JOURNAL OF DISTANCE EDUCATION
REVUE DE L'ÉDUCATION À DISTANCE
SPRING/PRINTEMPS 2007
VOL. 21, No. 3, 93-114

Principles of Effective Web-based Content for Secondary School Students: Teacher and Developer Perceptions

Michael K. Barbour

Abstract

In this article, I describe findings from a study of the perceptions of course developers and electronic teachers on the principles of effective asynchronous web-based content design for secondary school students. Through interviews, participants' perceptions of various web-based components and instructional strategies, and the effectiveness of both based upon the experiences of the participants were investigated in a virtual high school context for the purpose of generating a list of guidelines that future course developers might utilize.

Resumé

Dans cet article, je décris les résultats d'une étude sur la perception des concepteurs de cours et des enseignants en ligne à propos des principes de conception d'un contenu Web asynchrone efficace pour les étudiants du secondaire. À travers des entrevues, les perceptions des participants, à propos de différentes composantes Web et stratégies de formation, et de l'efficacité de ces éléments sur l'expérience des participants, ont été étudiées dans le contexte d'un environnement virtuel de niveau secondaire pour générer une liste de recommandations pour les concepteurs de cours.

Introduction

In 1999, calls for a provincial web-based distance education program (Sparkes & Williams, 2000), resulted in the Government of Newfoundland and Labrador creating the Centre for Distance Learning and Innovation (CDLI) in 2001. One of the functions of the CDLI was to deliver provincially mandated courses to secondary students, the majority of whom attended schools located in rural communities. In addition, approximately one third of these schools have been determined to be "necessarily existent," a term used when a school is located so far from another school that it makes bussing the students from that community to another school impossible due to distance or geography (Government of Newfoundland and Labrador, 2005, pp. 9-10). As with most schools located in rural areas, many did not have sufficient teachers to be able to offer many aspects of the curriculum. Simply put, in this

closed environment rural schools were not able to compete with their larger, urban counterparts (Stevens, 1997).

Over the past four years, the CDLI has increased its secondary school offerings to where there were 1,500 student enrolments from 95 different schools in thirty-five courses (Govt. of Newfoundland, 2004). These 1500 students typically took the majority of their courses through teacher-led, classroom-based instruction. Their CDLI involvement was usually limited to one or two courses, usually undertaken in an unsupervised distance education room. In the CDLI courses the teacher was not physically present, but provided a combination of synchronous instruction using Elluminate Live® and asynchronous instruction using WebCT®.

Teachers who are hired to develop the asynchronous content for the CDLI courses are required to use a standard template created by the CDLI to ensure that all courses have a similar look and feel (see Figure 1). This template divides a lesson into five separate webpages: "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" contains subject content and instructional processes and may be broken into multiple pages; "Activities" contains further instructional tasks the student should carry out in order to master the lesson outcomes; and "Test Yourself" offers an opportunity for students to gauge the degree to which they achieved the lesson outcomes (Centre for Distance Learning and Innovation, 2003, p. 12). Once completed, this template is uploaded into the WebCT shell.

In large part, the development of this asynchronous material for the CDLI has been based upon lessons learned from previous web-based distance education programs in the province (e.g., the East West Project and the Vista District Digital Intranet (see Barbour, 2005a for a more complete discussion). While valuable, there has been little formal reporting of these lessons. Therefore, in this study, I sought the perceptions of course developers and teachers with the CDLI concerning the elements of asynchronous web-based content which they felt were effective for secondary school students within the CDLI environment.

Figure 1. Overview of the CDLI developer's template.

Rationale for the Study

Dick, Carey and Carey (2005) recommend using Moore's theory of transactional distance when designing instruction for distance learners such as the students engaged in learning through the CDLI. Moore's (1972) theory was based upon the premise that adult learners are autonomous learners and therefore distance education instruction should be flexible in design and could have a low level of interactive communication. Historically, the practice of and research into distance education and online learning has been focused upon adult populations, such as those found in post-secondary institutions or corporate environments, and until very recently relatively little was known about distance education in K-12 contexts.

This context for the literature is important because of the differences in cognitive development between adult and adolescent learners. As Moore (1973) speculated, "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). In addition, 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). Virtual school researchers Cavanaugh, Gillan, Kromrey, Hess and Blomeyer (2004) suggested, "since adults have progressed 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). In this context, the methods designed to help the adolescent learner develop cognitive skills are provided as guidance to these learners to ensure that they remain within a space that is sufficiently challenging, yet personally motivating (Vygotsky, 1962, 1978).

Moore (1973) also stated that typically K-12 students "should not be compelled to assume a degree of autonomy they are not ready to handle, and so it is customary in child education for the preparatory and evaluation processes to rest entirely in the hands of the teacher" (p. 84), or in the case of asynchronous web-based instruction the teacher and course developer. Children are not ready to assume high degrees of autonomy, and thus adolescent learners require more structure in their educational settings. This is particularly so in distance education settings such as virtual schools where the lack of proximity to the teacher decreases one of the main sources of guidance for K-12 students. The present state of the design of K-12 distance education has led one rural education scholar to wonder if web-based distance education may not be suitable for all secondary-level students or if these opportunities are provided solely for a select group of students (Mulcahy, 2002).

It is because of these differences that it is important to explore the perceptions of those with experience in designing asynchronous web-based content for adolescents. Unfortunately, the research into alternative principles that cater to secondary students has only just begun (see Barbour, 2005b, 2005c; Barbour & Cooze, 2004; Bruning, Horn & PytlikZillig, 2003; Cooze & Barbour, 2005; Morris, 2002, Muirhead, 2000) and recommendations at present are still preliminary.

Literature Review

Although the CDLI had already created an instructional design that it required its course developers to use, the format provided limited constraints on how teachers might employ the template in helping students learn and be successful. This literature review, therefore, explores the principles that have been found to be effective in the design of distance education and specifically web-based instruction.

Much of the research conducted on principles of effective web-based instructional materials have focused on or include the elements of course structure and student interaction. For example, in their study of student and faculty perceptions of whether the use of web-infused courses influenced learning styles and instructional practices, Gallini and Barron (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" (p. 149). 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). This was consistent with the thinking of Moore and Kearsley (1996), who underscored both the importance of providing a structure for the content and the learning process and that student involvement is always critical. Similarly, Shearer (2003) described the need for flexibility in the structure of web-based distance education to accommodate learners' independent personal and professional needs and, more generally the importance of the learner autonomy/learner control and interaction as two important design aspects in distance education.

In addition to individual principles, there have been many sets of guidelines proposed in the literature. For example, Moore and Kearsley (1996) identified a series of general principles they felt applied to all well designed distance education: good structure, clear objectives, small units, planned participation, completeness, repetition, synthesis, stimulation, variety, open ended, feedback, and continuous evaluation (pp. 122-123). This list has many elements similar to those identified by Gunawardena and McIsaac (2004). Their review identified "interactivity, student

support, media selection, instructional design issues and feedback" as elements of course design commonly found in the literature. Finally, these two lists were consistent with Kanuka (2002), who developed a set of principles encouraging the use of higher levels of teaching and learning in web-based distance education based upon her dissertation research conducted with post-secondary level instructors and educational technology support staff. Her principles included such things as integrating the importance of the content to the learner in its presentation, the use of diverse instructional approaches and meaningful evaluation, along with the use of tools for learner independence.

In her description of the TeleTOP method utilized at the University of Twente, Collis (1999) offered a list of ten guidelines for designers of web-based instruction.

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. Within the same system, offer support for a variety of types of learning experiences.
3. Do not assume students will use the course-support site as a primary source of course content; many students cannot be on-line often or for long periods of time and many do not respond positively to reading from the screen, even when access is not a problem. Books and print materials are better for primary study materials in terms of portability, ease of use and cultural fit than computer materials.
4. Use the course-support site to supplement study materials, and to integrate and manage student study activities. The course-support site should initially be as empty as possible, to be filled by the instructor and students in their own ways as the course proceeds, including accessing student-created or instructor-created materials from previous sessions of the course via the underlying database.
5. Design the WWW site so that students and instructors can input and make use of a variety of combinations of supplementary media and resources: multimedia materials, links to external WWW-based materials, student-created materials, instructor-created materials including computer-based presentation files and notes.
6. Design for minimal technical levels: levels of technical support, for minimal levels of computer-related skills and competencies, for minimal levels of on-line time.
7. Reduce text fixed on the screen to a minimum; use a minimum of graphic and iconic elements and provide context-sensitive help (i.e., via pop ups).

8. Offer a flexible assortment of tools that can be combined for different communication configurations.
9. Design for organisational flexibility: so that courses of different lengths, offered at a variety of times, and with different types and levels of prerequisites and examination/assessment requirements can be supported.
10. Be realistic about what instructors could and should do; instructors have little or no time and little or no interest in creating electronic learning materials and often do course-related activities (preparing lectures, giving feedback to student work, setting test questions, etc.) at the last minute. Design the system to reflect these realities. (pp. 204-206)

While there are many other such lists of instructional design principles (e.g., McLoughlin and Oliver (2000) offered a list of ten design principles for culturally inclusive instructional design, while Gunawardena and McIsaac (2004) also proposed six characteristics for the adoption and use of technologies for distance education), I have chosen to focus upon the principles provided by Collis because of their focus upon web-based design.

Research Design and Methodology

In preparing for and providing course instruction, CDLI uses a combination of course developers who prepare the course materials in WebCT and teachers who are employed to instruct students using both synchronous interaction through Elluminate Live, a group audio and whiteboard-based software as well as the previously-prepared instructional activities available through WebCT. To secure research participants, I e-mailed all eight former course developers and all 24 current and former e-teachers (eight of whom were also developers) and invited them to participate in the study. The six individuals who volunteered each participated in a 30-60 minute telephone interview using a semi-structured interview guide, which had been pilot tested with two former web-based course developers not associated with the CDLI (see Appendix A). The interview questions began with demographic items and the person's curriculum development experience and then focused on eight questions designed to explore the person's experiences in designing web-based lessons for secondary students. All interviews occurred between June and August 2004.

Due to my own participation in a district-wide distance education project and later my direct involvement with the CDLI as a district administrator (and after this study was conducted as course developer), I knew or had met most of the longer serving course developers. Of those

whom I interviewed, I had worked with all six of the participants with the exception of Cliff, whom I had never met prior to the interview. I believe that my personal relationship with these five participants meant that they did not feel the need to provide information on the historical context or personalities involved with the CDLI - both of which were common elements of my interview with Cliff. I also believe that these five participants were more open with me than they would have been with someone they didn't know because they trusted that I was interested in trying to improve web-based distance education in the province.

I audio-recorded and transcribed each interview, using pseudonyms for the participants' names and other identifying information, incorporating any notes I took during the interview into the final transcript in a different font, with hesitations being represented by an ellipsis (…) in the transcript. Each transcription was independently checked for accuracy by a second individual. Because the transcripts were lengthy (many interviews having taken more than the 60 minutes) and the school year was just starting for these teachers, I did not ask the interviewees to conduct member checks of their interview transcripts. Instead, because it was a shorter document and more likely to be read, I provided the participants with a list of the themes that I had identified during my analysis for their review. I received several acknowledgements of agreement, and did not receive any other substantial feedback about the themes or interviews.

Prior to conducting the interviews, due to my experience with the CDLI and other web-based initiatives with secondary school students, I was already attentive to potential categories. During the process of transcribing the interviews, I focused on analyzing the data using an inductive analysis approach. According to LeCompte and Preissle (1993) this approach involves scanning the data for categories and relationships within individual transcripts and between transcripts. More specifically, I used the constant comparative method, a form of inductive analysis that shares its focus on identifying categories. Ezzy (2002) describes the process of constant comparison as developing and identifying codes that can be compared for similarities and differences. These "comparisons allow data to be grouped and differentiated, as categories are identified and various pieces of data are grouped together" (p. 90). I began to search for emerging themes that were common across interviews (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).

Research Participants

John's involvement with the CDLI began when he was a teacher at Redwood Academy, during the 2000-01 school year. One of the initial ten developers, John exhibited a strong ability to incorporate interactive components into his course. The following year he accepted a position at a new school with the understanding that he would not seek a position with the CDLI and this has limited his subsequent involvement with the organization.

Norman, also one of the initial developers, was among a group of four course developers who went on to teach the course that he developed. In addition to this initial development, he had experience in the development of sections of two other courses and also had taught one other course.

Bill was another of the initial CDLI developers. He had been teaching the course he had developed for the past three years. Although he had been in teaching for almost 30 years, Bill had no previous contact with distance education prior to his involvement with the CDLI.

Cliff, now retired, had spent 29 years in the classroom. He also had served on the provincial curriculum committee for his subject area and was involved in the development of two textbooks presently in use in the curriculum. Cliff was in the process of designing his first course for the CDLI at the time of this study.

Sam was a principal of a small, rural school, where he had taught almost every subject area at every grade level, even though his teacher preparation had focused on Science. Prior to becoming involved with the CDLI, he had been involved in distance education activities at his school.

George was also one of the initial ten developers. Due to his extensive experience with distance education, he now held an administrative position with the CDLI.

The six participants for this study possessed a wide range of experiences; as teachers, as developers of curriculum materials, and with distance education. The initial ten course developers were teachers who had been recommended to CDLI based upon their reputation for being good classroom teachers and in some instances also because of their knowledge or use of technology in the classroom. Subsequently, developers have been hired by contract based upon submission of formal proposals in response to open calls for specific course materials. Like the participants in this study, the 32 CDLI course developers represent a wide range of experiences.

Trustworthiness of the Data

As identified by Guba and Lincoln (1989), qualitative data must be collected under conditions which provide for its rigor. Because the nature

of human subjects and the inherent variability in their reactions and responses made a measure of whether or not a study will achieve similar results if it is repeated problematic, Lincoln and Guba (1985) suggested the terms "dependability" and "consistency" were more applicable than more positivist concepts of validity and reliability. In this study, several steps were undertaken to ensure the credibility of the data. These included the fact that I knew most of the participants and hence we had a level of comfort and trust based on our shared experiences and desire to enhance distance learning. They were all volunteers. The conversations were audiotaped and transcribed and the transcriptions checked by an independent person not connected to the study. In terms of the data's dependability, I asked participants to indicate their reaction to the set of themes I developed from their transcripts. Further, I also presented the data at a conference where feedback from the audience helped clarify my understanding. Together, these measures helped confirm the trustworthiness of the data. Research ethics approval was obtained from the University of Georgia and CDLI gave permission to contact and interview the participants.

Findings

Based upon the coding of the transcriptions from four of the six interviews, I initially identified ten themes (Barbour, 2005b). These were identified as themes either because they were repeated by a number of the individuals interviewed or were the main point made throughout the entire interview by one or more participants, and were referenced indirectly by other participants. With feedback from colleagues who participated in a presentation of this research study at a regional conference (Barbour, 2005d), along with further analysis of all six transcriptions, I refined these ten themes into a list of seven guidelines.

Preparing to Develop

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. This guideline was probably best described by George:

> do 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 … and make a misstep … undoing that mistake usually means changes that percolate right through the web of work that you've constructed … 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.

While not mentioned specifically by any of the others, this theme was referenced indirectly by three other participants. For example, Cliff discussed the planning process that he undertook prior to starting the development process: "What I basically did was… sat down with George and decided what we're going to do… and then we created the particular illustrations and how we were going organize them."

Simple Navigation, but Diverse Content Presentation

Course developers should keep the navigation simple and to a minimum, but don't present the material the same way in every lesson. As discussed earlier, the CDLI utilizes a standard developer's template. The logic for this template as Sam described was "more because the students need some consistency" or as described by George, in a more direct fashion, "don't frighten the kids with a different navigation menu on every screen."

In referencing this template, the participants felt that the students tended not to use the "You will learn" and "You should know" sections. For example, John noted: "They don't read … 'You will learn' … 'You should know,' they go … right to the 'Lesson.'" Bill, along with Norman, were even more descriptive in their assessment of the students' usage patterns: "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." Based on their observations, these course developers suggested that the "You will learn" and "You should know" information should be included in the text of the "Lesson," in most instances in the first paragraph.

The participants also felt that it was important to ensure that the material was not presented the same way in every lesson. For example, George pointed out that each lesson

> has to offer a certain sense of choice to the student's 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.

The participants felt that this diversity was necessary because, as they would in the classroom, students become bored if these are presented to them in the same way every time. Cliff suggested "to turn kids 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." Sam, on the other hand, described it like this: "I thought it was very important to provide a different slant; all the same information but with different interpretation, different twist and interact if possible. I thought that were key and very important." Overall, all six participants referenced this need to ensure the navigation was easy for the students to use, but that the content should be presented in different and interesting ways.

Summarize and Personalize

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. In developing his own courses, John stated that the first thing he tried to ensure was that he "developed a good set of notes [and] a good set of worked examples" for the students. His rationale for this was because "a lot of them were isolated, and knowing that they didn't have access to a [content-area] teacher readily whenever they wanted… so I tried to make the websites… compensate for that as much as I possible could." Most of the participants referenced their belief that many students, especially those of average and below average ability, did not read their textbooks and when they did they had poor strategies for finding important material. This made the content summaries provided in the asynchronous lesson that much more important.

In addition, they thought it was important to consider the use of examples that the students were able to personalize to their own contexts. Cliff "tried to get the kid to find in the literature the experience in their own lives" while Bill had students "looking a lot at their own lives [and] their own communities". Along with this attempt to have the students personalize or internalize the content, Norman suggested that course developers attempt to use local content and local examples where possible. "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". The reason participants gave for having students personalize the material was their belief that 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).

Clear Instructions and Expectations

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 five of the six participants, the "Lesson" and "Activity" portions in particular should provide the students with clear instructions and expectations. For example, John suggested that students "need to have clearly defined what has to be done [over] a certain period of time," In describing the process that he undertook, he stated,

> I made sure that I included… very detailed instructions for the investigations and activities that they were supposed to do because a lot of the investigation activities in the book… they're very, very open ended. So what I would do to make sure that the instructions were well laid out and… that students could follow them.

The need for clear instructions, as described by a number of the participants, is best summarized by Bill when he commented, "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." Like John, three other participants specifically referred to the fact that students should be shown how to respond to the questions they are given.

Norman, who was also a teacher with the CDLI, had provided expectations for his students as a way to get them to utilize certain aspects of the CDLI template with mixed results.

> It all depends…[on] my expectations of what they should be doing basically. So, if I'm expecting them to go down through and, and look at… 'Okay, this is what we're going to cover…' then, they'll have a look at it. But if I say 'Okay, what we're going to do today is we're going to go through and we're going to do this 'Activity,' and its based on this 'Lesson,' so you're responsible for looking at the 'Lesson' prior to the activity, the more responsible student will most definitely go through the 'Lessons' and you can tell which ones do. And they'll go through the "'Lessons' and they'll go through the 'Activity' and normally, those students are the ones that are probably more successful at completing those activities. So, that's generally been the… the trend.

This observation was supported by George, who explained,

> if the instructor is… not basing their activities around the asynchronous content, then the students don't feel any great need to do them, and then what we typically find then is only a small fraction of the students will actually use them unless the instructor does some behavior that requires it.

This realization may mean that regardless of how clear the instructions and expectations in the web-based materials are, if those teaching in the online environment want students to make use of the web-based materials, they need to require it as a part of their asynchronous or synchronous instruction.

The use of Text and Visuals

Course developers should refrain from using too much text and consider the use of visuals to replace or supplement text when applicable. Almost all of the participants referenced their belief that students didn't like to interact with text-only content. This was best summarized by George:

> students don't like text very much. So … if your content needs texts, then you have to be sneaky about it, you know, you have to make it presentable, you know, what we found is, is nice, clean design is a good start… not too much content in…one place, you know, chop it up a bit, add some graphics… you got to do that if… its text based because they don't like text very much.

The problem identified by the participants was that, in many instances, the content was difficult and needed a lengthy explanation. Bill stated that 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.

This requires course developers to use strategies to shorten long portions of text. One way is through the use of visual images. Norman felt "by providing students a visual cue with the written information it does provide a connection for them." By using images, course developers can break up the amount of text that is presented to the students and visuals are also useful to, as Cliff put it, "communicate abstract ideas."

Sam was more passionate about not only the need to keep text to a minimum, but he also raised an important question about the purpose of the web-based material:

> I thought it was important that the online lessons act as a supplement to what the e-teacher would be able to provide, and certainly as part… [of] that the students already have the text book material at their fingertips so I thought if I want to provide simply a rehash of what was in the text, I could have just said 'in this lesson read pages 300-308 in the text' and on the way down the line I thought that was serving no purpose.

This sentiment was common among all the participants, particularly when they considered the numerous methods to present content in a web-based environment, as compared to a textbook.

Smart use of Multimedia and Interactive Elements

Course developers should use multimedia to enhance the content and not simply because it is available. Media do not have to be sophisticated

pieces of computer programming, for example, Norman made a suggestion of 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." On the other end of the technical spectrum, Sam suggested that "students can obtain a lot of information from the video. Obviously it's much more interesting for a student to see an interactive video which is moving with color flashing and sound on the screen than it is reading about it."

John suggested a way to use interactive elements to ensure that students completed the assigned tasks within an activity, when he described one of the multimedia items he included in his course.

> I actually developed… ways of having students, forcing students to input certain… data into my… [interactive] piece, so for example they would be asked a question and given a problem and they would input the answer before they could go on.

In describing a particular example from one of the courses he designed, Norman noted:

> There are a variety of things that are included in that, the students would be able to then look at that learning object… they would be able to see the actual calculation as it is being stepped through with maybe with some voice… maybe some images there as its working its way through that particular … it may be an animation… it could be a variety of… mediums obviously.

With the exception of Cliff, every participant was able to provide a specific example of how they could use multimedia or an interactive element to enhance the curriculum. George provided the first caution, noting that using multimedia was "very much a moving target… [because it was] becoming more interesting from year to year to year as we get more tools to work with." However, many of the examples that were provided by the participants were specific to the curriculum they either had developed or currently teach, and have not been described in order to protect their anonymity. Also, as George correctly points out, many of these examples are based upon particular technologies that may become dated as newer interactive software becomes available.

A second caution, provided by three of the participants, was when selecting interactive elements developers should ensure that selections are based on solid content or pedagogy. Bill tried to describe it as

> the students can't be intimidated by what they see. I don't think that … there should be a lot of distractions there with things that are … that might be gimmicky … I don't think that they should be having to waste a lot of

> time going through unnecessary things … they should feel comfortable when they … go through the page … it shouldn't be too busy but at the same time there should be a certain … energy in … what comes at you.

Norman simply described it as too often, "trying to be too flashy… really may distract… from the lesson itself and students may miss the message." This caution specifically speaks to the portion of the guideline that states "not simply because it is available."

Who to Target

Finally, course developers should develop their content for the average or below average student, while including enrichment activities for above average students. This guideline came from comments made by four of the participants. These participants felt that in order to make the web-based content accessible by all students, it had to be designed for the average or below average student. Bill, for example, stated:

> 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.

Similarly, Cliff suggested that developers not always assume "that they're all self motivated … it's much better to shoot … for the average and below average student and … having enrichment for the brighter ones, the self-motivated ones, but making sure that… there's a structure in place that guarantees they're doing their … work." Bill suggested providing activities that allow students across the spectrum to be engaged and able to respond at different levels. Norman concluded:

> I don't think that everything needs to be flashy, if the students want to learn, if you provide the information, and you … provide it in … a fairly interesting way … and provide some motivation, then … they'll usually take it upon themselves to, to move ahead with it.

With this comment, which addresses the final three guidelines, Norman is describing his belief that these guidelines are not individual suggestions but a collection of advice, which was a common sentiment of the majority of the participants.

Discussion

In examining these seven principles of effective asynchronous web-based content for adolescent learners, there appears to be some consistency with the guidelines offered by Collis, at least from the perspective of these six course developers. For example, the second principle described in this

study (i.e., to keep the navigation simply, but vary the presentation of content) is similar to Collis' second guideline to design a variety of roles for students in the content. Also, in discussing how the students used the CDLI template and course content, the developers described how the students did not necessarily use it as was expected and that this needed to be considered during content development. This is also consistent with Collis' guideline not to assume how students will use the course-support site.

The third principle based on the perspectives of these six developers, to summarize course content and personalize examples, is similar to Collis' fourth guideline. Collis suggests that designers use the course-support site to supplement course materials. The developers in this study felt it important that the asynchronous content provide a strong supplement to what the student already had access to (i.e., their textbooks) because in this environment the student did not have ready access to a teacher. As well, the fifth principle offered by these CDLI developers is consistent with one of Collis' guidelines. The caution concerning the use of text and the suggestion that graphics and other media can be used in place of text appears in both lists. As does the suggestion for the varied and appropriate use of multimedia, which was the sixth principle in this study and the fifth and eighth guidelines offered by Collis. Finally, the seventh principle generated from the data was advice to design from the bottom up, in terms of the ability of the students. This was not dealt with directly by Collis and the principle may be more appropriate for K-12 courses.

Like much of the research on the elements of effective web-based content, most of the suggestions offered by these CDLI course developers focused upon the issues of course structure and student interaction, primarily with the asynchronous content. However, unlike previous research conducted with adult populations the principles offered here call for a high degree of structure and a greater level of interaction to increase the chance of success for the adolescent learner. It is interesting that none of Collis' guidelines are concerned with the independence required by the student, in fact, three speak directly to the flexibility offered to the students. Whereas, all but the first principle generated from this study reference the level of maturity or lack of autonomy in the adolescent learner. Comments such as “students need some consistency” (Sam), be “able to… guide the students and… be able to monitor… when the students weren't grasping something” (Bill), “many of them won't even bother looking at the 'Lesson,' the more astute student would” (Norman), and “students are still students and… we shouldn't assume that they're all self motivated” we need to make “ sure that… there's a structure in place that guarantees they're doing their… work” (Cliff), indicates that the learners who these developers are targeting are far from independent.

The courses developers in this study appear to be more concerned with, and design their web-based courses for, average, and even lower ability, adolescent learners. Through these principles, the developers are attempting to add the structure that is necessary for these non-autonomous learners to be successful. As a part of their design experience, they have attempted to make virtual schooling accessible to those learners who are not highly motivated, self-directed, self-disciplined, and independent, which are the characteristics, identified by Clark, 2002; Haughey and Muirhead, 1999; Kozma, Zucker and Espinoza, 1998, that virtual school teachers and administrators prefer. In essence, they are making a conscious effort to address Mulcahy's (2002) concern and make web-based distance education suitable for more secondary level students.

Although the focus of this research study was the participants' perceptions of effective asynchronous web-based content, the first theme that I identified from the data was a fundamental principle of the instructional design process: that being that the analysis and design of instructional materials should inform their development (Gustafson & Branch, 2002).

Finally, there was a noticeable difference throughout the interviews between the views of Norman and Bill (and to a lesser extent George), and the others on how hey felt the students would use these course materials. As developers who had also gone on to teach the courses that they had developed (and George as the CDLI administrator), they seemed to have a much better sense of how the students did and did not make use of the course materials. They also had a better sense of how little other e-teachers, who had not developed their own course materials, actually used those course materials themselves or encouraged their use with their own students. This disconnect between how much focus the e-teachers placed on the course materials during the synchronous and, primarily, the asynchronous instruction seemed related to if and how much the students actually used these materials. However, with such a small sample and with this not being the focus of this particular study, further examination of whether or not there are differences in how e-teachers make use of the materials based upon their history with the development of the course materials and, if differences do exist, what the nature of those differences are needs to be undertaken.

Conclusions

The main purpose of this study was to generate principles of effective asynchronous web-based materials specifically applicable for secondary students based upon the perceptions of those who have developed

courses for this population. This was considered necessary because much of research in this area has used adult populations and there are differences between how adults and adolescents learn. These principles provide a promising beginning in an effort to fill the existing research gap.

With out-migration and a declining population in many of the rural areas in Newfoundland and Labrador (and elsewhere), the necessity for instruction to be provided to students through the use of web-based offerings will continue to grow. During this period, it is important that these web-based materials be well designed to encourage all students to take advantage of the opportunities they afford. Otherwise, as George noted earlier, "undoing [those] mistake[s will] mean changes that percolate right through the web of work that [has been] constructed."

References

Barbour, M. (2005a). From telematics to web-based: The progression of distance education in Newfoundland and Labrador. *British Journal of Educational Technology, 36*(6), 1055-1058.

Barbour, M. (2005b). The design of web-based courses for secondary students. *Journal of Distance Learning, 9*(1), 27-36.

Barbour, M. (2005c). Perceptions of effective web-based design for secondary school students: A narrative analysis of previously collected data. *The Morning Watch, 32*(3-4). Retrieved November 04, 2005 from http://www.mun.ca/educ/faculty/mwatch/win05/Barbour.htm

Barbour, M. (2005d, March). *Teacher and developer perceptions of effective web-based design for secondary school students.* Paper presented at the annual Southeastern Conference in Instructional Design and Technology, Mobile, AL.

Barbour, M., & Cooze, M. (2004). All for one and one for all: Designing web-based courses for students based upon individual learning styles. *Staff and Educational Development International, 8*(2/3), 95-108.

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.

Bruning, R., Horn, C. A., & PytlikZillig, L. M. (Eds.). (2003). *Web-based learning: What do we know? Where do we go?* Greenwich, CT: Information Age Publishing.

Cavanaugh, C., Gillan, K.J., Kromrey, J., Hess, M., & Blomeyer, R. (2004). *The effects 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

Clark, T. (2002). *Final report: Illinois Virtual High School, 2001-2002.* Aurora, IL: Illinois Mathematics and Science Academy.

Collis, 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.

Cooze, M., & Barbour, M. (2005). Learning styles: A focus upon e-learning practices and pedagogy and their implications for success in secondary high school students in

Newfoundland and Labrador. Malaysian *Online Journal of Instructional Technology, 2*(1). Retrieved July 14, 2005 from http://pppjj.usm.my/mojit/articles/pdf/02-Michael%20Barbour.pdf

Dick, W., Carey, L., & Carey, J. O. (2005). *The systematic design of instruction,* 6th ed. New York: HarperCollins Publishers.

Ezzy, D. (2002). *Qualitative Analysis.* London: Routledge.

Gallini, J. & Barron, D. (2001-2002). Participants' perceptions of web-infused environments: A survey of teaching belies, learning approaches, and communications. *Journal of Research on Technology in Education, 34*(2), 139-156.

Government of Newfoundland and Labrador. (2005). *Educational Statistics 2004-2005.* St. John's, NL: Queen's Printing for Newfoundland and Labrador. Retrieved on May 1, 2005 from http://www.ed.gov.nl.ca/edu/pub/stats04_05/stats04_05.htm

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

Guba, E. G., & Lincoln, Y. S. (1989). *Fourth generation evaluation.* Newbury Park, CA: Sage.

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.

Gustafson, K. L., & Branch, R. (2002). *Survey of instructional development models* (4th ed.). Syracuse, NY: ERIC Clearinghouse on Information and Technology.

Haughey, M., & Muirhead, W. (1999). *On-line learning: Best practices for Alberta school jurisdictions.* Edmonton, AB: Government of Alberta. Retrieved on July 31, 2005 from http://www.phrd.ab.ca/technology/best_practices/on-line-learning.pdf

Kanuka, H. (2002). Guiding principles for facilitating higher levels of web-based distance teaching and learning in post-secondary settings. *Distance Education, 23*(2), 163-182.

Kozma, R., Zucker, A., & Espinoza, C. (1998). *An evaluation of the Virtual High School after one year in operation.* Arlington, VA: SRI International. Retrieved on July 31, 2005 from http://ctl.sri.com/publications/downloads/evalvhs1yr.pdf

Kvale, S. (1996). *Interviews: An introduction to qualitative research interviewing.* Thousand Oaks, CA: Sage Publications.

LeCompte, M. D., & Preissle, J. (Eds.). (1993). *Analysis and interpretation of qualitative data. In Ethnography and qualitative design in educational research* (2nd ed., pp. 234-278). San Diego: Academic Press.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry.* Thousand Oaks, CA: Sage Publications.

McLoughlin, C., & Oliver, R. (2000). Designing learning environments for cultural inclusivity: A case study of indigenous online learning at tertiary level. *Australian Journal of Educational Technology, 16*(1), 58-72. Retrieved on July 31, 2006 from http://www.ascilite.org.au/ajet/ajet16/mcloughlin.html

Moore, M. G. (1972). Learner autonomy: The second dimension of independent learning. *Convergence,* Fall: 76-88.

Moore, M. G. (1973). Toward a theory of independent learning and teaching. *Journal of Higher Education, 19*(12), 661-679.

Moore, M. G., & Kearsley, G. (1996). *Distance education: A systems view.* Belmont, CA: Wadsworth.

Morris, S. (2002). *Teaching and learning online: A step-by-step guide for designing and online K-12 school program.* Lanham, MD: Scarecrow Press.

Muirhead, B. (2000). *Teachers' perceptions of online education.* Unpublished doctoral dissertation, University of Alberta, Edmonton, AB.

Mulcahy, D. M. (2002). Re-conceptualizing distance education: Implications for the rural

schools of Newfoundland and Labrador. *The Morning Watch, 30*(1-2). Retrieved on July 31, 2005 from http://www.mun.ca/educ/faculty/mwatch/fall02/Mulcahy.htm

Shank, G. D. (2002). *Qualitative research: A personal skills approach.* Upper Saddle River, NJ: Merrill Prentice Hall.

Shearer, R. (2003). Instructional design in distance education: An overview. In M.G. Moore & W.G. Anderson (Eds.), *Handbook of distance education* (pp. 275-286). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

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.

Stevens, K. (1997). A new model for teaching in rural communities - The electronic organization of classes as Intranets. *Prism - Journal of the Newfoundland and Labrador Teachers' Association, 6*(1), 23-26.

Strauss, A., & Corbin, J. (1990). Open coding. In A. Strauss & J. Corbin (Eds.), *Basics of qualitative research: Grounded theory procedures and techniques* (2nd ed., pp. 101-121). Thousand Oaks, CA: Sage.

Vygotsky, L. S. (1962). *Thought and language* (E. Hanfmann & G. Vakar, Trans.). Cambridge, MA: The M.I.T. Press.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychologist processes* (M. Cole, V. John-Steiner, S. Scribner, E. Souberman, Eds.). Cambridge, MA: Harvard University Press.

Michael K. Barbour (mkb@uga.edu) is a Ph.D. candidate at the University of Georgia. A social studies teacher by training, having taught in the traditional classroom and virtual high school environments, Michael is interested in the use of virtual schools to provide learning opportunities to rural secondary school students.

Michael K. Barbour est candidat au doctorat à la University of Georgia. Formé en sciences sociales, ayant enseigné en classe traditionnelle et dans des environnements virtuels au niveau secondaire, Michael s'intéresse à l'utilisation des écoles virtuelles pour offrir des opportunités d'apprentissage aux étudiants des écoles rurales de niveau secondaire. .

Appendix A

Demographic Questions

1. How long have you been teaching?
2. What subjects have you taught?
3. Have you taught distance education courses before?
   Follow-ups:
   With the TETRA/Tele-Medicine system or web-based?
   If web-based, through what program or initiative?
   Which courses?
4. Describe your educational background.
   Curriculum Development Experience

5. Have you had any experience in curriculum development? If so, describe those experiences.

6. Have you had any experience in writing textbooks or course manuals? If so, describe those experiences?

7. What course(s) have you developed or are developing for the CDLI? Have you taught that course/those courses?

Follow-ups:
If so, how often?
For how long?
In what format?

8. Have you reviewed courses for the CDLI? If so, what course(s) have you reviewed or are reviewing for the CDLI? Have you taught that course/those courses?

Follow-ups:
If so, how often?
For how long?
In what format?

Experiences Designing Web-based Lessons for Secondary Students

9. In your development experience, how did you design your courses? Why?

Follow-ups:
What elements did you try to include? Why?
How did you try to structure your lessons? Why?

10. Thinking about your experiences as an e-teacher, describe a web-based lesson that you feel was effective with students?

Follow-ups:
Why was it effective?
What type of multimedia components did it contain?
What were the students' reactions to the lesson?

11. Thinking about your experiences as an e-teacher, describe a web-based lesson that you feel was ineffective with students?

Follow-ups:
Why was it ineffective?
What type of multimedia components did it contain?
What were the students' reactions to the lesson?

12. What do you think of the developer's template used by the CDLI?

Follow-ups:
Do you think that the units/sections/lessons breakdown is a good one? Why or why not?
Do you think that the units/sections/lessons breakdown should be used for all subject areas? Why or why not?

If you were to suggest another format, what would it be? Why?
Do you think that the five page breakdown of lessons is a good one? Why or why not?
Do you think that the five page breakdown of lessons should be used for all subject areas? Why or why not?
If you were to suggest another format, what would it be? Why?

13. If you were to develop a course knowing that the instruction would primarily be synchronous, how would that affect what your course would look like?
What elements would you try to include? Why?
How would you try to structure your lessons? Why?

14. If you were to develop a course knowing that the instruction would primarily be asynchronous, how would that affect what your course would look like?
What elements would you try to include? Why?
How would you try to structure your lessons? Why?

15. If you had to make one statement about designing web-based lessons for high school students, what would it be? Why?

16. If you were to include one item in most or all of your web-based lessons, what would it be? Why?