Online Learning and the Younger Student—Theoretical and Practical Applications

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The student population that is targeted for online learning has expanded to younger students. This article discusses the theory and practice of using online learning with K-5 students. When trying to adapt adult oriented distance education protocols for use with younger children a number of issues must be considered. These include differences in cognitive competencies and capacities, differences in how independent and autonomous the learning situation is, and differences in curriculum and goals of the educational process. As an example of good practice an online music class created and implemented for third, fourth and fifth grade students is examined. Specific examples of how to adapt distance learning to younger students are shown. The online classes were created using WebCT as a partial requirement for a Master’s degree program in Education at Florida Atlantic University. The music class and three other classes all created for students in K-5 are available for review on the WebCT Internet.

This article examines some of the issues involved in the delivery of web-based learning to younger children in the K-12 system and how to translate these issues into the virtual classroom. We primarily examine an online
music class created by Mrs. Jolene Long, an elementary school music teacher and graduate of the Master’s degree program in Education at Florida Atlantic University (FAU). We also point to examples of other online courses on Art, Bats, and Penguins that have been produced by her FAU colleagues. All of these courses were created for use in the teacher-developer’s own K-5 classes.

The concept of distance education is not a new one. Correspondence courses have been available for over a century and still are available today. Adults have the opportunity to take correspondence courses in a wide variety of both academic and recreational subjects. This mode of educational delivery has the advantage of allowing the students to work on their own time schedule and pace. With the recent explosion of personal computers and the Internet, traditional educational delivery modes have given way to online instruction. In 1997-1998, 44% of all institutions of higher education offered distance-learning opportunities over the Internet, and that percentage is no doubt higher today (Council for Higher Education Accreditation [CHEA], 2000). A cursory glance at any college catalog reveals a plethora of distance learning opportunities with estimates that over 2 million students will be taking courses through this delivery mode by 2002. While higher education is leading the way in distance learning, it is not the only domain for web-based learning.

The profit-sector of private industry and business have discovered the effectiveness and economy of delivering training programs over the Internet and that market will be in excess of $6 billion by the year 2002 (Driscoll, 1999). The U.S. military has also recently invested in a sweeping venture to offer all soldiers online learning opportunities and will spend $600-million over the next six years to enable any interested soldier to take distance-education courses on the Internet at little or no cost (Carr, 2000). Military online learning encompasses both job training and college credit and is targeting the recruitment and retention of military personnel.

For most of the relatively brief history of Internet delivered distance education, the target audience has been adult learners who work on the material independently and asynchronously, but adults are certainly no longer the only audience for web-based distance education. Many high schools offer some classes online in order to expand their course offerings, with some high schools offering their full curriculum online. Florida’s Virtual School, located at: http://www.flvs.net/ has been recognized as a well executed learning environment for secondary learning by the United States Distance Learning Association. Kentucky’s virtual high school, located at: http://www.kvhs.org/, is another good example of an online high school. Ravaglia
and Sommer (2000) point out that since many courses in arts and foreign languages have been dropped or reduced in the high school curriculum, distance education delivery modes can provide those students who wish to take such classes the opportunity without specialized instructors or a classroom full of students. Additionally, with increases in the numbers of high school students who are choosing home schooling options, Internet delivery of curriculum expands the courses and materials available to them. These online offerings can also greatly benefit those students who are geographically isolated or homebound.

More recently, the audience for web based distance education has expanded to younger students. Students who are academically advanced have been one of the first younger student target populations. By utilizing online learning for such advanced students it is now possible to provide these students with individualized distance learning classes through the Internet, allowing for interactive simulations, sound, color, and pizzazz, as well as immediate human feedback, all self paced to allow the students to progress or review at will (Washington, 1997). Many of these students who are academically advanced are the cognitive equals of high school students, so often, no modifications of the material or of the delivery mode are necessary. As distance education has trickled down into the younger and nonacademically advanced end of the K-12 spectrum, cognitive characteristics, social maturity, teacher scaffolding, and a myriad other differences between younger children, older children, and adult learners need to be considered in the production, presentation, and delivery of web based materials (Flavell, Beach, & Chinsky, 1966; Bandura, 1994).

Teaching Elementary Teachers to Create Online Learning

Florida Atlantic University and the College of Education’s Department of Educational Technology and Research have instituted a series of cohorts who, together as a group, pursue their Master’s degree. These cohorts collectively progress through their coursework from start to finish taking classes in such areas as Instructional Program Development, Learning and Instruction Models, Telecommunications, Instructional Design, and Distance Education. The vast majority of these cohort students are active K-12 teachers in the Broward County Florida public school system with most of them teaching in grades K-5. In order to make the coursework more meaningful and applicable to these teachers, efforts are made to focus on projects they can actively use in the K-5 learning environment.
In the Distance Education course (EME 6458), students acquire the technology skills and instructional design knowledge to create and implement both synchronous and asynchronous distance learning courses and programs in order to provide instruction, as the motto of Florida Virtual School says, “any time, any place, any path, any pace.” Part of the course is to develop an online, distance education class that can be implemented in their particular grade and situation. Mrs. Jolene Long has created a unique and interesting class she calls “Recorder 101” to teach music and how to play the recorder (a flute-like instrument) to her students in grades 3 through 5 in a classroom-based, completely online, distance learning course. Ms. Long’s colleagues developed a variety of courses also aimed at the younger distance learner including classes on Art, Bats, and Penguins. All four courses can be found at: http://broward.eduprise.com/webct/homearea/homearea. You can then login as user name: welcome with the password: guest. These courses were developed using WebCT (WebCT, 2001), a distance learning software program that was chosen for several reasons. A primary reason is that WebCT is a secure island in the vast sea of the World Wide Web (WWW or Web). As a password restricted site, the children could not accidentally stumble upon inappropriate or potentially damaging materials. All course materials were within the WebCT “box.” WebCT also has the capacity for the designer to track and monitor the progress of the students, allowing the teacher to give better answers to questions by knowing which lessons the student had already completed.

Recorder 101

Recorder 101 was designed as a completely online autonomous class but as a concession to the student’s ages (from 8 – 11 years in this sample) and level of sophistication using computers, it was decided that the class be offered as a pilot study in the music classroom under the guidance of the designer/teacher. This was done in order to directly monitor the student’s reactions to the course, to be able to assist those students who had technology based problems such as logging on or navigating the course, and monitor if the design of the course was appropriate for the children as they progressed through the music/recorder class.

WebCT contains a number of built in tools including the staples of distance learning communication: e-mail, discussion board, chat rooms, and a whiteboard. In Recorder 101 students were also able to communicate face-to-face. If one student experienced a problem, another student could leave
their computer and demonstrate, assist, or answer their questions. Student-to-student assistance was encouraged by the teacher in both face-to-face and computer mediated communication modes. This fostered a stronger sense of community and gave status to those who had more computer skills, perhaps encouraging and demonstrating the value of education and skills development. The elementary students found the communication tools quickly and used them frequently. Although some students used the e-mail tool to chat, most students in Recorder 101 appropriately used the e-mail tool to help answer each other’s questions. Especially when dealing with younger students, computer mediated communication needs to be well structured and monitored to help keep students on task (Jonassen, 1996).

It will probably come as no surprise, but all students needed initial assistance navigating around the novel WebCT environment, needing help with how to use the various communication tools. Many students also needed some guidance in navigating around the site and in taking online tests. The children developed the requisite skills very quickly, and by the third session, the teacher was only needed for major problems such as the loss of the internet connection, or the computer “freezing up.” Once these technology issues were settled, the children were on to the learning of music, and how to play the recorder.

Online Instruction Design for Elementary Students

There are many instructional design elements that are important in online learning regardless of the age of the target audience. The distance educator must employ a number of strategies focusing on planning, student understanding, interaction, and teaching to ensure a successfully delivered course (Cafolla & Knee, 1999). Distance educators need to facilitate by paying close attention to students, organizing independent learning activities, and being available for consistent reference and reinforcement (Burge & Howard, 1991; Hackman & Walker, 1990; Maloy & Perry, 1991; Strain, 1987).

When trying to adapt adult oriented distance education protocols for use with younger children a number of issues must be considered. These include differences in cognitive competencies and capacities, differences in how independent and autonomous the learning situation is, and differences in curriculum and goals of the educational process.

One important difference between adults/older adolescents and their younger counterparts is in the area of Short-term memory (STM) capacity. STM studies comparing adults and children show children have a significantly smaller STM capacity (Dempster, 1981; Myers & Perlmutter, 1978).
A large amount of information can still be learned by younger children if it just needs to be presented in smaller instructional pieces with no distractions. Instead of feeding them a whole chocolate bar all at once, think of feeding the student a bag of M & M’s. In Recorder101, the designer was careful to break the lessons down into small chunks of information. Each instructional element in the content modules was a small manageable cognitive piece. Even the PowerPoint lessons are short and sweet (Figure 1).

Figure 1. PowerPoint of the soprano recorder

Closely associated with limitations of STM capacity are limitations in attentional capacity. Attentional capacity is much smaller in children when compared to adults. Piaget described this as centration where children are only capable of focusing on one aspect to the exclusion of all others. When a child’s attention is focused on something, it is difficult (if not impossible) to attract his attention because of his limited attentional capacity. A classic example of this is trying to converse with a child while they are watching television (or perhaps a husband while he is watching a playoff game). When designing online learning for children, background graphics, fonts, and text layout all need to be simple and consistent. Complicated visual fields are likely to distract them from the content on the page (Problems of
attention and visual search, 1999). Recorder 101 incorporates this “less is more” graphic strategy. The site is pleasing to the eye with a sparing use of animated images. Consistent background designs help students recognize recurring patterns, as well as to quickly identify important highlighted material (Abby, 2000).

*WebCT* also contains consistent navigational cues to lighten the cognitive load. Since children have a smaller amount of attention available to use it is important not to waste it on navigational elements. *WebCT* contains a navigational tool called breadcrumbs which shows the student a visual representation of the “clicking” path. Breadcrumbs provide a linked concept map of where you are on the site and where you have been.

Just as important as the attentional differences that children display are the qualitative differences in cognition. Piaget described these differences as a series of developmental stages. Piaget and Inhelder (1969) proposed that programs for older students may be inappropriate and impossible for younger students because of the cognitive limitations of younger compared to older children/adults. Piaget’s stage theory of cognitive development proposes that maturation and experience work together to develop children’s cognitive skills and styles. Children in early elementary school fall into Piaget’s stage of Pre-Operational thought, those in late elementary school and early middle school fall in the Concrete Operations stage, and those in late middle school, high school, and beyond are in the Formal Operations stage of cognitive development. Piaget suggested that older children not only know more things (words, facts, formulas), but also do different types of mental work on that knowledge.

Since young children studying online have not reached what Piaget describes as the Formal Operational stage of cognitive development they are especially dependent on good online instructional design. The entire set of lessons in the Recorder 101 class is contained in one content module. This content module is in a sequential, linear order so students know where to begin and where to go next (Figure 2).

This type of organization fits well with the cognitive maturity level of elementary children. Good online instruction makes heavy use of Embedded Support Devices (ESD). Martens (1998) described ESD as a whole spectrum of online additions to help compensate for the lack of a teacher present in front of the classroom. ESD are instructional elements such as examples, questions with feedback, study tips, self-tests, and learning objectives. Recorder 101 makes heavy use of ESD’s. One of these ESD’s is the use of highlighted key words in the instructional text for emphasis of key conceptual points (see Figure 3).
Other important vocabulary words are hyperlinked to the WebCT glossary tool. All the student needs to do is click on the linked glossary word to display a small pop-up window containing that word’s definition. Another ESD in Recorder101 is practice tests that are taken before the “real” test. This allows students feedback on what they need more work on to insure a rewarding performance on the test. Further, since younger children who are in Piaget’s Pre-Operations stage of cognitive development do not have the ability to reason abstractly, Recorder 101 gives the children lots of real-world examples. There are pictures of students sitting in proper playing posture. There are pictures of a recorder. There are diagrams of finger position charts (Figure 4).
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Figure 3. Highlighted text used as an embedded support device

Figure 4. Finger positioning chart
There is also a progress report to further aide the younger students as an ESD in the content module. “What should I know?” gives the students a check list to help them stay on track (Table 1).

**Table 1**
Progress report as an embedded support device

<table>
<thead>
<tr>
<th>What Should I Know?</th>
<th>What to do?</th>
<th>Done?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Read the syllabus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Copied / downloaded the syllabus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Started my portfolio, table of contents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Purchased and received Adventures CD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Created student page, uploaded to WebCT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Participate in the discussions often</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Downloaded fingering chart and took pre-test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Know fingerings B, A, G, D, C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Practiced song charts 1-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Took the first online test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Older adolescents/adults are more independent and autonomous than children, while younger students may still be developing the skills necessary to be successful. In general, younger students need more guidance and encouragement than older students. The younger student is more dependent on their teacher for what Vygotsky (1962, 1978) termed scaffolding. Scaffolding is cognitive and social support that allows the student to go beyond where they could go without such support, greatly enhancing the learning process (Wood, 1980; Wood, Bruner & Ross, 1976).

There are also significant differences between older and younger students in terms of motivation. Adults are often motivated to learn because of the tangible rewards that come with increased education and training. Children often don’t understand the value of their lessons and they sometimes lack intrinsic motivation as well. This requires the designer of programs aimed at younger children to include specific feedback and reinforcement.

**SUMMARY**

Online learning presents special challenges when aiming the instruction at younger students, but with proper knowledge of the target audience even subject areas that you might not expect to see online, such as music can be successfully created and enjoyed by the students. Mrs. Long’s students
completed a survey at the conclusion of her class and 98% had positive comments. It will be interesting to follow other online courses developed by Mrs. Long’s fellow cohort students in the Masters program at Florida Atlantic University. Due to the timing of the class at the writing of this article other online classes have yet to be fully implemented. Other online courses developed for the K-5 grade level included an instructional unit on Penguins, another unit on Bats, and a course in Art, to name just a few.

The age of the target audience is a huge factor when developing or implementing web-based distance education programs. Where a fully online, autonomous program may be satisfactory for high school or adult learners, it may not be beneficial for younger children. It makes sense to combine the best of both traditional face-to-face and online delivery to produce web-enhanced learning environments for the younger end of the K-12 spectrum. Ideally, distance learning programs should augment, rather than replace the existing classroom expanding the elementary curriculum and filling gaps in traditional course offerings while keeping learning firmly centered within the school (Ravaglia & Sommer 2000).

Because of all of the developmental challenges that young children present in online learning environments we recommend that any distance education project directed toward K-5 grade levels be first run through an implementation phase. This would include the teacher/designer piloting the program for at least one term within the overview of the classroom situation. Another advantage of a pilot would be that it would allow those teachers/designers to produce standards and protocols for distance education in this age group and to share with others that are interested how to produce the most effective, efficient, and enjoyable experience for learners of any age. Perhaps out of these projects, a new standard can be created whereby effective and appropriate distance education can be created for those traditional students in the K-5 age range.

References


