

The Design of Web-based Courses for Secondary Students

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Abstract– This article considers the initial findings of a study on the perception of course developers, electronic teachers and students on the characteristics of effective web-based design for secondary school students. Through interviews and document analysis, the views 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 1985, the Government of Newfoundland and Labrador commissioned a study of small schools that called for “a Distance Education School to be established and... distance education courses [to be delivered] by correspondence, computers, videotapes” and by using Memorial University’s Tele-Medicine system (Riggs, 1987, p. 28). In 1988, 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).

The Government appointed a Royal Commission in 1990 that recommended “that a School of Distance Education and Technology be established” utilizing the TETRA/Tele-Medicine model, along with CD-Roms, electronic bulletin boards, and computer databases (Williams, 1993, p. 321). Later, individual school districts began to experiment with web-based methods of delivery. For example 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.

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 piloted in ten districts (i.e., one course per district). After the pilot phase, the CDLI expanded its course offerings and students from all over the province could access any course. At present, the CDLI offers twenty-seven courses, with eleven others in development.

This article is attempting to address the inequity that exists in opportunities between urban students and rural students to take full advantage of the provincial curriculum, by investigating the design of web-based distance education program for rural secondary school students. Discovering the characteristics perceived to be important by course developers and e-teacher of web-based courses, along with the perceptions of the secondary students themselves, this study will begin to addressing the gap in the literature with this research question.

What characteristics do developers, electronic teachers and students perceive for an effectively designed web-based course for secondary school students?

This article reports the initial findings from this study.

Literature Review

According to Roblyer and Knezek (2003) there are

three assumptions educators often make about research on technology-based (i.e., computer-based and online distance learning) methods are that: (a) it has a commonly-held, theory-based agenda, (b) findings provide convincing evidence about unique ways modern technologies enhance achievement and motivation and (c) these findings shape practice in the field. The last thirty years of educational technology research notwithstanding, none of these assumptions are currently true. (p. 60)

In relation, Gallini & Barron (2001-2002) believe that

an increasing number of educators in K-12 and postsecondary settings are experimenting with the potential of the technologies for instruction and learning, but all of this is happening at a pace that is far surpassing the collection of useful data to test the mediational effects of the tools. (p. 143)

The virtual high school movement represents one area where the increase in the number is happening at a pace that is surpassing the collection of useful data. According to Clarke (2001) there have been fourteen US-state sanctioned virtual high schools since 1997 (pp. i-ii), while according to Vail (2001) there were “more than 50 charter and public school online programs running in at least 30 states, and demand for them continues to grow” (p. 1). With the growing number the virtual high schools, there is a concern that web-based distance education may not be suitable for all secondary students (Mulcahy, 2002).

There has been much research on web-based course design. Collis (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 has focused upon post-secondary institutions and corporate America, both of which have adult learners as their primary interest (see also Duvchastel, 1997; Twigg, 2001; Zhu & McKnight, 2001; Murphy, 2003; McKnight, 2004). In their chapter on distance education, Gunawardena & McIsaac (2004) only reference the K-12 education system once, in a two paragraph discussion of the use of personal digital assistants in distance education (pp. 369-370). In the same publication, Hill, Wiley, Nelson & Han (2004) made no specific references to Internet-based learning within the K-12 environment.

This evidence of little research on the secondary school learner in this domain is an important oversight because there is a difference between how adults learn compared to the way adolescents learn. Andragogy, defined by Darkenwald and Merriam (1982) "as a set of assumptions and methods pertaining to the process of helping adults learn.. Knowles (1970)... argued that pedagogy – which we use here to mean an approach to childhood learning – is inappropriate for adults and thus its use should be restricted to children" (as cited in Merriam and Brockett, 1997, p. 135). More specifically, Knowles (1970) stated

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. 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)

Even in his harsh critique of Knowles concept of andragogy, Bright (1989) states "it is not being suggested that there are no differences between adults and children. On the contrary, there are probably many..." (p. 55). This distinction between andragogy and pedagogy provides a strong

rationale for research into the characteristics of effective web-based design for secondary students.

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: two 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.

In addition, there was also an administrator with the CDLI interviewed. George has been involved in distance education in the province of Newfoundland and Labrador 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.

The main sources of secondary data were the CDLI homepage and the CDLI developer's server. The homepage of the CDLI includes all web-based course content developed for the CDLI, along with a variety of multimedia learning objects. The developer's server contains support material for web-based course designers and multimedia learning object designers. For the purpose of this study, the developer's template included on the developer's server is of particular interest. This template provides the structure that CDLI course developer use to plug the content (i.e., text, image and multimedia objects) into the actual course webpages.

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 preliminary findings.

The analysis of the secondary data consisted of the researcher reviewing the documents initially for examples that would support or refute the statements in the document mentioned above. After this was completed, the researcher again reviewed the documents for further evidence that would be useful in addressing the research question. In addition to these perceived characteristics, a consideration of the grounded design of these CDLI courses. Grounded design,

as described by Hannafin, Hannafin, Land & Oliver (1997), has four conditions necessary for design practice to be grounded.

First, design must be based in a defensible theoretical framework. The framework must be public; that is, it can be both articulated clearly and differentiated from other perspectives... Next methods must be consistent with the outcomes of research conducted to test, validate, or extend the theories upon which they are based... In effect, grounded designs reflect a close link between empirically verified approaches and those employed in a given learning system. In addition, grounded designs are generalizable, that is, the methods can be applied more broadly than only to a specific setting or problem... Finally, grounded designs and their frameworks are validated iteratively through successive implementation. (p. 103)

This analysis will compare the actual design of existing courses to the beliefs espoused by the course developers and electronic teachers to determine if the CDLI courses are grounded in an instructivist or a constructivist framework.

Preliminary Findings

The statements taken from the interview transcripts supported ten initial guidelines that course developers to use when designing courses for secondary school students. The first 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. 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.

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.

The third is that the lesson 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).

In addition to clear directions and expectations, course developers should also ensure that there is not too much text to read. 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 thing a course developer can use is an image. “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).

Another way can be the inclusion of interactive items. 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).

The seventh guideline for content developers is to consider the use of real-life examples. It is important to have 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 eighth is not to use the same format for 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).

The ninth guideline is to design for the average ability 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).

Finally, course developers should plan their entire course before they begin. More directly, “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, 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 you’re 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” (George).

Discussion

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 ten 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.

Knowles (1970) stated that there were

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 by the interviewees of their experiences with adolescent learners.

The secondary analysis considered whether the courses, and specifically the CDLI course template, are grounded in the same epistemology beliefs held by the course developers. All of the developers interviewed made comments that indicated that they attempted to design their courses in a constructivist fashion.

A way of guiding [students] through the course. (John)

What I'm trying to do is I'm trying to draw [the students]... to understand or to lead them to an understanding of certain content. (Norman)

The teacher being able to... guide the students and... be able to monitor... when the students weren't grasping something. (Bill)

I have always found that effective because [you're] getting the response early because the activity is early and you use that as a teaching tool rather than the students becoming like passive sponges and you give them information and... then evaluate them on whether they've got the information. (Cliff)

These statements indicate the developers believe that the teacher is more of a “guide on the side,” whereas the structure of the developer’s template is more representative of a “sage on the stage” perspective. Based upon an analysis of the developer’s template, there are many similarities between its individual components and Gagné’s nine events of instruction. The table below compares these nine events of instruction with the developer’s template.

Table 1 – CDLI course and behaviorism (Gagné’s nine events of instruction)

Gagné’s Nine Events of Instruction	CDLI Template / Courses	Rationale
Gaining attention	N/A	There is no piece for this in the developer’s template and typically was not done in the courses reviewed. It assumes that students will bring this to the table with them.
Informing the learner of the objective	You Will Learn	This section provides a list of learning objectives for the lesson, written in student friendly language.
Stimulating recall of prerequisite learning	You Should Know	This section provides a list of learning objectives that the students should know before starting the lesson, written in student friendly language.
Presenting new material	Lesson	This section provides students with the instruction of the lesson, giving them information about the topic and examples of worked problems (if applicable). This is the section where the majority of learning is due to take place.
Providing learning guidance		
Eliciting performance	Activities	This section provides students with readings that they are responsible for, along with online and/or written exercises for them to complete and receive feedback from the e-teacher.
Providing feedback about correctness		
Assessing performance	Test Yourself	This section, in most instances, provides students with an interactive quiz that students can take, have marked and provide feedback all by clicking a few buttons
Enhancing retention and recall		

This comparison illustrates the behaviourist tendency of the developer’s template. This contradiction, along with the interviewee’s comments about what and how students use the various components, may provide a rationale for the CDLI to revisit the developer’s template.

Conclusion

While still a work in progress, the ten guidelines from the five initial interviews provide a promising start to filling the literature gap that exists. 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 “undoing [those] mistake[s will] mean changes that percolate right through the web of work that [has been] constructed.”

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