

Learning Styles: A Focus upon E-Learning Practices and Pedagogy and their Implications for Designing E-Learning for Secondary School Students in Newfoundland and Labrador

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Abstract- With the increase of online learning in the K-12 environment, research must turn to specific studies focused upon this level. One area of investigation surrounds the development of online course content and individualized student learning styles. This review found that although there is a vast body of research concerning online learning in the post-secondary environment, this is not true for K-12 education. Recent studies have begun the discussion for secondary school students as online learning becomes more prevalent and accepted as a means of learning. The lessons that these studies bring forward may be of particular interest to instructional designers and e-teachers in the K-12 environment.

Introduction

During the past decade educators have witnessed to an infusion of technology into learning spaces and along with it, a renewed focus and vigor as it relates to educational pedagogy and methodologies. Is this desire for change a result of the technological evolution occurring in schools? Have new theories of learning been the impetus for change? Certainly change for the improvement of any system should be regarded as a step in the right direction. Ideally in education change should improve the quality and equality of learning, as stated by Farrell (2001), “change in education systems is always in pursuit of one or more of the following goals: Improvement of access to educational opportunities, enhancement of quality in terms of both standards achieved and the learning process, and improvement of efficiencies such as increased productivity, greater return on invested capital and cost reduction or containment” (p. 6).

Regardless of reasons, educators have been inundated with an unprecedented plethora of information to digest as it pertains to their specific learning environment. Educators have been expected to integrate technology into their classrooms while retaining the essence of the curriculum. A most arduous task it has been and one that has not been without criticism. Not all schools of thought believe that technology has been utilized for the betterment of learning. As Cavanaugh (2001) notes, “...having technology does not ensure effective use of the tools, and therefore may not translate into education benefits” (p. 74).

These criticisms, however, do not appear to be altering the technological landscape as it relates to technology and education. Computers, often thought as ‘*the technology*’, in conjunction with connectivity continue to become more widely available throughout K-12 schools across North America. According to SchoolNet’s On-Line Connectivity Survey (2000), 88% of all computers in Canadian public schools had Internet access, with a Canadian ratio of students to Internet connected computers of 8:1 as compared to 9:1 for our United States counterparts. This same report also noted that

Newfoundland and Labrador's ratio of students per Internet connected computer was 11:1. The National Center for Education Statistics (2003) recently reported that in 2002, "99% of public schools in the United States had access to the Internet" (p. 12) compared to 35% in 1994.

This situation has also improved recently within Newfoundland and Labrador, due to current developments in distance education, changing the face of learning for rural and small schools. This transformation dates back to 1999 when the Department of Education deployed a ministerial panel to investigate the delivery of education in Newfoundland and Labrador. They recognized that many significant changes have occurred and are still occurring as a result of school reform in the 1960's and again in early 1990's. The panel presented recommendations pertaining to the way that education was being delivered in the classroom. One area of special interest focused on distance learning. A review of the methodologies employed by the traditional system of distance education was completed and several recommendations concerning new and innovative methodologies were made. This focus in part due to the fact that the student population in rural areas continues to decline greater than in urban areas. "Enrolment decline is not evenly distributed throughout the province but is more pronounced in rural than in urban areas" (Sparkes & Williams, 2000, p. 6).

The panel also noted that, "technology must be embraced for a variety of reasons" (Sparkes & Williams, 2000, p. 71). Technology can be utilized for much more purposeful reasons and it, "can be viewed as a liberating force capable of placing more resources in the hands of students than could ever be accomplished by conventional means" (Sparkes & Williams, 2000, p. 71). In their recommendations the panel described a system and method of delivery using Internet-Communications Technologies as the backbone. This led to the birth of the Centre for Distance Learning and Innovation (CDLI). This network provides students in rural Newfoundland and Labrador the opportunity to enroll in high school courses which they may not have access to otherwise. The curriculum is delivered utilizing Internet and Communications Technologies, thus dubbed, electronic learning or more pointedly '*e-learning*'.

Literature Review

Until recently most research has focused upon post-secondary education and applications in the business world. These findings have then been translated to fit the K-12 school environment. Considering the learning characteristics of K-12 learners as compared to post-secondary learners, there is a need to provide results and recommendations which are more suited to K-12 learners. With the growth of e-learning this is beginning to change and as e-learning continues to proliferate K-12 education research results are beginning to provide precise meaning, "to guide the development and initial implementation of online e-learning in K-12 schools" (Blomeyer, 2002. p. 5).

As such, this method of delivering the curriculum to secondary students is viewed as a part of a larger phenomenon where, "virtual schooling...is cresting several years after the maturation of e-learning in higher education" (Clark & Berge, 2003, p. 1). The

focus, however, in higher education has been primarily on asynchronous methods of course delivery rather than on synchronous systems. Students would utilize course content, emails, discussion postings, and other related materials via an asynchronous system, such as WebCT. Recent developments in software design are now permitting e-learners access to virtual classrooms with synchronous communication with their 'e-teacher'. It is this model of a combination of asynchronous and synchronous communication that is being utilized by the CDLI.

As the CDLI continues to develop its services for students in Newfoundland and Labrador, several key issues will undoubtedly become topics of discussion. One such issue surrounds the nature of the learner and the impact that this knowledge can have on their potential success as an e-learner. With the convenience and flexibility of e-learning, learners often neglect to consider the, "appropriateness of online instruction for their individual learning behaviours and characteristics" (Kaminski, 2002, p. 1). Notably, institutions delivering e-learning programs seldom provide surveys for potential e-learners in order to determine if e-learning is an appropriate choice. "Recent research involving the effects of online education has emphasized dimensions such as the learner's performance and course evaluation but has largely ignored the role of student characteristics as linked to instruction" (Liu, Lavelle, & Adris, 2002). This also applies to e-teachers who ultimately interact with learners throughout course deliberations. "Effective learning, however, requires both knowledge of learner styles and advance preparation on the part of the teacher" (Sherry, 1996). This may in the end impact learner success as it relates to overall performance and enjoyment within the e-learning environment. By understanding more about the e-learners it may be possible to enhance their learning. "If we can find variables that impact student success, we might be able to design courses according to the students' preferred learning styles to help bridge the gap of not knowing the students as well as in a face-to-face environment" (Du & Simpson, 2002, p. 4).

One of the factors influencing this reform towards e-learning has been research pertaining to learning theories. As it relates to technology Valdez, McNabb, Foertsch, Anderson, Hawkes, & Raack (2002) believe that, "technology can and does help students develop all kinds of diverse skills from the basics to higher-order thinking." Furthermore, the effective utilization of technology includes; "employing research and best practices to match technology software to the curriculum and the developmental needs of learners; to customize content area learning; to enrich learning experiences with communications and links to others beyond the school walls; to offer new learning opportunities; and to help learners see the value of learning by applying knowledge and skills to real-world tasks" (Valdez, *et al*, 2002). McNabb, Valdez, Nowakowski, & Hawkes, (1999) also identify the importance of utilizing technology in learning in that it, "...should be used to enhance and extend each practice to better meet the needs of students in striving towards higher levels of achievement" (p. 14).

Understanding the learning styles of students has been identified as an important element for consideration in e-learning instruction, development and delivery which can lead to improved student performance (Shih & Gamon, 2002). Du and Simpson (2002)

concluded that in e-learning, “it is good practice for online instructors to incorporate students’ learning styles into the pedagogical design of their courses to maximize student’s success” (p. 12). A simple awareness of differences in student learning styles is vital for educators in order to aid the learning process (Diaz & Cartnal, 1999).

Learning Styles and their Implications on Design E-Learning

There are many varying views and beliefs concerning learning styles and several theories each with their particular focus. Which one does the e-teacher then utilize as their guide when developing instructional strategies for online learning? This undoubtedly is a challenging task. As Hood (1995) notes, “realistically, a teacher cannot be expected to have a different lesson for every child in the classroom, however, lessons can reflect an understanding of individual differences by appropriately incorporating strategies for a variety of learning styles.”

The first step is to identify what a learning style encompasses. A review of literature found that the general definition identifies a learning styles as the manner in which a learner takes in and processes information or an individuals preferred and consistent set of behaviours or approaches to learning. (Felder, 1996; Greenagel, *n.d.*) Ally and Fahy (2002) separate individual learning styles into two components: perceiving – the way we absorb information around us, and processing – how we understand the information that is absorbed.

Traditional Learning Style

Learning styles are simply different approaches to learning. The most commonly known learning style is accelerated learning, which is a clearinghouse term for individuals whose learning style preference is visual, auditory or tactile. The implications for online learning when measured against these different types of learners extend to each of the three areas of focus. Students will learn the course content based upon the methods of presentation and a learners predisposition to learn in a predominant mode of learning; visual, auditory or tactile. This traditional description of learning styles has developed over the years to include many other facets of learning. Two such pieces of work include the theory of experiential learning as outlined in Kolb’s theory of experiential learning and Gardner’s’ theory of Multiple Intelligences. Healy and Jenkins (2000) note that both Kolb’s and Gardner’s theories, “emphasize the different learning styles of individual students and the necessity for us as teachers to use a wide range of teaching methods to meet their needs.”

Kolb’s Theory of Experiential Learning

Kolb’s theory of experiential learning identifies a learner’s preference in one of four areas of learning. This identified preference is not absolute but reflects a tendency, “where students may adopt different learning styles in different situations, but they tend to favour some learning behaviours in preference to others” (Healey & Jenkins, 2000). Kolb’s theory of experiential learning has also

been described by Ally & Fahy (2002) as one that, "...looks at how learners perceive and process information".

This theory has identified four learning styles: (1) concrete experience, (2) reflective observation, (3) abstract conceptualization, and (4) active experimentation. According to the Kolb and Baker (1979-80) Personal Learning Guide the four learning styles are: accommodative, divergent, convergent, and assimilative. Healey and Jenkins (2000) identified the relationship between learning style and learning conditions, as displayed in the Table 1:

Table 1 – Learning styles and learning conditions

Learning Style	Conditions under which learners learn best
Assimilators	When presented with sound logical theories to consider
Convergers	When provided with practical applications of concepts and theories
Accommodators	When allowed to gain 'hands on' experience
Divergers	When allowed to observe and gather a wide range of information

This has implications for teachers in their endeavor to develop sound teaching strategies to reach learners. Where does e-learning and e-teaching fit into this model? How can this theory be representative utilizing information and communications technologies to present the curriculum?

When viewing Kolb's descriptors of learning styles and the relationship to e-learning, Ally & Fahy (2002) concluded that students who were identified as assimilators required the most support in e-learning. Divergers and accommodators required less but this may be due to their reliance upon other learners rather than their e-teacher. They also found that convergers were the most active in the e-learning environment. Their findings led them to conclude that in the e-learning environment e-teachers must, "ensure that adequate support strategies are provided for students with different learning styles."

Gardner's Multiple Intelligences

Howard Gardner established another method of attaching our learning styles to several identified 'intelligences', where a learning style is a general approach to learning that can be applied in any situation, and a specific intelligence is a capacity for a specific content (Conner & Hodgins, 2002).

Gardner's findings, focusing upon brain research and interviews with stroke victims, prodigies, and individuals with autism, led to the development of his list of intelligences and the basis for his theory of learning (Giles, Pitre & Womack, 2003). In his initial work, Gardner utilized eight different criteria to identify a list of intelligences. These criteria included:

- Isolation by brain damage/neurological evidence
- The existence of prodigies, idiot savants, and exceptional individuals
- Distinguishable set of core operations
- Developmental stages with an expert end state
- Evolutionary history and plausibility

- Susceptibility to encoding in a symbol system
- Support from experimental psychological tasks
- Support from psychometric research

Using these criteria, Gardner initially proposed seven of these intelligences and has since added two more to the list.

1. Verbal/Linguistic intelligence
2. Logical/Mathematical intelligence
3. Visual/Spatial intelligence
4. Bodily-Kinesthetic
5. Musical-Rhythmic intelligence
6. Interpersonal intelligence
7. Intrapersonal intelligence
8. Naturalistic intelligence,
9. Existential intelligence

As an e-teacher it then behooves one to utilize instructional strategies that can reach learners with a strong predisposition towards one or more of these intelligences. This should then support the learners as they interact with course content as it is presented and moderated by the e-teacher. “The key is to provide the most effective learning environment for students” (Lamb, 2004). To accomplish this task Giles, Pitre & Womack (2003) recognize and identify three steps when implementing learning style-based instruction; 1) diagnosing the individual learning styles of each student, 2) profiling group preferences and weakness, and 3) assess the current instructional methods to determine whether they are adequate or require more flexibility.

Conclusion

What are the implications for e-learning and the integration of learning styles as a means to support learning? In this time of technological focus, where online learning is becoming common-place, e-teachers have a daunting task to ensure that students of varying learning styles are supported through sound instructional pedagogy. “Special consideration, then, must be given to online student learning styles. The opportunities extended by distance education cannot be taken advantage of if, during implementation, they replicate the problems found in traditional classrooms” (Kaminski, 2002, p. 7).

E-teachers are now faced with new challenges with old nuances. The outcome is still the same, to support learning in the best possible manner with the tools that are available. The knowledge of learning styles certainly can impact an e-teachers methodologies and practices as they endeavor to reach into the virtual classroom and support each learner and their specific needs. Blomeyer (2002) provides a succinct thought on this subject summing up where the true focus should lie. With all of the discussion surrounding technology and learning, “in final analysis, online learning or e-learning isn’t about digital technologies any more than classroom teaching is about blackboards. E-learning should be about creating and deploying technology systems that enable constructive human interaction and support the improvement of *all* teaching and learning” (p. 20).

By utilizing the knowledge gained through learning style inventories and descriptors, the e-teacher should have a greater repertoire of skills to support learning in the virtual classroom and ultimately reach out through and beyond the tools in order to provide quality instruction for all learners.

References

- Ally, M. and Fahy, P. (2002). Using students' learning styles to provide support in distance education. Retrieved March 27th, 2004, from http://www.uwex.edu/disted/conference/proceedings/DL2002_1.pdf
- Blomeyer, R. (2002). *Online learning for K-12 students: What do we know now?* North Central Regional Educational Laboratory. Retrieved March 29th, 2004 from <http://www.ncrel.org/tech/elearn/synthesis.pdf>
- Cavanaugh, C. (2001). The effectiveness of interactive distance education technologies in K-12 learning: A meta-analysis. *International Journal of Educational Telecommunications*. 7(1), 73-88. Retrieved March 19th, 2004, from <http://www.unf.edu/~ccavanau/CavanaughIJET01.pdf>
- Clark, T. and Berge, Z. (2003). Virtual schools and e-learning: Planning for success. Paper presented at the 19th Annual Conference on Distance Teaching and Learning. Retrieved March 27th 2004 from http://www.uwex.edu/disted/conference/Resource_library/proceedings/03_71.pdf
- Conner, M. & Hodgins, W. (2002). *Learning Styles*. Learnativity. Retrieved March 31st, 2004 from www.learnativity.com/learninggstyles.htm
- Diaz, D. and Cartnal, R. (1999). Comparing student learning styles in an online distance learning class and an equivalent on-campus class. Retrieved March 27th, 2004, from http://home.earthlink.net/~davidpdiaz/LTS/html_docs/grslss.htm
- Du, Y. and Simpson, C. (2002). Effects of learning styles and class participation on students' enjoyment level in distributed learning environments. Texas Center for Digital Knowledge. School of Library and Information Sciences. University of North Texas.
- Farrell, G. (2001). The changing faces of virtual education. Retrieved March 10th, 2004, from: http://www.col.org/virtualed/virtual2pdfs/V2_chapter1.pdf
- Felder, R. (1996). Matters of style. *ASEE Prism*, 6(4), 18-23. Retrieved March 31st, 2004, from <http://www.scsu.edu/felder-public/Papers/LS-Prism.thm>
- Giles, E., Pitre, S., & Womack, S. (2003). Multiple intelligences and learning styles. In M. Orey (Ed.), *Emerging perspectives on learning, teaching, and technology*. Retrieved February 22, 2004 from <http://itstudio.coe.uga.edu/ebook/>
- Greenagel, F. (n.d). Lead balloons, stone canoes, and learning styles in the Internet age. Retrieved March 30th, 2004, from <http://www.guidedlearning.com/Learning%20Styles.pdf>
- Healey, M. and Jenkins, A. (2000). Learning cycles and learning styles: Kolb's experiential learning theory and its application in geography in higher education. *Journal of Geography*, 99(5), pp.185-195. Retrieved March 31st, 2004 from <http://www.chelt.ac.uk/gdn/discuss/kolb1.htm>

- Hood, K. (1995). Exploring learning styles and instruction. Retrieved March 31st, 2004, from <http://jwilson.coe.uga.edu/EMT705/EMT705.Hood.html>
- Lamb, A. (2004). Technology and multiple intelligences. Retrieved April 1st, 2004, from <http://eduscapes.com/tap/topic68.htm>
- Liu, Y., Lavelle, E., and Andris, J. (2002). Experimental effects of inline instruction on locus of control. *United States Distance Learning Association Journal*, 16(6). Retrieved March 20th, 2004, from http://www.usdla.org/html/journal/JUN02_Issue/article02.html
- Kaminiski, C. (2002). Formative use of select-and-fill-in concept maps in online instruction: Implications for students of different learning styles. University of Massachusetts. Retrieved March 30th, 2004, from http://www.ed.psu.edu/CI/Journals/2002aets/t1_kaminski.rtf
- Kolb, D. & Baker, R. (1979-80). *Personal Learning Guide: A practical guide to increasing your learning from a training program or workshop*. Dallas, TX: Baker & Company.
- McNabb, M., Valdez, G., Nowakowski, J., and Hawkes, M. (1999). Technology Connections for school improvement - Planners handbook. Retrieved March 16th, 2004, from: <http://www.ncrel.org/tplan/tplanB.htm>
- National Center for Education Statistics. (2003). *Internet access in U.S. public schools and classrooms: 1994-2002*. Retrieved March 29th, 2004, from: <http://nces.ed.gov/pubs2004/2004011.pdf>
- SchoolNet's On-line connectivity survey: Final report (2000). Retrieved April 1st, 2004, from <http://www.schoolnet.ca/>
- Sherry, L. (1996). Issues in distance learning. *International Journal of Educational Telecommunications*. 1(4), 337-365.
- Shih, C. and Gamon, J. (2002). Relationships among learning strategies, patterns, styles, and achievement in web-based courses. *Journal of Agricultural Education*. 43(2). Retrieved March 30th, 2004, from <http://pubs.aged.tamu.edu/jae/pdf/Vol43/43-04-01.pdf>
- 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.
- Valdez, G., McNabb, M., Foertsch, M., Anderson, M., Hawkes, M., & Raack, L. (2002). Computer-based technology and learning: Evolving uses and expectations. Retrieved March 29th, 2004, from <http://www.ncrel.org/tplan/cbtl/toc.htm>