

# Perceptions of Effective Web-based Design for Secondary School Students: Initial Findings

Michael Barbour (mkb@uga.edu)  
University of Georgia at Athens

**Abstract**– This article considers the initial findings of a study on the perception of course developers and electronic teachers on the characteristics of effective web-based design for secondary school students. Through interviews, the perceptions of the participants on various web-based components, instructional strategies, and the effectiveness of both are investigated in a virtual high school context.

## Introduction

In 1988, after calls for a provincial distance education program (Riggs, 1985, p. 28), the Government implemented a distance education program to provide students in small schools courses that were important for post-secondary admission but were difficult to offer in rural schools due to student enrolment. In its first year, there was one course with an enrolment of 36 students in 13 schools. By 1999-2000, there were 11 courses with 898 enrolments (Brown, Sheppard, & Stevens, 2000).

Over the next decade, amid additional calls for a school of distance education (Williams, 1993, p. 321), through different provincial and individual school district initiatives, various methods of web-based delivery for secondary school students. For example in 1996 the Government, through the East-West Project, was involved in the creation of five information technology curriculum modules. In 1999 the Centre for TeleLearning and Rural Education and the Vista School District created the *Vista School District Digital Intranet: The Delivery of Advanced Placement Courses to Young Adult Learners in Rural Communities*, which saw the development of four courses for web-based delivery. Initiatives such as these provided models for authoring standards, design templates and pedagogical technology tool usage that have been used as the basis for further web-based distance education initiatives.

In 1999, the Government appointed a ministerial panel that recommended the creation of the Centre for Distance Learning and Innovation (CDLI) based on a web-based model not “totally dependent on high bandwidth technologies and [a] minimal reliance on synchronous communications, fixed schedules or other constraining elements,” as had been evolving throughout the province (Sparkes & Williams, 2000, p. 65). The CDLI began in 2001-02 with ten courses field tested in ten districts (i.e., one course per district), having a total of 200 student enrolments from 76 different rural schools. After the field test, the CDLI expanded its course offerings so that students from all over the province could access any course. Over the past four years, the CDLI has increased its offerings to the point where there are 1,500 student enrolments from 95 different schools in thirty-five courses in 2004-05 (Government of Newfoundland, 2004).

The development of these web-based courses has been done largely based upon the lessons learned through previous distance education programs within in the province. While valuable, there has been little formal reporting of these lesson. In addition, the vast majority of research into web-based course design has been conducted on adult learning populations. The purpose of this study is to discover the characteristics perceived to be important by course developers and teachers of web-based courses, along with the perceptions of the secondary students themselves, for an effectively designed web-based course for secondary school students. This article reports the initial findings from the interviews conducted with course developers and teachers of these web-based courses.

## **Literature Review**

Over the past two decades the use of distance education has expanded to the K-12 environment, particularly in rural schools. Today, K-12 distance education has taken the form of

web-based virtual schools, which have growth throughout Canada and the United States. According to Clarke (2003) “by August 2002, at least 14 states had virtual high schools in operation that were officially recognized by the governor, legislature or state education agency as ‘the’ statewide virtual school” (p. 678). In the summary of their three year evaluation, the Virtual High School (2003) stated that it worked “with nearly 200 high schools in 24 states and 10 countries” (p. 10). Within Canada, initiatives such as the Open School in British Columbia, Contact North in Ontario and the Centre for Distance Learning and Innovation in Newfoundland have led the way in providing web-based distance education for secondary school students.

There has been much research on web-based course design. Collins (1999) illustrated ten guidelines for instructional designers. These included

1. Plan for flexibility and adaptation when the WWW-based course-support system is defined.
2. Design for a variety of roles for both instructors and students; allow roles to be interchangeable or modifiable ...
3. Do not assume students will use the course-support site as a primary source of course content...
4. Use the course –support site to supplement study materials, and to integrate and manage student study activities ...
5. Design the WWW site so that students and instructors can input and make use of a variety of combinations of supplemental media and resources...
6. Design for minimal technical levels: levels of technical support, for minimal levels of computer-related skills and competencies, for minimal level of on-line time...
7. Reduce text fixed on the screen to a minimum; use a minimum of graphic and iconic element and provide context-sensitive help...
8. Offer a flexible assortment of tolls that can be combined for different communication configurations...
9. Design to organizational flexibility: so that courses of different lengths, offered at a variety of time, and with different types and levels of prerequisites and examination/assessment requirements can be supported...
10. Be realistic about what instructors can and will do...(pp. 204-206)

Gallini and Barron (2001-2002) found that “most students (77%) prefer a course structure with clear guidelines along with opportunities in the course to suggest alternative approaches to meeting course objectives. [They also found that] approximately 97% indicated that they communicated more with their instructors and peers in courses that integrated Web-based components than in courses that did not” (p. 149). While Stein (2004) found that “contrary to

theories of transactional analysis that state that low structure, the ability to negotiate with the instructor, and the autonomy that online learning offers are valued at a premium... that structure was the most important factor in online learner satisfaction and community formation..." (p. F1).

However, this research conducted in online learning has focused upon post-secondary institutions and corporate America (see other examples Duvchastel, 1997; Twigg, 2001; Zhu & McKnight, 2001; Murphy, 2003; McKnight, 2004). Furthermore, the only reference Gunawardena & McIsaac (2004) make to the K-12 system is a two paragraph discussion on the use of personal digital assistants in distance education (pp. 369-370). In their chapter about online learning from the same publication, Hill, Wiley, Nelson & Han (2004) made no specific reference to Internet-based learning within the K-12 environment. Further, as a part of their nine year literature review of the *American Journal of Distance Education*, Kolbe & Bunker (1997) found there had only been a minor shift in the original emphasis upon adult and continuing education to reflect the growing interest in distance education in public schools (p. 35).

The problem with this focus upon an adult population is that there is a difference between how adults learn compared to the way adolescents learn. The study of how adults learn is known as andragogy. Knowles (1970) stated that "andragogy is premised on at least four crucial assumptions about the characteristics of adult learners that are different from the assumptions about child learners on which traditional pedagogy is premised" (p. 39). Within the mainstream of educational research, andragogy is seen more as a set of assumptions, as opposed to an actual learning theory. However, even in his harsh critique of Knowles, Bright (1989) stated "it is not being suggested that there are no differences between adults and children. On the contrary, there are probably many..." (p. 55). Some in the field of distance education have argued that these differences are based upon theories of cognitive development, as opposed to actual learning

theory. For example, in his discussion of the importance of learner autonomy to the success of distance education Moore (1973) suggested

in Erikson, the ego quality of autonomy emerges in infancy, though it would be consistent with his theory for a particular kind of autonomy, such as 'autonomy of learning' to emerge at a developmental stage in which the primary ego crisis is no longer that of 'autonomy versus shame and doubt.' It may well be that, as learners, people are struggling in an 'autonomy versus shame and doubt' crisis in grade school, high school, or university. (p. 667)

While Cavanaugh, Gillan, Kromrey, Hess, Blomeyer (2004) suggest that "since adults have progress through these stages of cognitive development, delivery of web based education at the adult level need not concentrate on methods that help the learner develop these cognitive skills" (p. 7).

These researchers were suggesting that adolescents aren't as far along in their cognitive development as adults and therefore need additional supports that may or may not be available in distance education environments. It is because of these differences, along with the increasing number of K-12 students enrolled in web-based courses, there is a need for more research in the design characteristics of web-based distance education at the K-12 level.

## **The Study**

This study is the initial portion of a study on the perceptions of the characteristics of effective web-based design for secondary school students within the CDLI environment. This initial portion considers the perceptions the administration of the CDLI, course developers and those who held the role of both course developers and electronic teachers.

### *Data Collection*

The data collection process has involved telephone interviews with different course developers, e-teachers and individuals who have held both roles for the CDLI. An e-mail was sent to twenty-four e-teachers (eight of which were also developers) and four course developers (four others were not contacted; three having retired from teaching and the fourth's e-mail

address is unknown). Four individuals agreed to participate: three course developers and two individuals who were both course developers and e-teachers.

John was one of the initial developers and was perceived as one of the stronger course developers until accepting a new job with the understanding he would not seek to be seconded by the CDLI. Cliff, a retired teacher who spent twenty-nine years in the classroom, is designing his first course. Norman, one of four original developers who went on to be an e-teacher, has also developed sections of two other courses and is teaching a second web-based course. Bill, about to begin his thirtieth year of teaching this September, is another of the initial developers with the organization for the past three years as an e-teacher.

Finally, Sam is a principal of a small, rural school, where he has taught in almost every subject area at every grade level, even though he is trained as a Science teacher. Prior to becoming involved with the CDLI, he had been active in distance education, both as a school-based supervisor of distance education students and a teacher in the former TETRA/Tele-medicine system. In addition, there was also an administrator with the CDLI interviewed: George, who has been involved in distance education in the province for the past decade and a half; first as a distance education coordinator in a rural school, then as an instructor and content developer, and later with a web-based program; making him a natural choice to fill one of the administrative positions in the CDLI.

### *Data Analysis*

Prior to the interviews being conducted the researcher, due to his experience with the CDLI and other web-based initiatives directed at secondary students, was attentive to potential categories. During the transcriptions of the interviews, the researcher began to search for emergent themes that were present in each of the interview transcripts (Kvale, 1996). As themes

were identified, each one was written in the form of a statement and the transcripts were again analyzed for quotations that would support or detract from each of the statements (Shank, 2002).

These statements formed the basis of the initial findings.

### **Initial Findings and Discussion**

Based upon the transcripts from the six interviews, an initial list of seven guidelines was developed. When designing web-based content for secondary school students, course developers should:

1. prior to beginning development of any of the web-based material, plan out the course with ideas for the individual lessons and specific items that they would like to include;
2. keep the navigation simple and to a minimum, but don't present the material the same way in every lesson;
3. provide a summary of the content from the required readings or the synchronous lesson and include examples that are personalized to the students' own context;
4. ensure students are given clear instructions and model expectations of the style and level that will be required for student work;
5. refrain from using too much text and consider the use of visuals to replace or supplement text when applicable;
6. only use multimedia that will enhance the content and not simply because it is available; and
7. develop their content for the average or below average student.

The following discussion provides some of the material from the interview transcripts that supported these guidelines.

Course developers should, prior to beginning development of any of the web-based material, plan out the course with ideas for the individual lessons and specific items that they would like to include. More directly, the CDLI administrator George stated that course developers should "not attempt to write anything, do not attempt to construct anything, until you have designed your project out from end to end, from start to finish... if you fail to do this, here's what happens... if you get in there and get on with it and make a misstep, ... undoing that mistake usually means changes that percolate right through the web of work that you've constructed. So, undoing your mistakes is horrendously difficult. Second thing is that when you take the time to lay your project out from start to finish, the chances are you will confer with

other people and that means that you will add layers of... important content... to your project that would not otherwise have been there if you did not take the time.”

Additionally, course developers should keep the navigation simple and to a minimum, but don't present the material the same way in every lesson. At present, the CDLI utilizes a standard developer's template (see Figure 1).

**Figure 1 – Overview of the CDLI developer's template**

Unit 01 ▶ Section 01 ▶ Lesson 01



This template breaks each of the student lessons down into five pieces: “You Will Learn” – briefly lists, in student friendly language, the instructional outcomes for the lesson; “You Should Know” – lists, and when necessary elaborates on, knowledge and skills students are expected to have mastered prior to the lesson; “Lesson” – is self-explanatory and may be broken into multiple pages; “Activities” – contains further instructional events the student that students need to carry out in order to master the lesson outcomes; and “Test Yourself” – offers an opportunity for the student to gauge the degree to which the outcomes were achieved” (Centre for Distance Learning and Innovation, 2003, p. 12).

With reference to the lesson outcome, students tend not to use “You will learn” and “You should know” in the developer's template.

They don't read... “You will learn” ... “You should know,” they go... right to the “Lesson.” (John)

Instead of going... “You will learn,” or “You should know,” and so on, they'll click right to the “Lesson”... if I have any activities assigned to them, they'll simply just go right to the “Activities,” they won't even bother with the “Lesson” itself. (Norman)

The only things that are looked at... are the “Activity” sections... the other parts... there's nobody looking at them... they go right to the “Activities”... to see what they have to produce. Then they'll go back to the “Lessons” to get the background... to the activities. (Bill)

Based on these observations, course developers should also include this information in the text of their “Lesson,” in most instances in the first paragraph.

However, it is also important to ensure there the material is not presented the same way in every lesson. Each lesson “has to offer a certain sense of choice to the students preferred style or mode of learning. Some students learn better by reading, some... with their hands, [and] some... by discussing items. Now a well designed lesson would either a) provide a couple of approaches or b) at least in the long scheme of things the lessons taken in aggregate would provide... a varied approach” (George). This diversity is necessary because “to turn kinds on... every unit should be different... everything needs a unique flavor to keep the kids interested, [so] you’ve got to do every unit with... a slightly different spin” (Cliff).

Course developers should provide a summary of the content from the required readings or the synchronous lesson and include examples that are personalized to the students’ own context. The first thing is that developers should “try to develop a good set of notes [and] a good set of worked examples” (John) for the students. Many of the interviewees referenced the fact that many students, especially those of average ability and below average ability, do not read their textbooks and when they do they have poor strategies for finding important material.

In addition, it is important to consider the use of examples from their own contexts that the students are able to personalize. One course developer and teacher stated that he had students “looking a lot at their own lives [and] their own communities” (Bill). “For example, if it’s... a student in Newfoundland and Labrador, you would use organisms that would reside in the province themselves,” which “can provide [the students] with something a little more substantive and relate to where they are” (Norman). The reason to have students personalize the material is because teachers believe they need “to draw [the students]... to understand or to lead them to an

understanding of certain content” (Norman) and to be “able to... guide the students and... be able to monitor... when the students weren’t grasping something” (Bill).

Course developers should ensure students are given clear instructions and model expectations of the style and level that will be required for student work. According to the course developers and teachers, the lesson portion in particular should provide the students with clear instructions and expectations. Students “need to have clearly defined what has to be done [over] a certain period of time” (John). “The directions and the expectations [need to be] precise enough so students can work effectively on their own, not providing a roadblock for their time” (Bill). They also referred to the fact that students should be shown how to respond to the questions that they may be presented. By providing the students with a good set of notes and worked examples, the course developer will give the student the opportunity to achieve the lesson outcome

Course developers should also refrain from using too much text and consider the use of visuals to replace or supplement text when applicable. Unfortunately, “you’re trying very often to explain things... [that are] difficult to understand. The more explanation you have there the less chance... students are going to read it, but some of the concepts are just too difficult to be... presented very concisely” (Bill). This requires course developers use strategies to shorten long portions of text. One way a course developer can shorten long portions of text is through the use of visual images. “By providing students a visual cue with the written information it does provide a connection for them” (Norman). By using images, course developers can break up the amount of text that is presented to the students and visual are also useful to “communicate abstract ideas” (Cliff).

In addition, course developers should only use multimedia that will enhances the content and not simply because it is available. These do not have to be sophisticated pieces of computer

programming, for example, a graph where students can “move their mouse over a point [and] it would identify what that is, and, tell them the purpose of it on the graph” (Norman). However, when selecting interactive items, developers should ensure that selections are based on solid content or pedagogy. “There should be a lot of distractions there with things that... might be gimmicky” (Bill). Too often, “trying to be too flashy... really may distract... from the lesson itself and students may miss the message” (Norman).

Finally, course developers should develop their content for the average or below average student. “Appropriateness... [is] an important thing... because a lot of... people who develop courses... design... for... top students... but we’re also going to have some very, very weak students... so even if you’re into doing complicated material... keeping it as simple as possible” (Bill). Always remember “students are still students and... we shouldn’t assume that they’re all self motivated... it’s much better to shoot... for the average and below average student... making sure that... there’s a structure in place that guarantees they’re doing their... work” (Cliff).

The purpose of this study was to generate a list of characteristics of effective web-based design specifically for secondary students. As discussed earlier that there were differences between the ways in which adults learn and how adolescents learn. Considering the guidelines discussed in the previous section, it should be noted that there was little similarity with the ten guidelines for instructional designers illustrated by Collins (1999), which was provided for a higher education (i.e., adult) audience. Based upon the interview transcripts, one of the reasons for this difference may be the maturity of the adolescent learner.

Expanding upon Knowles (1970),

at least four crucial assumptions about the characteristics of adult learners that are different from the assumptions about child learners on which traditional pedagogy is premised. These assumptions are that, as a person matures, 1) his self-concept moves from one of being a dependent personality toward

one of being a self-directing human being; 2) he accumulates a growing reservoir of experience that becomes an increasing resource for learning; 3) his readiness to learn becomes oriented increasingly to the developmental tasks of his social roles; and 4) his time perspective changes from one of postponed application of knowledge to immediacy of application, and accordingly his orientation toward learning shifts from one of subject-centeredness to one of problem-centeredness. (p. 39)

Many of these assumptions were counter to the logic stated above by the interviewees of their experiences with adolescent learners. This underscores the need for additional research into online learning for secondary students, in general, and the characteristics of effective web-based design in particular.

## **Conclusion**

While still a work in progress, the guidelines from the six initial interviews provide a promising start to filling the gap that exists in the literature. The next stage of this research will be to conduct individual interviews and at least one focus group with students who have taken or are engaged in courses with the CDLI. The perceptions of these secondary school students will aid in the development of better guidelines that can be utilized by those who design web-based instruction for the CDLI and other virtual high school.

With the declining population in many rural areas, necessity for the delivery of instruction to students in these schools the number of web-based course offerings will continue to increase. During this period of growth, it is imperative that the design of web-based courses allows all students to take advantage of the opportunity that they afford. Otherwise as Sam was quoted earlier as saying: “undoing [those] mistake[s will] mean changes that peculate right through the web of work that [has been] constructed.”

## **Selected Bibliography**

- Bright, B.P. (1989). Epistemological vandalism: Psychology in the study of adult education. In B.P. Bright (Ed.), *Theory and practice in the study of adult education: The epistemological debate* (pp. 34-64). London: Routledge.
- Brown, J.; Sheppard, B.; & Stevens, K. (2000). *Effective schooling in a tele-learning environment*. St. John's NL: Centre for TeleLearning and Rural Education
- Cavanaugh, C., Gillan, K.J., Kromrey, J., Hess, M., Blomeyer, R. (2004). *The effectes of distance education on K-12 student outcomes: A meta-analysis*. Naperville, IL: Learning Point Associates. Retrieved on November 24, 2004 from <http://www.ncrel.org/tech/distance/k12distance.pdf>
- Centre for Distance Learning and Innovation. (2003). *CDLI educator's reference manual*. St. John's, NL: Government of Newfoundland and Labrador. Retrieved on February 24, 2005 from [http://www.cdli.ca/pdf/2003\\_educators\\_reference\\_manual.pdf](http://www.cdli.ca/pdf/2003_educators_reference_manual.pdf)
- Clarke, T. (2003). Virtual and distance education in American schools. In M.G. Moore & W.G. Anderson (Eds.), *Handbook of distance education* (pp. 673-699). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Collins, B. (1999). Designing for differences: Cultural issues in the design of WWW-based course-support sites. *British Journal of Educational Technology*, 30(3), 201-215.
- Duchastel, P. (1997). A web-based model for university instruction. *Journal of Educational Technology Systems*, 25(3), 221-228.
- Gallini, J. & Barron, D. (2001-2002). Participants' perceptions of web-infused environments: A survey of teaching beliefs, learning approaches, and communications. *Journal of Research on Technology in Education*, 34(2), 139-156.

- Government of Newfoundland. (2004, September 9). *CDLI's reputation continues to grow*. St. John's, NL: Queen's Printing for Newfoundland and Labrador. Retrieved on December 9, 2004 from <http://www.gov.nl.ca/releases/2004/edu/0909n04.htm>
- Gunawardena, C.N. & McIsaac, M.S. (2004) Distance education. In D.H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (pp. 355-395). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Hill, J.R., Wiley, D., Nelson, L.M. & Han, S. (2004). Exploring research on Internet-based learning: From infrastructure to interactions. In D.H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (pp. 433-460). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Knowles, M.S. (1970). *The modern practice of adult education: Andragogy vs. pedagogy*. New York, NY: Association Press.
- Kolbe, M.A. & Bunker, E.L. (1997). Trends in research and practice: An examination of *The American Journal of Distance Education* 1987 to 1995. *American Journal of Distance Education*, 11(2), 19-38.
- Kvale, S. (1996). *Interviews: An introduction to qualitative research interviewing*. Thousand Oaks, CA: Sage Publications.
- McKnight, R. (2004). Virtual Necessities: Assessing online course design. *International Journal on E-Learning: Corporate, Government, Healthcare, & Higher Education*, 3(1), 5-10.
- Moore, M.G. (1973). Toward a theory of independent learning and teaching. *Journal of Higher Education*, 19(12), 661-679.

- Murphy, E. (2003). Moving from theory to practice in the design of web-based learning from the perspective of constructivism. *The Journal of Interactive Online Learning*, 1(4). Retrieved on March 18, 2004 from <http://www.ncolr.org/jiol/archives/2003/spring/4/MS02028.pdf>
- Riggs, F. (1987). *Report of the small schools study project*. St. John's, NL: Queen's Printing for Newfoundland and Labrador.
- Shank, G.D. (2002). *Qualitative research: A personal skills approach*. Upper Saddle River, NJ: Pearson Education Inc..
- Sparkes, R & Williams, L. (2000). *Supporting learning: Report of the ministerial panel on educational delivery in the classroom*. St. John's, NL: Queen's Printing for Newfoundland and Labrador.
- Stein, D. (2004). Course structure: Most important factor in student satisfaction. *Distance Education Report*, 8(3), F1.
- Twigg, C. (2001). *Quality assurance for whom? Providers and consumers in today's distributed learning environment*. Retrieved March 18, 2004 from <http://www.center.rpi.edu/pewsym/mono3.html>
- Virtual High School. (2003). *Virtual High School program evaluation 2001-2003*. Maynard, MA: Virtual High School, Inc.
- Williams, L. (1993). *Our children, our future: Report of the royal commission of inquiry into the delivery of program and services in primary, elementary, secondary education*. St. John's, NL: Queen's Printing for Newfoundland and Labrador.
- Zhu, E. & McKnight, R. (Eds.) (2001). *Principles of online design*. Retrieved on March 18, 2004 from <http://www.fgcu.edu/onlinedesign>