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ABSTRACT

Telecommunications offers teacher candidates an environment through which to delve into higher order thinking skills within the methods coursework, student teaching internship experience, as well as within the PreK-12 classroom environment. Modeling of appropriate uses of technology within the learning environment as the teacher candidate progresses through their course of study emphasizes numerous constructive opportunities to integrate telecommunications to reach the lesson objectives. Telecommunications encompasses several elements that can be positively modeled within a learning environment. Listservs, chat sessions, bulletin boards, and electronic mail create positive environments within a learning environment when focusing upon the scope and sequence of the instructional design process. Further, the instructor-centered and learner-centered focuses of telecommunicative uses are also elements that deserve further review. (AEF)

Teacher Candidate Applications of Telecommunications

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Abstract: Telecommunications offers the teacher candidates an environment through which to delve into higher order thinking skills within the methods coursework, student teaching internship experience as well as within the PreK-12 classroom environment. Modeling of appropriate uses of technology within the learning environment as the teacher candidate progresses through their course of study emphasizes numerous constructive opportunities to integrate telecommunications to reach the lesson objectives.

Introduction

Teachers desire numerous tools through which to communicate lesson objectives to the learners, opportunities to build communities of learners, as well as to focus efforts upon the unwritten curriculum that is of importance within all schools through out the nation and the world at large. Teacher candidates are novice instructional designers as well as instructors but the majority of teacher candidates, at this juncture within the history of educational training, are more comfortable with the idea of technological ideology. The philosophical as well as conceptual leap that must occur with the teacher candidates' use of technology within a learning environment is the instructional design and implementation of technologies. Further, modeling of such activities must be an objective of superior teacher education units.

The integration of technology within teacher candidate's methods coursework offers the opportunity to communicate at numerous levels of understanding. Through the support of the United States of America's Department of Education Preparing Tomorrow's Teachers to Use Technology grant, the design and development of a World Wide Web site through which the teacher candidates, inservice educators associated with the professional development schools (PDSs) that support the training of teacher candidates, PreK-12 learners and university faculty have the opportunity to delve into the world of telecommunications. A supportive environment has been created through which access to telecommunicative environs is available to the teacher candidates, as well as faculty and learners whom support the teacher candidate's professional learning opportunities.

Telecommunications encompasses several elements that can be positively modeled within a learning environment. listservs, chat sessions, bulletin boards, and electronic mail creates positive environments within a learning environment when focusing upon the scope and sequence of the instructional design process. Further, the instructor-centered and learner-centered focuses of telecommunicative uses are also elements that deserve further review.

Cognitive Flexibility

Cognitive flexibility offers further theoretical understanding concerning the nature of learning and the opportunities through which learning occurs within complex domains as well as ill-structured domains.

Spiro and Jeng state that, "By cognitive flexibility, we mean the ability to spontaneously restructure one's knowledge, in many ways, in adaptive response to radically changing situational demands.... This is a function of both the way knowledge is represented (e.g., along multiple rather single conceptual dimensions) and the processes that operate on those mental representations (e.g., processes of schema assembly rather than intact schema retrieval)" (1990, page 165). Additionally, cognitive flexibility "is largely concerned with transfer of knowledge and skills beyond their initial learning situation" (Kearsley, http://tip.psychology.org/spiro.html, paragraph 2). As such, cognitive flexibility is especially structured to support the integration and success of interactive technologies, such as telecommunications within the learning environment.

Telecommunications has the opportunity to reposition the learners beyond the mere obtainment of basic knowledge, towards opportunities through which the learners are enveloped within a world of understanding, analyzation and evaluation of the knowledge they are integrating into a conceptual framework of understanding. The complex and ill-structured domains delineated within cognitive flexibility theory aptly describe the world of telecommunications, as well as the opportunities towards achieving higher order thinking skills within the learner's conceptual framework of understanding.

Bloom's Taxonomy of the Cognitive Domain

As learners begin to obtain subject-specific knowledge, an emphasis must be placed upon the developing conceptual framework of understanding that is created. Bloom's Taxonomy creates an appropriate format through which to view the developing levels of higher order thinking skills as the learner moves beyond basic knowledge levels of information towards a level at which the learner is comfortable analyzing the information and then, finally, synthesizing and evaluating the information that has been appropriately and successfully incorporated within the learner's conceptual framework of understanding. Following is a brief explanation of the distinct levels of Bloom's Taxonomy, with a short definition and sample learning objective verbs made available for review. Further, examples of behavior are presented to emphasize the specific levels of understanding.

LEVEL	DEFINITION	SAMPLE VERBS	SAMPLE BEHAVIORS
KNOWLEDGE	Student recalls or recognizes information, ideas, and principles in the approximate form in which they were learned.	Write List Label Name State Define	The student will define the 6 levels of Bloom's taxonomy of the cognitive domain.
COMPREHENSION	Student translates, comprehends, or interprets information based on prior learning.	Explain Summarize Paraphrase Describe Illustrate	The student will explain the purpose of Bloom's taxonomy of the cognitive domain.
APPLICATION	Student selects, transfers, and uses data and principles to complete a problem or task with a minimum of direction.	Use Compute Solve Demonstrate Apply Construct	The student will write an instructional objective for each level of Bloom's taxonomy.
ANALYSIS	Student distinguishes, classifies, and relates the assumptions, hypotheses, evidence, or structure of a statement or question.	Analyze Categorize Compare Contrast Separate	The student will compare and contrast the cognitive and affective domains.
SYNTHESIS	Student originates, integrates, and combines ideas into a product, plan or proposal that is new to him or her.	Create Design Hypothesize Invent Develop	The student will design a classification scheme for writing educational objectives that combines the cognitive, affective, and psychomotor domains.

EVALUATION	Student appraises, assesses, or critiques on a basis of specific standards and criteria.	Judge Recommend Critique Justify	The student will judge the effectiveness of writing objectives using Bloom's taxonomy.

(Huitt, 2000, paragraph 2)

The focus of the learning environment is to aid the learner in reaching the synthesis and evaluation stages of Bloom's Taxonomy. The higher order thinking skills that the learner must reach are areas of further interest and discussion.

Bloom's Taxonomy of the Cognitive Domain and Higher Order Thinking Skills

Achieving higher order thinking within the realm of a learner's conceptual understanding of the subject matter under discussion is an art that teacher candidates must glean from inservice educators, university faculty and numerous other mentors. Higher order thinking skills provide opportunities to provide higher order thinking occurrences for learners within a learning environment are supported by the further examination of Bloom's Taxonomy. Further, broadening the focus of higher order thinking offers the opportunity to emphasize the creation and understanding of information beyond merely the knowledge level of comprehension. Thomas, Thorne and Small (2001) offer a brief description of what higher order thinking skills emphasize.

> Higher Order Thinking, or HOT for short, takes thinking to higher levels than just restating the facts. HOT requires that we do something with the facts. We must understand them, connect them to each other, categorize them, manipulate them, put them together in new or novel ways, and apply them as we seek new solutions to new problems. (Thomas, Thorne & Small, 2001, paragraph 7)

Higher order thinking skills (HOTS) can be distributed into three main categories of understanding: content thinking; critical thinking; and, creative thinking. HOTS emphasize distinctly different levels within Bloom's Taxonomy, which offers the range of simplistic knowledge attainment towards more complex levels of understanding and working with information. The complex levels of working with information and learner's thinking processes and skills associated with HOTS parallels Bloom's Taxonomy within the levels of the synthesis and evaluation. "As patterns of higher order thinking are emphasized in learners within all levels of the educational system, each subject area emphasizes the creation of innovative aspects that aid the learner towards the creation and reconceptualization of thought patterns; in other words, viewing the information from numerous perspectives and within real-world environments" (Brown & Crawford, 2001).

Therefore, there is a clear pattern towards Bloom's Taxonomy of the cognitive domain and HOTS, which leads towards cognitive flexibility's ill-structured domain that offers the learner the opportunity to create and delve into further understanding of subject matter through the appropriate and successful integration of telecommunications into the learning environment. The modeling of telecommunications within the learning environment is accomplished through the integration of specific available opportunities within the teacher candidates' professional development. Following are specific telecommunicative opportunities that have been made available to teacher candidates, through the Preparing Tomorrow's Teachers to Use Technology (PTTT) grant.

Listservs

Listservs have been integrated into the communicative levels of electronic discourse for numerous years. Such a telecommunication ally offers the ability to disperse information to numerous people within a simplistic mode of interaction and transmission. The listserv available through the PTTT grant maintains a bi-weekly message to all teacher candidates, university faculty, inservice educators and administrators who have become subscribers to the listserv community.

Digital newsletters offering updates on professional development opportunities, new technological innovations for the learning environment, useful Web sites for subject-specific or foundational knowledge are offered. Each digital newsletter is focused upon a specific topic, so as to offer significant information that will be useful to the subscribers. As well, a listserv is a simplistic format through which to disperse

important or useful information in an up-to-date, digital fashion. This ease of use maintains a one-way, asynchronous communication between the PTTT grant and the participants.

Bulletin Boards

Another asynchronous communication tool available for integration within learning environments is the bulletin board. The opportunity to create threaded discussions maintains a communicative quality to the learning environment, without hampering the learner's ability to create an "anytime, anywhere" attitude towards information attainment. The communication is occurring within a threaded discussion, yet the learner can access and respond to the discussion at any point within their busy daily schedule. Teacher candidates are expected to maintain a rigorous schedule within the PDS learning environment and may not have the opportunity to maintain designated time allocation towards telecommunicative activities at specific points through out the day. Therefore, the ability to offer bulletin boards as a communicative activity maintains the thought pattern displayed within the discussion, but also maintains the freedom to review the discussion as an asynchronous entity. Further, the teacher candidate has the ability to develop and submit thoughtful responses to the discussion, without being hampered by time or keyboarding ability.

Electronic Mail

As a one-on-one asynchronous communicative tool, electronic mail (e-mail) is unsurpassed. Documentation concerning previous communications is easily obtainable within e-mail, due to the ability to archive e-mail communications for future use. This is an important aspect for teacher candidates to consider, as documentation of learner and parental communications are important elements when issues arise. Further, the ability to maintain personal communication with parental figures is a lifesaving event, as telephone communications can be wrought with difficulty. E-mail has the ability to communicate with a parental figure, as well as document the communication attempts. As well, the ability to communicate with a learner who may have course difficulties is an important element to the success of the learner.

Chat Sessions

Synchronous telecommunication opportunities are also an important element within the learning environment. Teacher candidates maintain that a virtual office hour is useful during their plan of study, and maintains communication with their university faculty whenever questions arise concerning coursework issues. The positive element concerning chat sessions is the ability to communicate back and forth within a real-time setting; however, the negative elements associated with chat sessions are the designated date and time allocation as well as the keyboarding abilities of some teacher candidates.

Integration of Telecommunications into the Learning Environment

As stated by the International Society for Technology in Education (ISTE), "Technology must become an integral part of the teaching and learning process in every setting supporting the preparation of teachers" (International Society for Technology in Education, 2001, paragraph 2). Further, "A combination of essential conditions is required for teachers to create learning environments conducive to powerful uses of technology. The most effective learning environments meld traditional approaches and new approaches to facilitate learning of relevant content while addressing individual needs" (International Society for Technology in Education, 2001, paragraph 1). Therefore, ISTE supports the integration of technology into the learning environment so as to create a supportive environment that emphasizes effective learning and addressed the learner's individual needs.

Instructor-Focused Versus Learner-Focused Integration

The implication for telecommunications modeling is that the ability to integrate telecommunications into the learning environment is simplistic; however, this is definitely not the case. Careful modeling of telecommunications integration into the learning environment must be created and supported by university faculty and inservice mentors. Only through this modeling of appropriate and

successful telecommunicative ventures will the teacher candidates expand their conceptual framework of understanding concerning the integration of technology into the learning environments. Emphasis must be placed upon the ability to integrate technology as an instructor-focused activity as well as a learner-focused activity. Telecommunications could easily be integrated as an instructor-focused activity through the support of a listserv environment; while a learner-focused activity could easily be designed and implemented through the support of bulletin boards and chat sessions.

Conclusion

With the inclusion of telecommunications through out the learning environment, it remains that "The most obvious benefit of the electronic classroom is that it achieves what progressive educators could only dream of: a union of work and play.... There is no certainty that the electronic classroom will actually fulfill this promise, but it is this hope that makes the realization so attractive" (Ravitch, 1987, p. 28). The creation of learning environments that ready our learners for the complex, ill-structured world in which we live can only be appropriate towards the success of the future generations. Through the inclusion of technology, specifically telecommunications, the communicative nature of information and bonding has the opportunity to flourish.

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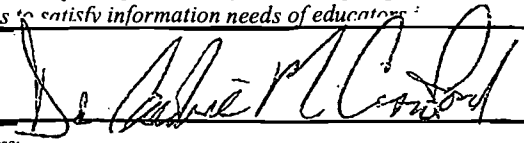
Signature: 	Printed Name/Position/Title: Caroline M. Crawford, Assistant Professor of Instructional Technology
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