Curriculum Integration: The Use Of Technology To Support Learning

Allen Jackson, Chadron State College, USA
Laura Gaudet, Chadron State College, USA
Larry McDaniel, Dakota State University, USA
Dawn Brammer, Chadron State College, USA

ABSTRACT

Our understanding of how people learn is continually changing. Howard Gardner's Theory of Multiple Intelligences revolutionized the field education, because it accounts for a broader range of human potential in children and adults and suggests that individuals learn in a multitude of ways. Gardner's theory suggests there are a variety of possibilities to facilitate learning. People with heightened verbal, linguistic skills are often referred to as word smart. Verbal, linguistic students learn best through the comprehension of language which includes speaking, writing, reading, and listening. Students with verbal linguistic intelligences can easily access information through worldwide databases and computer networks. Any subject content can be enhanced, enriched, and updated from a variety of easily accessed sources which allow students to master the use of technology to access and share information. Students with logical mathematical intelligence are individuals who are number smart and have innate skills which involve logical, problem solving abilities, creative and manipulative skills, and are adept visual learners. Educators can enhance logical-mathematical intelligence through challenging and innovative multimedia technology. With innovative multimedia technology, students learn at all levels and effectively gain knowledge through a variety of different software programs that offer immediate feedback. Learners with visual-spatial intelligence are aesthetically oriented and may have a greater capacity for learning certain sciences like anatomy or topology. They are skillful when it comes to visualization and memory, but may be challenged with auditory memory. Learning for visual-spatial students takes place all at once, with large chunks of information grasped in intuitive leaps. Many people have an innate kinesthetic ability, as well as a natural sense of how their body should react in physical situations. Students with bodily-Kinesthetic intelligence learn best through tactile learning experiences. Bodily-kinesthetic proficiency can be enhanced for students through the use of the whole body to express ideas and feelings. Gardner proposed that musical intelligence almost parallels linguistic intelligence. The person with interpersonal is able to collaborate, understand and work effectively with others. They are aware of their interactions with others and usually take notice of and react to the feelings of others. The interpersonal learner learns best in group situations and structured class settings. Learners with intrapersonal intelligence have accurate self-understanding and are skilled in problem-solving. There is a multitude of different ways to integrate technology into our classrooms and all should focus on learning theory and educational practices. The use of technology should not occur without thinking about how people learn best. To actively engage diverse learners in higher education, the instructor should have a good understanding of the overall nature and purpose of the group, as well as the ability to interact well within the learner's unique world. The instructor must also be able to structure learning activities to meet their learning needs. The use of Howard Gardner's Theory of Multiple Intelligences, coupled with an understanding of how effective technology can enhance the learning community, can meet the diverse learning needs of all students.

Keywords: Curriculum Integration, Theory of Multiple Intelligence, Bloom's Taxonomy of Educational Objectives, Verbal Linguistic Intelligence, Logical Mathematical Intelligence, Visual-Spatial Intelligence, Bodily-Kinesthetic Intelligence, Musical Intelligence, Interpersonal Intelligence, Intrapersonal Intelligence, Multiple Intelligences and technology, Problem-based Learning, Multiple Intelligence Teaching Approaches

INTRODUCTION

Multiple Intelligences

Howard Gardner, professor of education at Harvard University, proposed the Theory of Multiple Intelligences in 1983. His theory suggested that the traditional concept of one's intelligence, based on I.Q., was very limited and not a valid assessment of a learner's true ability. Gardner proposed his Theory of Multiple Intelligences to account for a broader range of human potential in children and adults (Armstrong, 2000).

When Gardner first presented this theory, the most notable feature was its suggestion that there is a variety of possibilities to facilitate learning. Although Gardener's theory was not immediately embraced by the educational community, it was realized that students, who were not gifted with traditional linguistic or logical skills, were not void of cognitive abilities, but were merely cognizant in different ways. The Theory of Multiple Intelligence revolutionized education by suggesting "several other ways in which the material might be presented to facilitate effective learning" (Armstrong, 2000, p. 2).

Technology and Multiple Intelligences

Our understanding of how people learn is continually changing. Since its inception in 1983, Gardner's theory has expanded from seven to nine different intelligences. It is only through the understanding of students' strengths and weaknesses that committed educators can help learners realize success (Lamb, 2004).

The publication of Bloom's Taxonomy of Educational Objectives (1956) established certain criteria for academic review and the structure of specific learning objectives. The original taxonomy included evaluation, synthesis, analysis, application, comprehension and knowledge. "Researchers recently revised and updated this commonly used and well-respected assessment tool to reflect the advances in cognitive psychology and educational research that have occurred since it was first published" (Hanna, 2007, p. 2). In the 1990's, a group of cognitive theorists, lead by a student of Bloom, Lorin Anderson, revised the taxonomy to better apply to the 21st century learner (Overbaugh & Schultz, n.d.). The newly revised taxonomy (Anderson & Krathwohl, 2001, cited by Hanna, 2007) provides a format for developing standardized assessment criteria that can be applied to many educational practices (Hanna, 2007). This revised taxonomy introduced many changes in terminology, organization, and hierarchical value. Such language changes included the reconfiguration of several major cognitive categories from nouns to verbs. Cognition is recognized as thinking and thinking involves the act of mental processing; therefore Anderson & Krathwohl, (2001) replaced some nouns for verbs to identify certain actions. They renamed the knowledge category to remembering, because knowledge is an outcome of thought (Hanna, 2007). In the revised taxonomy hierarchy, creating is at the top, followed by evaluation, analysis, application, understanding and remembering (Overbaugh & Schultz, n.d.).

Verbal Linguistic Intelligence

People with heightened verbal, linguistic skills are often referred to as word smart. Verbal, linguistic students learn best through the comprehension of language which includes speaking, writing, reading, and listening (Lamb, 2004). They enjoy reading and writing, word games, stories, and possess good retention skills. They learn by saying and hearing. Writers, people who speak a great deal in their jobs, such as announcers, commentators, and instructors or teachers, probably possess a high degree of verbal-linguistic intelligence (Bixler, n.d.).

As we enter into the 21st century, students with verbal linguistic intelligences can easily access a multitude of information through worldwide databases and computer networks. "In every field of knowledge, educational systems are transforming as both teachers and students learn to use multimedia technology" (Dickinson, 1998, p. 1).

Other organizations, as well as the educational community, are utilizing computer banks filled with information. Educational professionals support the implementation of teaching strategies that allow for online

learning experiences while many qualified persons, including university professors and research scientists, offer students an assortment of different learning opportunities involving the use of technology.

Course content in any subject can be enhanced, enriched, and updated from a variety of easily accessed sources that allow students to master the use of technology to access and share information (Dickinson). "The development of linguistic skills for all populations can be catalyzed by remarkable new electronic tools for accessing and managing information and communicating, learning, and developing intelligence in unprecedented ways" (Dickinson, p. 2).

Logical Mathematical Intelligence

The most popular and well documented expertise involving cognitive processing is found in logical-mathematical intelligence. This form of intellect seldom, if ever, requires the use of verbal articulation and has been referred to as the "Aha!" phenomenon by Gardner (Carvin, n.d.). Those individuals who are thought to be number smart are recognized as having innate skills, which involve logical, problem-solving abilities, creative and manipulative skills, and are adept visual learners. Some have the ability to assimilate information using mental imaging from different perspectives and enjoy working with a variety of assessments, such as weighing, measuring, calculating, and organizing (Lamb, 2004).

As described by Dickinson (1998), logical-mathematical intelligence can be facilitated through challenging and innovative multimedia technology. With innovative multimedia technology, students learn at all levels and effectively gain knowledge through a variety of different software programs that "offer immediate feedback and go far beyond drill and practice and workbooks on computers" (Dickinson, p. 1). Computer programs that teach logic and critical thinking skills are often presented through a gaming format. This type of design is used to motivate younger learners and offers programs that emphasize drill and practice, followed by immediate feedback (Casacanada.com, 2000). Many web-enhanced programs offer challenging opportunities for the learner to implement higher-order thinking skills that are crucial to problem-solving (Dickinson).

Visual-Spatial Intelligence

The ability to envision the spatial world in one's own mind is indicative of spatial intelligence. Learners gifted with spatial intelligence are often aesthetically oriented and may have a greater capacity for learning certain sciences like anatomy or topology (Pickering, 1999). The visual spatial learner is well adept when it comes to visualization and memory, but often is challenged with auditory memory. Visual learners are creative and artistic, but easily diverted in many classroom situations. They have been labeled as systems thinkers, yet disorganized and challenged by detail (Silverman, n.d.).

Learning for visual-spatial students takes place all at once, with large chunks of information grasped in intuitive leaps, rather than in the gradual addition of isolated facts, such as small steps or habit patterns gained through practice. For example, "visual-spatial learners can learn all their multiplication facts much easier and faster as a related set rather than memorizing each fact independently" (Landsberger, 2007, p 1). For visual-spatial learners, perfectionism is their organizing principle. They are recognized as well-ordered individuals who place objects in a way that is appealing to the learner. The visual-spatial learner is unsettled when challenged with incomplete, unsettled, or disconcerted situations. Their tendency towards balance and completeness allows them to copy or imitate images in their mind while attempting to bring order by constructing, organize, coding, or configuration (Landsberger, 2007).

Bodily-Kinesthetic Intelligence

Carvin (n.d.) described bodily-kinesthetic intelligence as "one of the most controversial" (Carvin, p. 1) of Gardner's intelligences. Arguments from educators arise from an understanding that every person possesses a certain degree of movement control, including balance, agility, and self-confidence. All learners have a degree of strength in bodily-kinesthetic intelligence that appears before their involvement in formal activities. Many people have an innate kinesthetic ability, as well as a natural sense of how their body should react in physical situations (Carvin).

Some people may argue that physical control does not constitute an intelligence label, but "Gardner and other MI researchers maintain that bodily-kinesthetic ability does indeed deserve such recognition" (Carvin, n.d., p. 1).

The assessment of bodily-kinesthetic astuteness in learners may entail the teacher's use of a variety of unique learning opportunities. Many activities are designed to promote educational processes aimed at creating a more extensive outline of intellectual abilities. Through the application of an assortment of learning opportunities offering tactile learning experiences, the teacher may very well nurture aesthetic growth and artistic development in many young learners (Seitz, n.d.). Bodily-kinesthetic proficiency involves the use of the whole body to express ideas and feelings, as well as the capacity for using one's hands to produce or transform things. This particular intelligence includes tangible skills, such as coordination, balance, power, dexterity, flexibility, and speed (Haywood, n.d.).

Musical Intelligence

When it comes to musical intelligence, there is limited evidence that a bridge between musical activities and musical growth exists when working with young learners. The correlation of musical intelligence is more relevant to academic content when presented in an educational setting. For many, musical intelligence is regarded as an innate ability that certain people may enjoy (Gardner, 1993; Hinckley, 1998, Reimer, as cited in Mills, 2001). It has also been proposed that "intelligence associated with musical understanding does not always relate to superior levels of achievement in other academic areas" (Mills, p. 2). To appreciate musical intelligence, we must understand that it often involves "performance, composition, and appreciation of musical patterns" (Smith, 2002, p. 4). It also encompasses an aptitude for recognizing different musical pitches, tones, and rhythms. "According to Gardner, musical intelligence runs in an almost structural parallel to linguistic intelligence" (Smith, p. 4).

Interpersonal Intelligence

The interpersonal learner, communal in nature, is a person gifted with the ability to collaborate. The interpersonal learner generally understands and works effectively with others. Many interpersonal learners show evidence of this type of intelligence when they flourish in group work. They are very cognizant of their interactions with others and often take notice of and react to the feelings of others. They have strong social skills, communicate well with people, both verbally and non-verbally, and are often good listeners (Advanogy.com, 2003).

Interpersonal learners typically learn best when learning involves group situations and structured class settings. Interpersonal learners often seek out one-on-one teacher time with instruction that allows the interpersonal learners to express their own thoughts and opinions. Interpersonal students prefer to work out problems with others and commonly approximate games which involve groups of participants. Such activities might include any number of team sports (Advanogy.com, 2003).

Intrapersonal Intelligence

Are you good with analysis; do you often find yourself in deep thought; are you critical in regard to yourself and your accomplishments; and do you really get into reading books and other forms of literature (Fleming, 2007)? These are just a few of the personal characteristics indicative of intrapersonal learners. Intrapersonal intelligence involves a distinct set of abilities turned toward oneself; "individuals who have high intrapersonal intelligence have an accurate self-understanding, and can use this to their advantage in problem-solving" (Plucker, 2007, p. 2). For the most part, traditional education has seemingly overlooked intrapersonal intelligence, which recognizes the importance of self-knowledge and self-awareness. Intrapersonal intelligence goes beyond the demands of selecting strategies and evaluating outcomes in the problem-solving process (Shepard, Fasko, & Osborne, 1999). Intrapersonal intelligence is unique in that Intrapersonal intelligence may be thought of as a formal attempt to include the affective, feeling side of human nature to the intelligence equation. By recognizing that human beings are something more than the logical demands of daily life, issues such as motivation and personal identity may be considered as being integral to the process of adapting to one's environment" (Shepard, et al. p. 3).

Multiple Intelligences and Technology

As a facilitator of learning, one may ask themselves how educators can effectively use technology to implement Multiple Intelligences in the classroom. In many of today's schools, the model remains the same as it was; i.e., The teacher is typically in front of the classroom with students sitting in desks absorbing information from well-developed lesson plans. Hoerr (2000) indicated that technology really has not made much of a difference in overall student success. From a very broad spectrum, schools are not keeping up with advancing technology. Who is to blame? Access to a world-wide web is at the tip of our fingers. Are the inadequacies in utilizing appropriate technology the fault of the classroom teacher? "Schools are rarely adequately funded and buying technology only happens at the expense of purchasing other materials or increasing salaries" (Hoerr, p. 1).

Tomorrow's classrooms will have different technologies and their use eventually appropriated on a regular basis. The use of modern technology is rapidly appearing in today's classrooms, but different methodologies involving the presentation of curriculum must be adopted to meet the needs of the 21st century learner. As the use of technology becomes more prevalent in our public schools, the cost will eventually reduce and the capacity to obtain and store data will be realized. The variety and amount of information offered to learners will ultimately raise expectations for how problems are solved and research is conducted (Hoerr).

The use of technology in education is here to stay. "Technological advances will not only make our lives easier, they will change the way we live and think, and while it will be later rather than sooner, this will happen in our classrooms too" (Hoerr, 2000, p. 3). As educators, it is our responsibility to stay abreast of technology by discovering new and innovative ways to develop and present curriculum. Through this realization, we will better ascertain how to employ technology in creative new ways while using Gardner's Multiple Intelligence theory to help our students succeed (Hoerr).

Using Technology to Teach to the Multiple Intelligences

Technology has long been used in the classroom, even since the beginning of my formal education in 1962, when we were ushered into the library to witness the unfolding events following President Kennedy's assassination. By today's standards, technology has a much more extensive definition considering the tools now available to teachers, as well as the learner. There is a multitude of different ways to integrate newer forms of technology into our classrooms (Haywood, n.d.). Such methods should focus on learning theory and educational practices. The use of technology should not occur without thinking about how people learn. The presentation of new programs, applications, software, and technology related activities provided to our students will only prove to be of value if we coordinate the use of technology with the needs of the learner (Haywood, n.d.).

A Model for Learning and Thinking

To actively engage a diverse group of learners in the higher education classroom requires that the instructor have a good understanding of the overall nature and purpose of the group, as well as the ability to interact well within the learner's unique world. Typical instructional trends at our nation's colleges and universities neglect to enlist active student involvement by failing to understand the diversity of learning styles among every learner cluster. On occasion, we are confronted with a situation where our educational offerings fall short of student interest, which hampers students' ability to achieve. Learners all too often lose interest and become disengaged with the content of the lesson. Problem-based Learning (PBL) may offer ways in which the instructor can keep students involved while stimulating ideas relevant to a given curriculum. As the use of PBL expands into higher education, we should consider tapping into a variety of multiple intelligences as a means of increasing student participation, thus enhancing and supporting the various ways people teach (Webber, 2001).

Learners are influenced by innumerable psychological, social, and situational factors. As professionals, we should have a clear understanding and comprehension of the learning process. Learning is not a simple by-product following various educational inputs. In such a case, our best efforts may or may not be successful (Sale, n.d.). Sale offers us a clear perspective on PBL as a realistic approach to curriculum planning and delivery. His research focused specifically on the use of PBL in the promotion of thinking and learning and offers a practical model that

enables instructors to acquire the necessary methodological skills important for the identification of specific types of thinking in PBL activities.

The use of problem-based learning (PBL) activities varies based on class size, structure, and discipline. This type of learning is most effective when it involves learners in the use of specific types of cognition, which are important in the problem-solving process. Other learning opportunities include accessing, organizing, making sense of content knowledge, and developing processing skills important for promoting learning in the identified areas (Sale, n.d.).

To compliment PBL, the instructor needs to recognize different approaches to multiple intelligence teaching. Multiple intelligence teaching approaches (MITA) offer realistic approaches to the enrichment of learning opportunities for a greater population of post-secondary learners. The use of MITA generates challenging learning opportunities designed to boost student achievement. As professionals, we must provide learning activities to engage students in formulating and solving real life problems. As a result, the learner will acquire internal interests and abilities relevant to supporting academic success (Webber, 2001).

User-friendly computer programs are increasing the possibility of presenting curriculum in different ways. Students can make learning an adventure and educators can better develop and enrich their courses with the wealth of information technology now provided (Dickinson, 1998). When teachers incorporate technology into curricular areas, and use this methodological approach with an understanding of students' multiple intelligences, student interest is tapped into and maintained (Pickering, 1999). "When teachers implement both the theory of multiple intelligences and technology, they, along with their students, find that the classroom experiences become more stimulating" (Pickering, p. 1). Pickering's statement supports our belief that by allowing students the freedom to explore different avenues of learning, information is gathered that enhances the educational experience. According to Pickering, the Internet allows students to collect original data from experts in the field; experts who are associated with colleges, universities, and government organizations that have far more resources and up-to-date information than most libraries could ever acquire. There is so much information available that students are now learning about information literacy; how to search efficiently and effectively. "Having access to this immediate information can lead to some valuable learning experiences" (Pickering, p. 9).

CONCLUSION

The authors of this manuscript decided to use technology to support face-to-face classroom meetings with students as a result of action research through observations involving select groups of learners. We agreed there was successful engagement from approximately 60% of the class for 20 minutes, but we were not teaching to all learning strengths. A percentage of our students were struggling with lessons. Over the past decade, a growing number of opponents of technology in the classroom have raised questions about the kind of student learning educators might realize. From our perspective, educators should not think about what schools have to gain from technology, but should focus on how to meet the needs of a new generation of learners. These learners have grown up in a technological society.

When one considers contemporary issues in education, it must recognize that in 2005, the United States was at the forefront of enhancing knowledge and understanding due to the integration of technology into curriculum (Barnes, 2005). The role of technology in today's world is likely to have little value unless educators are willing to "raise the level of digital inclusion" (Valdez, n.d. p. 2) in the classroom. Cuban, Kirkpatrick, & Peck (2001) noted in their survey results from the 1998-1999 school year that fewer than 20% of teachers used technology in the classroom, while 50% of the teachers surveyed used little or no technology at all. They also recognized that of those using technology, very few did so in ways that would enhance the learning environment. More often than not, the use of technology sustained rather than altered existing patterns of teaching (Cuban et al.). Educators may become more aware of the needs of their students through observation, thus shedding light on a variety of student learning abilities. By integrating more technology into curriculum, educators will ensure that different learning modalities are being served. Students will become more engaged as well as more responsible for learning outcomes. Valdez stated, "The unavoidable conclusion is that successful improvement of technology is of high importance to our future" (Valdez, p. 1).

AUTHOR INFORMATION

Allen Jackson, M. Ed. is an Assistant Professor at Chadron State College in Chadron, Nebraska. He has taught in the Department of Health, Physical Education and Recreation (HPER) for six years. He teaches course in Personal Health and Wellness, Introduction to Recreation, Biomechanics of Sports, Community and Environmental Health and several activities courses. He is a doctoral student at Northcentral University in Prescott Valley, Arizona is in the dissertation phase of his program.

Laura Gaudet, Ph. D. is a Professor of Psychology at Chadron State College, in Chadron, Nebraska. She has taught in the Department of Counseling, Psychology, and Social Work for ten years and has served as the department chair since 2003. As she has degrees in both Psychology and Counseling, she teaches both undergraduate Psychology and graduate Counseling courses in Multicultural Counseling, Consultation and Program Development, School Counseling, Family Counseling, Advanced Developmental Psychology, Career and Lifestyle Development, Ethical and Legal Issues, Child Psychology, Developmental Psychology, Abnormal Psychology, and General Psychology. She primarily develops and teaches courses online.

Larry McDaniel, Ed. D., is an Associate Professor at Dakota State University in Madison, South Dakota. He has taught at Dakota State University for five years after teaching at Chadron State College for four years. He teaches in the Department of Human Performance and teaches both undergraduate and graduate students in the College of Education, DSU.

Dawn Brammer, M. Ed. is an Assistant Professor at Chadron State College in Chadron, Nebraska. She has taught in the Department of Health, Physical Education & Recreation (HPER) for six years. She teaches courses in Personal Health and Wellness, Theory of Physical Education, Tests and Measurements in Physical Education, Introduction to Adapted Physical Education, and Curriculum Planning in Physical Education. She is a doctoral student at Northcentral University in Prescott Valley, Arizona is in the dissertation phase of his program.

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