas provide courses in either a by-mail or an online format. Even students who use the traditional by-mail format typically use e-mails for assignments and communication with teachers through the use of BlackBoard CourseInfo (http://www.blackboard.com) software. Students work independently during school study halls, free periods, after school, or at home and communicate with their instructors via e-mail, telephone, and the U.S. Postal Service. Through a partnership with Stanford University, students can choose to enroll in Education Program for Gifted Youth (EPGY), a computer-based math and science program, using a combination of CD-ROM and Internet technologies. Three starting dates

(September 1 to October 1, February 1, and June 1) for fall, winter, and summer sessions accommodate students' schedules. Each course can be completed in a 9-month time frame or shorter, depending on the student. The program is accelerative in two ways: Students typically take the courses earlier than usual or they take them in a compressed time frame, such as in 3 months over the summer. LearningLinks teachers are veteran high school teachers, most of whom are currently teaching full time at a high school. CTD is accredited as a special function school for the gifted by the North Central Association of Colleges and Schools and, as a result, can issue transcripts documenting high school credit earned for LL courses.

Students enrolling in the LL courses have to meet minimum SAT or ACT requirements. Minimum scores vary by class, but, generally, a minimum Talent Search score (i.e., test taken in grade 7 or 8) of SAT-Verbal 510, SAT-Math 540, ACT-Reading 24, ACT-Math 20 to 21, or ACT-Science 21 to 22 is required for both honors-level and Advanced Placement courses. Students who have not participated in a Talent Search can submit an admission portfolio that includes scores on the most recent nationally normed test taken, a 250-word essay, a current report card, a teacher recommendation, transcripts showing the completion of prerequisites, and a writing sample for AP literature or AP social studies courses.

Participants

This study involved students in grades 6–12 who had participated in the LearningLinks program by taking either high school honors-level courses or Advanced Placement courses during the past 4 (for honors-level classes) or 2 years (for AP classes). Ninety-nine students who had completed an honors-level course from the fall of 1998 to the spring of 2002 responded to the survey (1998, 2.2%; 1999, 4.3%; 2000, 18.3%; 2001, 32.3%; 2002, 37.6%; no response, 5.4%). No information about the grade level of student participants was available in this study. However, in consideration of the grade level of 1,162 students at the time of enrollments in LL courses (i.e., 6th graders, 4.4%; 7th graders, 13.3%; 8th graders, 28.8%; 9th graders, 16.6%; 10th graders, 15.5%; 11th graders, 13.3%; and 12th graders, 8.1%), we assumed that the majority of student participants involved in this study would be in grades 8–10. Regarding the courses taken, more than half of the students took verbal courses (n = 52, 53.1%), followed by math (n = 27, 27.6%), social science (n =

13, 13.3%), and science (n = 6, 6.1%) courses. Examples of the courses included Creative Writing, English Literature and Composition, English Vocabulary, Algebra I or II, Geometry, Economics, Philosophy, World Perspectives, and Biology and Physics. Similar to the students in the AP course, a fair number of students attended a public school in a suburban area (44.4%), with 18.2% of students from a rural area and 11.1% from an urban area, while 20.2% of students attended a private or parochial school, and 3% were homeschooled.

Eighty-seven high school students who had taken an AP course from the fall of 2000 to the spring of 2002 completed the survey (2000, 46%; 2001, 41.4%; 2002, 12.6%). A sizeable percentage of students (70.1%) took their LL courses in the fall session of each year, followed by spring (26.4%) and winter (3.4%) sessions. At the time of the study, most of the students were in grade 11 (40.2%), with 33.3% in grade 12, 18.4% in grade 10, and 4.6% in grade 9. Forty-seven percent (n = 41) of the AP courses that LL students took were social science courses (e.g., AP Psychology, AP Government and Politics), 21.8% (n = 19) were science courses (e.g., AP Physics B, AP Biology), 16.1% (n = 14) were math courses (e.g., AP Calculus AB, AP Statistics), and 14.9% (n = 13) were verbal courses (e.g., AP Language and Composition, AP Literature and Composition). Forty-three percent of the students attended a public school in a suburban area, 28.7% in a rural area, and 10.3% in an urban area, while 11.5% of the students attended a private or parochial school, and 5.7% were homeschooled

Instruments

Two questionnaires, LearningLinks Course Evaluation and AP Course Evaluation, were used for this study. Each consisted primarily of multiple-choice items, but each also contained items using a 4-point Likert-type scale (1 = *strongly agree* to 4 = *strongly disagree*). Each questionnaire consisted of 19 items, and some common questions across surveys were items about why students took the course through a distance-learning program and whether they received high school credit for the courses from their schools.

For students in the honors-level courses, questions included the time spent on the courses (e.g., How many hours per week did you spend on this course?), satisfaction with various aspects of the courses (e.g., This course provided the right level of challenge for me; I found the texts and other instructional materials useful; My teacher responded promptly to my writing, etc.), and course activi-

ties performed online (e.g., read syllabus and general course information, submitted assignments or projects, exams, tests, or quizzes, or sent e-mails to instructors or classmates, etc.). Students were also asked how many months they took to complete the course, how many times they contacted the teacher, and if the course lived up to their expectations. Students who took classes online were asked if they had easy access to course information online, if the course Web site was well organized, and if the teacher had useful links and kept the announcements page current.

For AP courses, students were asked how much the distance-learning course contributed to their preparations for and performances on AP examinations and about their reasons for not taking AP examinations following the AP courses if they chose not to do so. They were also asked about the AP course offerings in their schools and how they prepared for the AP exam beyond their CTD courses. Appendix A presents a complete list of questions for both surveys.

Data Collection and Analysis

In the fall of 2002, the LearningLinks course evaluation was mailed out to 345 students. The students were selected randomly by a researcher at the Center from students who had enrolled in the CTD's LearningLinks honors-level courses from fall 1998 to spring 2002. Ninety-nine students responded to and returned the survey (return rate = 28.7%). The low response rate for the LL survey was probably due to the length of time between the follow-up survey and the students' enrollment in the program, which was 4 years in some cases. For AP courses, the survey was mailed out to all 207 students who enrolled in CTD's LearningLinks AP courses from fall 2000 to spring 2002. Eighty-seven students responded to and returned the survey to the CTD research team (return rate = 42%).

Descriptive statistics were computed for all multiple-option items in the survey, and students' comments for some open-ended items were analyzed using the constant comparative method typically employed for qualitative research analysis (Hutchinson, 1990). First, all of the open-ended comments made by students were analyzed line by line. Next, several categories (e.g., program seemed the best, too much philosophy for English class, helpful teacher, different communication with instructors, a lot of homework, lived close to Northwestern University, etc.) were created based on an initial coding process. Consequently, some consistent

themes (e.g., more challenging, higher quality of instruction, convenience, course material, lack of teacher interaction, etc.) across the categories were generated. See Appendix B for an example of the coding process. Considering the different nature of honors-level and Advanced Placement programs, the data were analyzed separately for both surveys.

Results

LearningLinks Honors-Level Courses

Information from mailings (brochure) received from the Center (46.5%) and participation in other CTD programs (41.4%) were the two primary ways students learned about the LearningLinks courses. Another 11.1% of students said they learned about the program through a friend or family member, while 6.1% learned about it through their schools. None of the students said they first learned of the courses via an online search.

In regard to reasons for taking courses through the LearningLinks, students' own interest in the subject area and desire to enrich their learning (69.7%) was the most frequently given reason by the students. Forty-two percent of students responded that they took the course because it was not offered by their local schools, and 40.4% took the course because it allowed them to work through the material at their own pace. To advance more quickly to the next level in the subject area was a reason given by 29.3% of students for taking the LL class, while 10.1% of students reported they took the course to get another high school credit and 6.1% to accumulate another AP credit for college. Less than 10% of the students took a course through LL because, although it was available at their schools, the course was not open to them at their grade levels (8.1%). Similarly, 7.1% of students took the course through LL because they could not fit it into their school schedule (7.1%). For 5.1% of students, the LL course was part of their home-school curriculum.

Open-ended responses from the students (n = 88) regarding the reasons for choosing the CTD LearningLinks program over other distance-learning programs included the following: only program they were aware of or contacted by (n = 27, 30.7%); particular course offering (n = 15, 17%); prior positive experience with CTD (n = 13, 14.8%); reputation of Northwestern University (n = 11, 12.5%); and convenience in terms of distance, environment, availability, and so forth (n = 10, 11.4%). More detailed information

Table 1

Reasons for Choosing LearningLinks Over Other Distance-Learning Programs

	n	%
1. Only program aware of/or contacted	27	30.7
Only program aware of	16	59.3
First program to contact	5	18.5
Best available program	4	14.8
Did not research other programs	2	7.4
2. Particular course offering	15	17.0
Matched student's interest	8	53.3
Variety of courses	4	26.7
Latin	2	13.3
Computer programming C++	1	6.7
3. Previous positive experience with CTD/Programs	13	14.8
Familiar/Good experience with CTD	9	69.2
Enjoyed other CTD programs	4	30.8
4. Reputation of Northwestern University	11	12.5
Prestigious/excellent academic place		
5. Convenience (distance, environment, availability)	10	11.4
Lived close to CTD/Northwestern	8	80.0
Easy to take the course online	2	20.0
6. Recommended by others (teachers, friends)	6	6.8
7. Course material	4	4.5
Received course descriptions from CTD	2	50.0
Flexible course offering	1	25.0
Sounded interesting and appealing	1	25.0
8. CTD's accreditation by NCA	1	1.1
9. Received scholarship for the course	1	1.1

Note. Responses were based on a total of 88 comments.

about these responses is available in Table 1.

Overall, students were satisfied with their distance-education courses. Seventy-nine percent of students said the course lived up to their expectations. In students' open-ended responses (n = 70), the most frequently given reason for satisfaction was that the course met their expectations based on the written course descrip-

tions provided prior to the class (n = 28, 40%), while 14.3% of students commented that the LL course exceeded their expectations. Of those students who expressed dissatisfaction with the course, 24.3% (n = 17) cited instructor or communication problems, such as lack of feedback from teachers, lack of teacher-student relationship, difficulties contacting the teacher, or feeling that teachers were not knowledgeable enough about the subject area. Of those students who expressed dissatisfaction, there were some (n = 11, 15.7%) who were not pleased with aspects of instructional methods or content of the course. Their comments included that the course involved "too much analyzing of writing," "too much philosophy for English class," and "more about vocabulary than culture."

Students were asked about their satisfaction with specific aspects of CTD's course related to texts or other instructional materials, syllabi and assignments, challenge level of the course, and teachers' qualifications for the course. Based on a 4-point Likert-type scale (1= *strongly agree* to 4 = *strongly disagree*), more than 80% of students agreed that the course provided them with the right level of challenge (87.6%: 59.8% strongly agree and 27.8% somewhat agree, M = 1.57, SD = .82), texts and other instructional materials were useful (85.7%: 58.2% strongly agree and 27.6% somewhat agree, M = 1.62, SD = .88), and the syllabus and assignments were well organized (84%: 55.3% strongly agree and 28.7% somewhat agree, M = 1.69, SD = .94). Students expressed that their teachers' explanations about the subject area were good (76.8%: 40% strongly agree and 36.8% somewhat agree, M = 1.97, SD = 1.03), that they were satisfied with their teachers' feedback regarding their work and performance in class (76.3%: 49.5% strongly agree and 26.8% somewhat agree, M = 1.97, SD = 1.48), and that teachers responded promptly to their work (72.2%: 45.4% strongly agree and 26.8% somewhat agree, M = 1.98, SD = 1.10). Sixty-nine percent of students (43.9% strongly agree, 25.5% somewhat agree, M = 2, SD = 1.07) also reported that they could easily contact their teachers. When asked about the number of times they contacted their teachers throughout the duration of the course, 47.9% of students responded 1 to 5 times, 25.5% 6 to 10 times, 20.2% 15 times or more, and 6.4% contacted the teachers 11 to 14 times. The component of the course with which students were least satisfied was whether or not the teacher kept them excited about the coursework (M = 2.41, SD = 1.15): 58.8% strongly or somewhat agreed and 22.7% strongly disagreed with the item.

When asked to compare the LearningLinks courses with the classes they normally took, 52 out of 115 open-ended responses

(45.2%) indicated that CTD's courses were more challenging (e.g., due to rigorous homework and assignments, individualized pace and independent study, required critical and analytic thinking, time management and demanding schedule, etc.) than their regular classes, followed by 20 responses (17.4%) indicating higher quality of instruction for the LL course. Thirteen students (11.3%) reported about the same level of challenge for both classes, while only 4 students commented that their LL classes were easier than regular classes. The lack of face-to-face teacher interaction (n = 14, 12.2%) was cited as a major negative aspect of the distance-learning course, and difficult communication with the instructor was given as a reason the LL course was more challenging. Twelve students (10.4%) also expressed that they did not like the LL course or it was "worse" than their regular classes (see Table 2).

Students were asked about the best components of the LL course they took. Their responses included setting your own pace (n = 33, 31.7%), interesting and simulating course content (n = 20, 19.2%), level of challenge (n = 17, 16.3%), quality of the instructor (n = 14, 13.5%), and advancement in school and preparation for advanced courses (n = 13, 12.5%). In contrast, as to the least liked components of the LL course, 19 (20.7%) out of 92 students' comments related to the lack of personal contact with teachers and other peers and quantity and quality of online, phone, or mailing interaction. Fifteen responses indicated dissatisfaction with course content (e.g., too much analysis, boring, hard to understand, etc.), and 10 responses were about the quality of instruction and explanations by the instructor (e.g., late feedback on tests, difficult to understand, etc.; see Figure 1).

In regard to the number of hours per week spent on the LL course, 35.4% of students responded 3 to 4 hours, 32.3% 5 to 6 hours, 25% 1 to 2 hours, and 7.3% 7 to 8 hours per week on their courses. Fifty-one percent of students needed 8 to 10 months to complete the course, while 33% of students took 5 to 7 months and 11% more than 10 months.

A sizeable percentage of students (69.5%) chose to take the honors course in the by-mail, rather than the online format. Based on a 4-point Likert-type scale (1 = *strongly agree* to 4 = *strongly disagree*), among those who took the course online (n = 29), most were satisfied with the quality of tech support: 78.9% (strongly agree 42.1%, somewhat agree 36.8%, M = 1.95, SD = 1.08) agreed that they received sufficient information from the LL staff to resolve any problem they had with the software; 70% (strongly agree 53.3%, somewhat agree 16.7%, M = 2, SD = 1.26) said they could

Table 2

Comparison Between LearningLinks Courses and Regular Classes in School

	n	%
1. More challenging	52	45.2
Rigorous, much homework/assignments	14	26.9
Required individualized pace, independent study with less help	11	21.2
Difficult, different communication with instructors	10	19.2
Demands on critical analysis, writing skills, reading, questioning	7	13.5
Fast-paced, challenging, complex coursework	6	11.5
Demanding schedule/time management	4	7.7
2. Higher quality of courses/instruction	20	17.4
Advanced in-depth courses, essay writings, reading, questioning	15	75.0
Capable, helpful teachers	5	25.0
3. Lack of teacher interaction	14	12.2
4. Similar/Same level of challenge with courses in school	13	11.3
5. Worse/Disliked program	12	10.4
Lack of time for completion of assignments	6	50.0
Teachers were not helpful	2	16.7
Difficult to be motivated	2	16.7
Vague assignments	1	8.3
Preferred hands-on courses	1	8.3
6. Easier than courses in school	4	3.5

Note. Responses were based on a total of 115 open-ended comments regarding LearningLinks courses.

easily get access to the course information online; and 68.2% (strongly agree 45.5%, somewhat agree 22.7%, $M = 2.09$, $SD = 1.23$) agreed that the course Web site was well organized. The students appeared to be pleased with the quality of and communication from instructors or classmates. More than 70% of students said they enjoyed communicating with their instructors or classmates via e-mails (80.8% = strongly agree 46.2%, somewhat agree 34.6%, $M = 1.85$, $SD = 1.01$) and that their instructor's links were useful (75% = strongly agree 25%, somewhat agree 50%, $M = 2.10$, $SD = .91$).

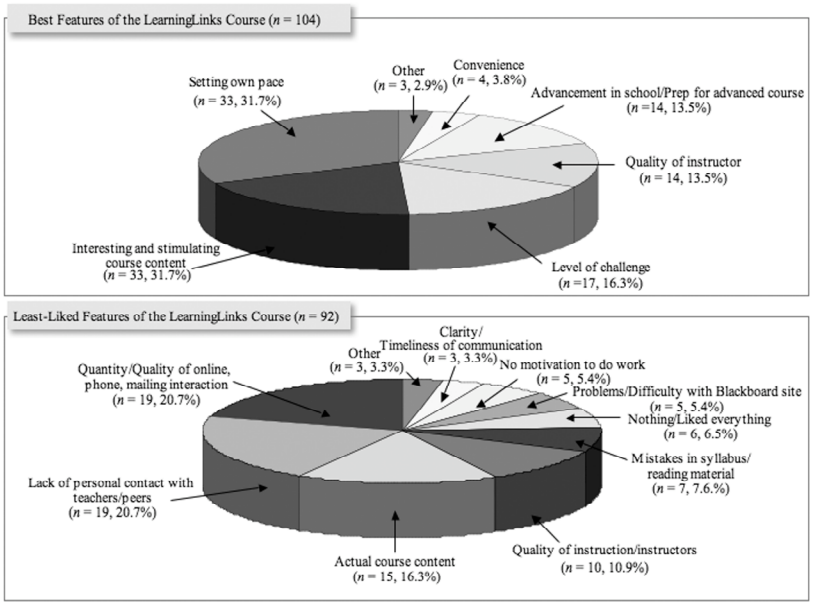

Figure 1. Best and least liked features of the LearningLinks course.

Seventy percent of students (strongly agree 35%, somewhat agree 35%, $M = 2.15$, $SD = 1.14$) also expressed that their instructors continuously updated the announcement pages. Additionally, when asked about whether they would sign up for another online course in the future, 75% (strongly agree 37.5%, somewhat agree 37.5%, $M = 1.96$, $SD = .95$) responded positively.

Regarding course activities, communication with instructors via e-mails (39.4%) and submission of assignments or projects (34.3%) were the two primary tasks fulfilled online. Receiving instructors' comments on assignments or tests (28.3%) and reading the syllabus and general course information (14.1%) were the next most frequent course activities done online (refer to Table 3 for more information).

Nearly half of students (48.9%) received high school credit for the course they took through LearningLinks from their schools. Of those responding "no high school credit" for the course, 30.9% explained they did not ask their schools for credit, while 20.2% said their schools would not give them credit for the course despite their requests. Of the 46 students who received credit, 35.4% had their LL course grades factored into their GPAs, while 33.3% were not sure if the grade was factored in and 31.3% indicated it was not. Additionally, less than 20% of students (18.5%) reported that they

Table 3

Course Activities Performed Online

	n	%
1. Sent/Received e-mail to/from instructor	39	39.4
2. Submitted assignments or projects	34	34.1
3. Received instructor's comments on assignments or tests	28	28.3
4. Read syllabus and general course information	14	14.1
5. Submitted exams, tests, or quizzes	11	11.1
6. Read assignments as they were posted on site	9	9.1
7. Did research online at sites other than course site	9	9.1
8. Sent/Received e-mail to/from classmates	7	7.1
9. Other	4	4.0

Note. Based on multiple options for the item, responses came from the 99 students who had participated in the CTD-LL honors-level courses.

were allowed to skip to the next course in the sequence, although another 27.8% said they had not asked their schools to do so. Six percent of students also asked to be placed in the next course in sequence, but their request was denied. Almost half of students (46.9%) reported that they did not skip to the next course because they did not have further courses available in the same subject area at their schools!

This survey did not include items regarding students' performance in their LL honors courses due to the confidentiality of the participants in the program. However, a separate analysis of all students who enrolled in the LL honors course from fall 1998 to spring 2002 (not just survey respondents) indicated that 551 out of 758 students completed the course (completion rate = 72.7%), and most of the students earned As (n = 401, 72.8%) and Bs (n = 110, 20%). This completion rate compares favorably to the lower retention rate of adult learners in distance-education programs (around 50%), which, generally, has been considered challenging for distance education relative to the traditional classroom coursework (Akridge, DeMay, Braunlich, Collura, & Sheahan, 2002; McCracken, 2002). Thus, we assume that, overall, students involved in this study performed extremely well in their LL classes, despite the more challenging content and independent nature of the classes.

AP Courses

More than half of AP students (58.6%) responded that they chose the LL program because their local schools did not offer a particular AP course they wanted. The next most frequently cited reasons for taking the AP course through LL were students' interest in the subject matter and their own personal enrichment (54%) and their desire to accumulate another AP credit for college (54%). Other reasons for taking the AP course included wanting to work through the content material at their own pace (32%), being unable to fit the course into their schedule even though the course was offered by their local schools (23%), and wanting to earn another high school credit (10.3%).

Of all 87 respondents, 92.9% said their schools offered some AP courses. Nearly half of the students (48.1%) responded that their schools offered 6 to 10 AP courses, 28.6% offered 11 or more AP courses, and 23.4% offered 1 to 5 AP courses. More than half (61.9%) of the students responded that they received high school credit from their schools for the AP LL courses. However, 28.6% reported that they did not ask their schools to give them credit for the courses, and 9.5% did not get credit for the courses, even though they requested it.

As in the case of students who took the LL honors-level course, this study did not ask students about their performance in LL AP courses. However, for all students who enrolled in the AP program from fall 2000 to spring 2002, 129 (65.5%) out of 197 students completed the AP course, and almost 90% of these students received As (n = 95, 73.6%) and Bs (n = 19, 14.7%). Thus, it can be assumed that the LL AP students involved in this study were likely to achieve similarly high grades in their LL AP courses.

Students' high achievement in AP coursework was apparent in their performance on AP exams following the distance-learning course. Sixty-four percent of students took AP exams following their LL AP courses, and most (94.4%) took the exams either in 2002 (50%) or 2001 (44.4%). The remaining 5.6% responded that they would take the exams in 2003, a year after taking the CTD course. Therefore, most students (88%) on average had less than a 3-month discrepancy between finishing their AP courses and taking the AP exams. The mean score on the AP exams was 3.81 (SD = 1.18) on a range of 1–5 points, but the majority of students earned 5s and 4s (5 points, 38.8%; 4 points, 24.5%; 3 points, 18.4%; 2 points, 16.3%; and 1 point, 2%). In comparison to the national AP score distributions in 2002, the CTD students earned higher scores on their AP exams. The AP score distributions in

2002 nationwide were as follows: 5 points, 14.3%; 4 points, 21.4%; 3 points, 27.4%; 2 points, 23.1%; and 1 point, 13.8%, with a mean score of 2.99 (G. Johnson, personal communication, May 3, 2003).

Students were also asked to list any AP exams they had taken anywhere. Both U.S. History and English Language/Composition were the most frequently taken AP exams (n = 26, 12.2%, each), followed by English Language/Composition (n = 25, 11.7%), Calculus-AB (n = 24, 11.3%), and Biology (n = 20, 9.4%). In combining across courses, 31.5% of AP courses taken by students were related to social science (e.g., U.S. Government/Politics, Psychology), 28.2% were verbal courses (e.g., English Literature/Language/Composition), 23.9% were science (e.g., Biology, Chemistry, Physics-B), and 16% were math (e.g., Statistics, Calculus-AB). Only one student mentioned Studio Art: Drawing. The mean score across these exams was 4.31 (SD = .89) on a range of 1 to 5 points, which was also higher than the recent mean score (M = 2.99) for AP exams nationwide. The students' self-reported scores for any AP exams taken in school, through LL or other programs, were slightly higher than their AP exams for the LL course; however, the variability in test scores was also slightly greater for LL AP courses. It may be that students only or primarily reported AP test scores that were high.

Aside from the CTD course, 39.1% of students reported that they did additional preparation for AP exams on their own at home, with 3.4% preparing with the help of a teacher at their schools and 1.1% with the help of a private tutor. Eighteen percent of students reported no additional preparation for the exams except for the CTD course.

Twenty-eight students did not take AP exams after their LL AP courses. Thirty-two percent of these students reported that they did not take the exams because they were not interested in getting college credit. Eleven percent said the CTD course did not focus enough on the preparation for the exams, while 7.1% reported they needed more time for additional study on their own, although they considered the course extremely helpful. Some also referred to scheduling conflicts or other commitments (3.6%) as a reason for not taking the exam, and a few (3.6%) had no idea of how to register for the exams. Fourteen open-ended comments revealed other reasons for not taking the AP exams following the AP LL course, including not completing or dropping the course (n = 11), because some colleges do not accept the credit (n = 2), and insufficient time for taking the exam with five other AP exams (n = 1).

Summary and Discussion

Overall, this study showed that students' interests in the subject area, a desire to enrich and accelerate themselves, and the unavailability of advanced courses at an appropriate time in their home schools were the major reasons for enrolling in the CTD distance-learning courses to take either Advanced Placement or honors-level courses. For students who took the AP courses, getting credit for college was another important reason for taking the distance-learning class.

Honors-level students were generally satisfied with the quality of communication with and from instructors or classmates. However, similar to other researchers who propose the lack of communication and interaction between teachers and students as a weakness of distance-education programs (Gallagher, 2001; McBride, 1991b; University of Plymouth, 2002), the present study also found the absence of face-to-face interactions with teachers as the least favorite component of the program.

With respect to granting credit for the courses taken through the LL program, only about half of students reported having credit awarded from their home schools, while even fewer students had course grades factored into their high school GPAs or were allowed to move to sequential courses in their schools. One fifth of students who did not receive credit were actually refused credit by their schools. This indicates that local schools are still reluctant to recognize outside-of-school courses by credit or appropriate placement, as previously found by other researchers for summer program courses (e.g., Lynch, 1990; Mills, Ablard, & Lynch, 1992; Olszewski-Kubilius, 1989; Olszewski-Kubilius, Laubscher, Wohl, & Grant, 1996). Another study (see Lee & Olszewski-Kubilius, in press) about credit for classes taken in a summer program found that 64% of students obtained credit, suggesting that schools may be more accepting of credits for outside–of-school classes, including more traditional formats of in-class instruction, than distance-learning formats.

A major problem was that, for nearly half of the students, no further courses were available in the same subject matter at their home schools, indicating a general lack of opportunity for continuous study for these gifted students. Students and their families are likely to be on their own when accessing other opportunities, possibly utilizing dual enrollment or early college entrance programs. These data highlight the need for such venues as distance-learning programs for gifted students to find appropriate courses. This study

also revealed that some students were still reluctant to ask their schools for credit or placement for the next course in sequence, even though previous research showed that schools took more actions when students and parents actively pled and pushed for credit or placement (Olszewski-Kubilius et al., 1996). Thus, it is important for students and parents to communicate with local school personnel to receive appropriate educational actions or services for outside-of-school coursework.

For students, challenge and enjoyment were the two most important reasons to take LL classes. The honors-level courses were perceived as more challenging, rewarding, and demanding than regular coursework at school, and these were regarded as the most significant benefits of taking the outside-of-school distance-learning courses. The majority of students felt that the course compared favorably to their prior expectations for it, they performed well, and they did not need any extension to complete the course. Students' comments also reflected the need for enjoyment in addition to challenge in the coursework. Even though students were satisfied with the overall quality and instruction of their teachers, they did not feel that their teachers kept them excited about the subject matter throughout the courses and cited this as a source of dissatisfaction. This may be, in part, a function of the lack of direct interaction with teachers. Enthusiasm and motivation are often conveyed to students nonverbally, which is lost in distance-learning technologies. These findings support the importance of both appropriate level of challenge and a joyful experience in motivating adolescents (Csikszentmihalyi, 1991; Csikszentmihalyi, Rathunde, & Whalen, 1997), a critical aspect in the design and implementation of any kind of coursework for gifted students both in and outside of school.

The LL courses contributed to students' preparation for AP examinations, resulting in less than a 3-month discrepancy, on average, between completion of the course and the exam. Most of the students excelled on AP exams after the LL course, and more than half felt that the distance-learning courses prepared them extremely well for their exams. The findings also showed that, for some students who did not take the AP exams after the LL course, getting college credit was not a major interest and scheduling conflicts or other commitments were often barriers that prevented them from taking the AP exams.

A substantial number of students chose not to take the CTD distance-learning course in the online format, despite the fact that the

majority of students who did so were satisfied with the course and the technology. In fact, one of our findings was that most students wanted to use computer technologies that enabled them to have easy access to the teacher (e.g., e-mailing), easy access to course information (e.g., posted Web pages), and interactions with other students (e.g., online or posted discussion lists), but also still desired to have traditional textbooks and written course materials. Communication with instructors or classmates and submission of assignments were two other major course activities students performed online. These results suggest that the distance-learning programs should use a combination of new and old methods to meet students' desire for easier and more efficient communication and written-content materials.

An interesting finding of this study was that a significant number of students took AP courses via distance learning for their own personal interest and enrichment, and many of these students also prepared for AP exams on their own at home, aside from the CTD distance-learning courses. This suggests that students supplemented their distance-learning courses with additional independent study, attesting to their exceptional motivation, interest, and achievement orientation. VanTassel-Baska (2001) has asserted that AP programs play a critical role in motivating gifted students to be more independent in their learning and set higher academic goals commensurate with their intellectual abilities. She also cited Fithian's (1999) study that a large number of students who accumulated AP credit pursued double majors and other coursework in college instead of choosing early graduation. Thus, AP courses have many and wide-ranging benefits for gifted students, and distance-learning programs provide an important new and additional venue for students to take them.

Since this study included only students who participated in the CTD distance-learning program, no comparisons were possible between students who took the distance-learning classes versus those who took classes in a more traditional format. These investigations would help to ascertain the unique features of online and distance-learning classes and how these features potentially impact learning. Studies also need to focus on comparing different online and distance-education formats to determine what features are most supportive of learning for adolescent students. Also, having information on the success of students in various distance-education formats would be a contribution to the literature and could guide educators' future efforts on behalf of these students.

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Appendix A
List of Questions

Honors-Level Courses

1. Reasons for taking the CTD course through LearningLinks (LL)
2. The ways they learned about LearningLinks
3. Reasons for choosing LearningLinks over other distance-learning programs
4. Type of high school
5. Whether received high school credit for the LL course from schools; whether the course grade factors into GPA
6. Whether school allows to skip to the next course in the sequence
7. Satisfaction with the LL course (e.g., course provided the right level of challenge for me, syllabus and assignments were well organized, text[s] and other instructional materials useful, teacher was easy to get in touch with, etc.)
8. Hours/week spent on the LL course
9. Number of months to complete the course
10. Whether needed an extension to complete the course
11. Number of times contacted teacher throughout the duration of the course
12. Whether course lived up to expectations from the course description
13. Whether took the course in the online format
14. Satisfaction with online format (e.g., easy to access my course information online, tech support received from the LearningLinks staff was sufficient to resolve any problem[s], Web site for this course was well organized, etc.)
15. Types of course activities performed online (e.g., read syllabus and general course information, read assignments as they were posed on the Web, sent or received e-mails to or from instructors, etc.)

Advanced Placement Courses

1. Reasons for taking the distance-learning AP course through CTD
2. Grade level when enrolling in the course
3. Type of high school
4. Whether school offers AP courses and number of available AP courses

5. Whether received high school credit for the LearningLinks (LL) course from the school
6. Whether took AP exam in the subject, the date of test, months elapsed between the completion of the LL course and the AP exam, score on the exam, satisfaction level of the LL course in preparation for the AP exam
7. Other way prepared for the AP exam
8. Reasons for not taking the AP exam following the LearningLinks course
9. Whether planning on taking the AP exam next year
10. List of any other AP exams with the score obtained
11. Whether planning for entering college earlier than usual and number of years

Appendix B
Examples of the Coding Process for Open-Ended Comments