Digital Media Curriculum Converted from Liberal Arts to Practitioner Based

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Abstract

Creating a student-centered/regulated curriculum is the objective for the new Lyndon State College's Digital Media program. Replacing the old liberal arts based Digital Media curriculum with a professional based program will better prepare Digital Media majors for the workplace. This goal is achieved by blending objectivist and constructivist learning models, which provide the learner the structure to learn new material and actively construct and apply meanings to each course. Instructional transactions are being considered for future development of the Digital Media curriculum. The introduction of instructional transactions will move instruction away from teacher controlled education and allow learners a choice between directed-study and/or student regulated learning. This paper provides information on how the new Digital Media curriculum is meeting and planning for the needs of learners who need to be dynamic students and professionals.

Introduction

The standardized test and other federally mandated educational requirements (United States) placed on K-12 learning institutions, may require higher education institutions to reshape students into becoming self-motivated, self-reliant and independent learners. For higher education to provide learning opportunities across programs and curricula reevaluation is needed. At Lyndon State College (LSC), Lyndonville, VT, students entering the Digital Media (DM) program have difficulty working independently or within a collaborative environment without procedural mandates from the instructor. When asked to move forward on a project or assignment many students require directives to accomplish the desired outcomes. Providing a percentage of this population free range to determine solutions to digital media problems is generally unsuccessful. Looking at developing the DM students' ability to become self-reliant learners the instructor may need to assist learners to identify self-directedness. Christensen &

Hooker (2000) theorized that self-directedness is the capacity to modulate the problem solving process by high order integrative development. Within this context, the DM student is unprepared to problem solve at a basic level. In the digital media workplace, problem solving and interpreting client needs require a workforce that is articulate in translating abstract concepts into tangible products.

To meet the evolutionary needs towards independent learning for LSC DM majors a new DM curriculum has been developed and implemented (fall 2005). The new curriculum turns its focus away from a liberal arts DM curriculum to one embedded in professional and practitioner development. The new DM curriculum has been approved by the LSC Curriculum Committee, Faculty Assembly, the Academic Dean and the President and is in the 2005-2006 College Catalog. Incoming first year DM majors (class 0f 2009) will be in the new DM program.

The previous DM curriculum (Table A1), in place since 2001, was developed by a tenure track Anthropology professor. At the time, the DM program was called Interactive Digital Media (IDM) and was part of the Mathematics and Computer Science department. At the beginning of the 2003-2004 academic year, the IDM program moved to the Digital and Graphics Arts (DGA) department and was renamed Digital Media. The old IDM curriculum introduced the DM student to web and multimedia software (Macromedia Flash, Director and Dreamweaver) and a plethora of media related liberal arts courses. Each web-based course excluded intermediate instruction in web multimedia programming (HTML, JavaScript, Actionscript and Lingo). Several of the DM liberal arts courses overlapped with the colleges' General Education course requirements.

The new DM curriculum (Table A2) students now have the opportunity to explore the major web and multimedia software (Director, Dreamweaver, Fireworks, Final Cut Pro, Flash, and Maya)

and programming languages (Actionscript, Active Server Pages (ASP), HTML, JavaScript, and Lingo).

The purpose of this paper is to delve into using various traditional and student-centered/regulated learning theories as part of developing course material(s) for the new DM curriculum. Behavioral and social cognitive learning theories require the DM student to work with directed-study materials and in team environments. In combination each learning theory will introduce the DM student to self-sufficient/motivated learning in preparation for the dynamic DM workplace and to become a life-long learner. Merrill and his Instructional Design 2 team (1990, 1991a, 1991b, 1992, and 1996) designed and developed the Instructional Transaction Theory, which may be a model for future digital media course development.

Identifying Course Development Needs

Chickering & Reisser (1993) discuss competency development as a means to cope with achieving goals successfully. The majority of students in the DM program have little confidence upon entering the program limiting student attainment of program goals as a result of low competency levels. Incorporating behavioral learning environments, which many students are familiar, into introductory software courses provide DM learners an introduction to develop the fundamental skills required to achieve success in mastering any web or multimedia software program.

The simplest means of assessing what a learner has learned is through observing a progression of changes in form or performance. Learners given stimuli (multi-answer exams) will respond using behavioral learning models (Ertmer & Newby, 1993). Having the students

reiterate material emphasizes the importance of performance through reinforced responses. Learning psychology has identified primary reinforcers as mainly biological (food) (Ertmer et al. 1993). In teacher-directed classrooms biological reinforces (food) have been replaced with grades as a primary reinforcer (Driscoll, 1994) and praise or any symbol given to a learner making him or her standout. Driscoll (1994) identifies the principles of behavior management as first strengthening the operant behavior through presenting a reinforcer contingent on the response. The reinforcer can be anything that increases responses and/or creates a high-frequency behavior in the learner and weakens the operant behavior with the introduction of a noxious stimulus leading to a punishment contingent upon the response. Removing the reinforcer will break down the contingency between the response and the reinforcer. Or it will exact a fine contingent, or remove the learner from the reinforcing environment (Driscoll, 1994).

In the DM program students expect to be assessed through behavioral models. Giving students multiple-answer tests is the preferred and familiar achievement measurement. In this venue the reinforcer is getting high grades. This form of testing does not provide a significant indication of the student's level of subject matter mastery. Therefore in the DM curriculum a multi-answer exam (midterms and finals), if used, would only provide a cursory measurement of the student's base knowledge of software terminology and use, and carry a low point value toward the final grade. Participation expectations carry a moderate grade value, as here the student has the opportunity to develop interpersonal skills and self-efficacy. A critical factor of assessment tools in a behavioral learning environment is the relationship between the stimuli and consequences within the environment. The inclusion of instructional cues, practice, and [to] reinforce students are prescriptions for learning that recalls facts, provides generalizations, and automatically perform procedures without the acquisition of higher order knowledge (Ertmer et

al., 1994). To achieve higher order knowledge the new DM curriculum incorporates collaborative learning, directed study, and student regulated learning experiences.

Bandura's (2001) Social Cognitive Theory determined that an individual's functional consciousness involves purposive assessing and deliberative processing of information for selecting, constructing, regulating and evaluating courses of action and the intentional use of semantic and pragmatic interpretation of goals, activities and future events (Bandura, 2001). To successfully achieve working collaboration, in or out of the classroom, the combination of the individual's "functional consciousness" (Bandura, 2001, p. 3) is a critical component. Members of a collaborative project need to perceive self-efficacy as a casual structure. Each belief affects adaptation and change to the central role of "self-regulation of motivation" in project outcomes (Bandura, 2001, p. 3). Developing a strong level of confidence can lead the DM student to understanding his or her power to produce self-efficacy. DM Students will have more control over their success(es) as they grasp the need for self-development, which in turn contributes to "regulating and evaluating courses of action" (Bandura, 2001, p. 3) resulting in productive collaboration in the classroom.

Students will collaborate with digital media colleagues and clients once they have graduated. To prepare students to understand the mechanics and responsibilities of collaborative engagement, as part of the new DM curriculum, students will have the opportunity to investigate and experience collaborative relationships (with classmates, on campus faculty and/or departments, and/or non-profit organizations). Working in collaboration with peers (classmates or professional colleagues) the group attains success when the product or project is completed with coordinated and synergistic dynamics of the team members' interaction. The collaborators also contribute shared intentions, knowledge and the skills. In team environments when the

collective efficacy is strong it manifests itself in high aspirations, motivation, and the ability to work through obstacles and negative morale at any point during the project (Bandura, 2001).

The DM curriculum course structure provides students with introductory to intermediate learning models (directed-study using tutorials) incorporated into each course as a student-regulated project. For the DM student to transition into a professional environment, he or she will work closely with clients and other DM and Information Technologies (IT) professionals. The ability to translate non-professional (client) concepts into a completed project requires the skill and knowledge to implement design and development expertise into the collaborative endeavor. (Digital Media graduates will become more competitive in the job market if they can translate and/or elaborate the technical development of their web and multimedia designs.)

Lower and upper level software courses are taught through the use of blending directed-study and student-regulated initiatives. Students who are good self-regulators will expand their knowledge and cognitive competencies; poor self-regulators will fall behind (Zimmerman, 1999 as cited by Bandura, 2001). Expanding global environments where technology, communications and technical skills quickly become outmoded require a workforce who continually renews or reinvents his or her skills and knowledge. Cultivating multiple competencies to meet ever-changing occupational demands (Bandura, 2001) indicate students learn how to become life-learners as part of student-regulated curricula. The student integrates knowledge acquisition (though tutorials and assignments) into the final project (self-determined and regulated).

There are problems with how well students are equipped to move from directed-study (teacher initiated learning) to a student-regulated learning experience. Hadwin, Boutara, Knoetzke, and Thompson (2004) identify self-regulation as a means for students to become masters of their own learning. Successful self-regulated learning will advance in metacognitive,

behavioral and motivation commitments by students controlling their own learning and assessments. This leads to a learning situation where the self-regulated student may see improvements in evaluations and the learning experience (Hadwin et al., 2004). The new DM curriculum's structural foundation introduces and prepares the DM major to move from exclusively teacher-directed learning into a directed-study learning environment balanced with student-regulated and constructivist learning models. When a student begins to construct and assimilate knowledge they are better equipped to become life-long learners. Singular advancements in technology and multimedia and web software position the DM major to actively construct meaning (Land & Hannafin, 2000). Students who have the opportunity to choose and select their specific interests in a subject evolve a greater responsibility for learning (Perkins, 1993 as cited by Land et al., 2000).

Course Structure

The brief introduction to directed-study and student-regulated learning theories and the relationship to the DM curriculum provides DM students an opportunity to integrate tutorial knowledge into practical application. In the two and three thousand series software courses, the general structure of the syllabi follows a directed-study model (tutorials; weeks 1 to 10), the student works with structured learning materials and a student-regulated Final Project (FP), which start in week 4 by introducing Final Project Versions (FPVs), which culminate in FPs submission at week fifteen.

In designing and developing the new DM curriculum, one objective is to engage students in active learning so students can begin to construct their own knowledge. Their newly constructed knowledge is based on combining objectivist and constructivist learning models. Jonassen (1991) suggests there are three phases of learning:

1. Introductory learning, where learners have little or no prior knowledge of the subject matter. And it is the initial stage of schema building integration [objectivist];
2. Knowledge acquisition, which is the beginning of the intermediate stage of acquiring advanced subject matter knowledge leading to solve complex, domain or context dependent problems [constructivist]; and
3. Expertise, which is the final stage of knowledge acquisition where knowledge structures are interconnected.

The DM curriculum moves students toward a constructivist learning experience by combining introductory learning and knowledge acquisition into all two and three thousand series software classes. The DM program has only one faculty member and no adjuncts teaching courses in the new curriculum. As a result DM software courses are taught to instruct the student in introductory to intermediate skills needed to work constructively.

Currently with no advanced software courses available students are provided advanced material in IDM 2160: Instructional Technology, IDM 3020: Virtual Arts and Sciences, IDM 3030: Fundamentals of e-Business, IDM 3810: Special Topics for the Internet, and IDM 4710: Digital Media Independent Study. In each course the DM student has the opportunity to implement his or her basic and intermediate software knowledge through collaboration with an on-campus client, study advanced software material, and use or create his or her own course of study while working independently under the supervision of the DM Faculty. There are limited opportunities to work with a real-world client in IDM 3030: Fundamentals of e-Business.

In Jonassen's (1991) phases of learning schema building is an integration of introductory learning and indicates objectivist learning is occurring. This coincides with students working through tutorials that enable them to learn how and what the software can do. Moving through the semester the student displays his or her acquired knowledge and expertise of design and development in the final project. Through the application of a student's acquired knowledge there is success with students beginning to construct meaning (introductory learning and

knowledge acquisition) and applying their expertise in the FP. The DM learner is responsible for a self-designed problem (the final project). To successfully solve the FP the learner integrates introductory schema and applies it to the problem as an opportunity to facilitate extrapolation [of] the instruction (Bruner, 1966).

Developing schema is the main objective of blending Jonassen's constructivist model. Tennyson & Elmore (1997) cite Ausubel (1980) who describes schemata as the scaffolding of ideas. Scaffolding is accomplished by a series of Final Project Versions (FPV) starting in week four. Digital media professionals work with project deadlines in the DM software courses FPVs due at intervals throughout the semester replicate a workplace project schedule. At week six or seven students start to organize their knowledge gained through the tutorials into meaningful concepts (Tennyson et al., 1997) in its application into the FP. Transmissive instruction alone cannot provide the DM student with building expertise. In a transmissive environment, knowledge becomes an object that is conveyed to the learner, which then is owned by the individual (learner) and knowledge can be assumed to be seen as the instructor sees it (Jonassen & Land, 2000). Merrill and the ID_2 Research Group (1996) define students as desirous of acquiring knowledge and able to construct their own meaning from the experiences (Jonassen, et al., 2000).

Instructional design for DM course models, assumes learning results in the organizing of memory structures, which Merrill (1990) terms mental models. The explicit specification of relations among knowledge units is known as elaboration (Merrill, 1991). Merrill and his ID_2 team (1992) created the Instructional Transaction Theory (ITT) that combines knowledge base (database) connectivity with a user interface based on transactions and frames of knowledge,

which provides the learner with a linear and/or non-linear Computer Based Instruction (CBI). Implementation of ITT in the DM curriculum is explained later in this paper.

Pedagogically integrating directed-study and student-regulated learning into the course curriculum purposefully guides students towards becoming problem-solvers. Problem solving is regularly engaged in every DM project. DM graduates who succeed in learning how to dissect a problem and interpret solution options will become valuable DM professionals. When learners are actively engaged in problem solving they make substantial connections to the course content. Students who make these connections through problem-based learning Dominowski (1993) believe students generate ideas that provide explanations to promote and support learning (Knowlton, 2003).

Through the blending of directed-study and student-regulated pedagogical models used in the two and three thousand series software classes, upper level students are better prepared to integrate both learning theories. Student evaluations in the DM program have suggested that exploratory learning be allowed. Students have expressed an interest in eliminating the multimedia or web software tutorial model. Student preparation for the exploratory learning model could be determined by how well previously embedded knowledge have prepared students to determine an individually viable sequencing of material.

To prepare students as self-regulated learners the instructional design of a course can embed Elaboration Theory (ET). ET makes distinctions from learning course material in-depth through performing simple toward more complex tasks sequentially. Reigeluth (1999) indicates that embedding ET in higher education courses requires the right content and this can be less clear depending largely on values, along with conflicting student interests and what is learned may not be apparent for years to come. In the current DM curriculum use tutorials introduce

elaboration through the structure of the final project. In each two-three thousand series software class a strong relationship between subject matter and its use in the final project closes the gap between directed-study and student-regulated learning. ET develops this relationship through sequencing and scope. The learner is likely to advance through the material systematically and master the material without having to organize large amounts of content logically (Reigeluth, 1999). Learner progression through course material leads to understanding content constructs (a single fact, concept, principle or step) and then develops subject-matter structures (sets of content constructs grouped together based on a pervasive relationship) (Reigeluth et al., 1980).

Relating content constructs and subject-matter structures to a DM software course is accomplished using weekly tutorials, assignments and in class labs. The interrelationship of newly learned material is part of developing an expert's understanding of the subject matter starting with small incremental pieces to compile complex knowledge. The breakdown of complex subjects starts with instruction taught in the broadest and most inclusive concepts, and proceeding to an ever narrower, less inclusive, and detailed concepts (Reigeluth, 1999). Reigeluth (1999) introduced the Simplifying Conditions Method (SMC), where subject matter is sequenced from simple-to-complex into a hierarchical structure. The learner is given a complex task to break down into a simple completion sequence with the initial task breakdown still representing a holistic view. Simplifying Conditions Method represents the entire task through the identification of an individual task component that relates back to the whole task; then building on preceding components, each progressively complex task component is sequenced until the desired level of complexity is reached (Reigeluth, 1999).

Instructional Transaction Theory and the Digital Media Curriculum

A Hierarchical Task Analysis and Sequencing approach is a fragmented approach to course design. Starting with part to whole/simple to complex components of subject matter, introducing subskills leads to the main skills required for mastering the material. The instructional designer analyzes the structural tasks needed to learn the material before constructing the sequencing of the material. Learners will then facilitate learning higher-order thinking skills (Reigeluth, 1999). Through tutorials learners build a knowledge based on drill and practice without multi-answer exams. Learners are provided with a holistic approach to DM subject matter with the introduction of task analysis and sequencing (TAS) and simplifying conditions methods (SCM). In combination TAS and SMC provide a whole task experience using applicable skills to enhance learner motivation (Reigeluth, 1999). Learners will have learned simple to complex knowledge gleaned from tutorials and problem solving to imbue in the FP.

Instruction Transaction Theory (ITT) designed and developed by Merrill and his Instructional Development 2 (ID_2) team from 1990 to 1996 employs Reigeluth's approach to subject matter using SMC and non-linear learning. In the design and development of a learning theory the means toward theory employment can provide opportunities to the practitioner to advance his or her student's learning opportunities and test the validity of the theory. With Merrill's learning theory (ITT) a progressive learning environment had been introduced. Technological advances in the last fourteen years since Merrill introduced ITT, impacts implementation of his theory. Interactivity and database connectivity have evolved to create more complex instructional transaction learning experiences. The seminal articles by Merrill et al (1990, 1991a and 1991b), Merrill and ID_2 Research Team (1992, 1996) and Merrill in Reigeluth (1999) is foundation material for future development in the DM's curriculum's course structure.

Knowledge is contained in a learning module's subject matter as defined by Merrill et al. (1990). Instructional Transactions are a series of interrelated frames connected to a knowledge base (Merrill, et al., 1990), which contains the subject matter. Each knowledge base is broken into frames to create algorithms plus data models represented in transaction shells (Merrill, et al., 1990). A transaction shell provides specific subject material used by the instructional transaction. Traditional Computer Based Instruction's (CBI) frame-to-frame based instruction is expanded in ITT, using an Elaborated Frame Network (EFN). The EFN represents knowledge objects called frames with an internal structure (slots, which contain values for the structure) linking to other frames. Slots can be internal or external and are an elaboration of the frames.

Creating an ITT transaction shell could positively impact the future development of DM course material. Students would choose between system or learner order. System order is based on frame-by-frame set of learning modules, reflecting traditional CBI; whereas learner order allows students to choose the module they wish to study. Students who can determine module relevance are aware of their prior knowledge. Therefore a student can move through the new material at a self-regulating pace instead of being subject to chapter-by-chapter tutorials. This then changes the pre-determined syllabus structure (directed-study) allowing for more flexibility in the classroom. Students in the DM program would still generate a student-regulated final project demonstrating knowledge acquisition and expertise.

Transaction shells use a series of knowledge frames as part of the process, entities and activities network (PEA-net) system representing the linked process, entity, and activity frames in the EFN. The PEA-net system can challenge the student to higher learning levels in a shorter amount of time. Merrill et al's (1991). PEA-net system is part of an Elaborated Frame Network. The components of EFN are process (step-by-step instruction or learner determined sequencing),

entities (provides an overview of the process or steps use in appropriate interrelationships), and activities (learner choice of dynamically generated slots).

Illustrating instructional transactions may be implemented in a future version for IDM 3040: Motion Graphics. This course is an introductory to intermediate Macromedia Flash MX 2004 course taken in the sophomore or junior year. The required course is currently taught using the dual objectivist and constructivist models discussed above. There has been mixed success in student achievement. Low performing students have difficulty transitioning and applying the directed-study material to the student-regulated project.

Merrill's knowledge base model creates component identification (name, portrayal and description) for a comprehensive translation of Flash MX 2004 into knowledge objects. The knowledge objects for name would be Flash tools and functions, they would be portrayed (portrayal) demonstrating the use of each Flash tool and function, and would describe (description) of each Flash tool and function (Merrill, in Reigeluth, 1999). Knowledge objects become part of a PHP database. The PHP database can dynamically create HTML pages, place Flash animations in web pages based on the learners' progression through PEA-net.

An instructional transaction is called a class in ITT. Class uses component transactions to identify, execute, and interpret the course material. Classes are traditional CBI frame-by-frame online instruction. In ITT a class can be enriched with database connectivity. Using a content-rich database can allow the learner to experience abstraction transactions of the course material based on student response to each class. Abstraction transactions judge, classify, generalize, make decisions, transfer knowledge and experience from the material. Each abstraction transition is dynamically generated instruction determined by student action taken in a student-regulated sequence. Use of association transactions will propagate, analogize, substitute, make decisions

and discoveries as how to develop and synthesize the material. Based on student actions, the interaction with specific sets of classes (abstraction, association, and transaction) the DM major will progress towards integrating comprehensive understanding of the course material.

The construction of an instructional transaction for IDM 3040 provides a means to dynamically create an online student-regulated learning environment. Although Merrill's ITT class structure intimates a progression and segregation of each transaction set in IDM 3040 (or any DM course) generating transaction sets from the knowledge base is determined on the learner's choice of actions.

Conclusion

A new DM curriculum is in place for the academic year 2005-2006 creating a practitioner environment. The new curriculum's initial phase will provide the DM major introductory to intermediate multimedia and web design/development software courses. Additional courses will provide the student advancement in his or her software experience through collaborative experiences with on campus and non-profit organizations.

Teaching introductory to intermediate software courses provide students with in-depth instruction and application of the knowledge to relevant real-world projects (authentic learning); to achieve this, the DM curriculum has in place a combination of directed-study (objectivist) and student-regulated (constructivist) learning models. Providing learners with a balanced integration of each learning model, the DM major applies the tutorial-based material into a student-regulated project. It is therefore concluded that DM majors at LSC, need to not work with tutorial-based instruction exclusively to succeed in the dynamic digital media workplace.

The DM majors' learning environment is structured to scaffold student knowledge, the program endeavors to lead him or her towards becoming a life-long learner. Students are expected to be self-sufficient in the workplace. This includes the ability to problem-solve, work

collaboratively, and keep abreast of technology and software changes. To meet each need a blended learning environment is used, but the introduction of transactions shells is under consideration. The introduction of ITT could replace the blended-learning environment.

Merrill's Transaction Shells will move away from teacher-directed instruction. Step-by-step instruction would still be available, but non-linear learning environments can be used for knowledge acquisition. Allowing the learner to choose the mode of study within each learning module, students can challenge themselves to move beyond simple identification. Self-directed learners are not assessed using a reward and punishment evaluation (high and/or low grades) system. Instead they will learn to develop self-evaluation skills determining what knowledge they possess and what knowledge they need to learn. (Based on LSC's academic guidelines student's still expect instructor generated grades.) Future assessment scenarios may include upper class students and DM faculty to co-develop a course's assessment rubric.

The new DM curriculum strives to develop strong undergraduates who reach graduation are fully prepared to approach each digital media project with the insight and confidence to successfully accomplish any task. Students with strong self-efficacy skills can easily become life-long learners. Life-long learning is an outgrowth of transitioning students from being dependent on teacher-lead instruction to becoming self-determining learners.

References

Ausubel, D. P. (1980). Schemata, cognitive structure, and advance organizers: a reply to Anderson, Spiro, and Anderson. American Educational Research Journal, 17, pp. 400-404. Retrieved June 9, 2005, from Questa database, http://www.questia.com.

Bandura, A. (2001). Social Cognitive Theory: an agentic perspective. Annual. Rev. Psychology 2001, (52), pp. 1–26. Retrieved June 9, 2005, from Questa database, http://www.questia.com.

Christensen, W. D. and Hooker., C.A. (2000). An interactivist-constructivist approach to intelligence: self-directed anticipative learning. Philosophical Psychology, 13(1). Retrieved June 9, 2005, from Questa database, http://www.questia.com.

Dominowski, R. L. (1998). Verbalization and problem solving. Hillside, NJ: Lawrence Erlbaum Associates.

Driscoll, M. P. (1994). Psychology of learning for instruction. Boston: Allyn and Bacon.

Ertmer, P. A. and T. J. Newby (1993). Behaviorism, cognitivism, and constructivism: comparing critical features from an instructional design perspective. Performance Improvement Quarterly, 6(4), pp. 50-72. Retrieved May 15, 2005, from EBSCOhost.

Hadwin, A. F., L. Boutara, Knoetzke, T., and Thompson, S. (2004). Cross-case study of self-regulated learning as a series of events. Educational Research and Evaluation, 10(4-6), pp.: 365-417. Retrieved May 15, 2005, from EBSCOhost.

Jonassen, D. H. (1991). Evaluating constructivist learning. Educational Technology, pp. 28-33. Retrieved May 15, 2005, from EBSCOhost.

Knowlton, D. S. (2003). Preparing students for educated living: virtues of problem-based learning across the higher education curriculum. New Directions for Teaching and Learning, 95. Retrieved April 20, 2005, from EBSCOhost.

Land, S. M. and Hannafin, M. J. (2000). Student-centered learning environments. In Jonassen, D. H., and Hannafin, S. M. (Ed) Theoretical foundations of learning environments (pp. 1-24). Mahwah, NJ: Erlbaum Associates, Inc.

Merrill, D. M. (1991). Constructivism and instructional design. Educational Technology. Retrieved May 15, 2005, from EBSCOhost.

Merrill, M. D., Z. Li, et al. (1991). Instructional Transaction Theory: an introduction. Educational Technology, 3(6), pp. 7-12. Retrieved May 15, 2005, from EBSCOhost.

Merrill, M. D., M. K. Jones, and Li, Z. (1991). Instructional Transaction Theory: classes of transactions. Educational Technology, 32(6), pp. 12-26. Retrieved May 15, 2005, from EBSCOhost.

Merrill, M. D., Z. Li, and Jones, M.K. (1991). Instructional Transaction Theory: responsibilities, methods, and parameters. Educational Technology, 32(2), pp. 5-27. Retrieved May 15, 2005, from EBSCOhost.

Merrill, M. D. and I. R. Team (1992). Instructional Transaction Theory: knowledge relationships among processes, entities, and activities. Educational Technology, 33(4), pp. 5-12. Retrieved May 15, 2005, from EBSCOhost.

Merrill, M.D., Ids Research Group. (1996). Instructional Transaction Theory: an instructional design model based on knowledge objects. Educational Technology, 36(3), pp. 30-37. Retrieved May 15, 2005, from EBSCOhost.

Merrill, M. D. (1999). Instructional Transaction Theory (ITT): instructional design based on knowledge objects. Mahwah, NJ: Lawrence Erlbaum Associates.

Perkins, D. N. (1993). Patterns of misunderstanding: an integrative model for science, math, and programming. Review of Educational Research, 58, pp. 303-326. Retrieved June 9, 2005, from Questa database, http://www.questia.com.

Reigeluth, C. M., M. D. Merrill, et al. (1980). The elaboration theory of instruction: a model for sequencing and synthesizing instruction. Instructional Science, 9, pp. 195-219. Retrieved June 9, 2005, from Questa database, http://www.questia.com.

Reigeluth, C. M. (1999). The elaboration theory: guidance for scope and sequence decisions. Mahwah, NJ, Erlbaum Associates.

Tennyson, R. D. and R. L. Elmore (1997). Learning theory foundation for instructional design. Mahwah, NJ, Erlbaum Associates.

Zimmerman, B. J. (1990). Self-regulating academic learning and achievement: the emergence of a social cognitive perspective. Educational Psychology Review, 2, pp. 173-201. Retrieved June 15, 2005, from Questa database, http://www.questia.com.

Appendix

Table A1: Old IDM Curriculum (2001-2004)

Course Name and Number*	Course Description
	Introductory and Foundation Courses
IDM 1010 Introduction to Communications	This course surveys the impact of communication technologies on non-Western cultures from prehistoric to recent times. The instruction focuses on the relationship between society and the representation of thought in the form of glyphs, inscriptions, icons, printed texts, and today's digital media.
IDM 2020 Interactive Multimedia (Choice course with IDM 2040)	This course introduces students to software used for creating interactive, multimedia projects. Students learn skills that will enable them to incorporate sound, video, graphics, text, animation, and interactivity in their work.
IDM 2030 Web Design and Development	This course teaches students basic web page design and development. Instruction focuses on creating html text, links, tables, frames, layers, and how to incorporate sound, animation and plug0ins as part of web page development.
IDM 2040 Multimedia (Choice course with IDM 2020)	This course teaches students the basics of preparing complex multimedia content for the Web. Emphasis is focused on developing complex skills in creating vector graphics, animation, and interactivity for playback over the World Wide Web.
TVS 2150 Digital Imaging (Choice course with DGC 2025)	This course introduces digital photography and image acquisition and demonstrates its integration in to various software applications in support of linear and non-linear video post-production. The instruction includes the basic theory and operation of the non-linear postproduction environment.
DGC 2025 Photographic Manipulation Software for Design (Choice course with DGC 2025)	This course focuses on the use of the design industry's standard electronic image alteration program. The instruction consists of exercises, which focus on both articulation and visualization of design principles and concepts

Course Name and Number*	Course Description
DGC 2025 Photographic Manipulation Software for Design (con't) (Choice course with DGC 2025)	by manipulating and altering photographic imagery, by selecting, specifying, and changing spot color; and by isolating, combining, and manipulating only selected areas of images. The instruction eventually covers more creative challenges involving typographic and photographic special effects. Knowledge of photography is helpful, but not essential.
Computer Applications: Choose 2	
IDM 2160 Instructional Design	This course teaches students how to maximize the use of computer hardware and software applications for instructional purposes. The course focuses on specific hardware and software solutions for creating, storing, transferring, and presenting digital media in the classroom or workplace.
CIS 3110 Networking	This course introduces data communications concepts and terminology. The instruction presents network topologies and components, distributed information systems, the communication environment, protocols, regulatory issues, pricing, and management. The course will also provide students with hands-on experience in setting up and maintaining a computer network.
CIS 2271 Java Programming	Topics include control flow, user defined and Java API classes and methods, data types (simple and object), object oriented concepts, operators, program design, basic input and output and swing GUI components.
Collaborative Projects: Choose 3	
IDM 3010 Virtual Humankind	This course utilizes interactive digital media as an aid to understanding specific dimensions of human experience in different places and periods of time. . The content of this course may vary, depending on the instructor. In that case the course may be repeated for credit.
IDM 3020 Virtual Arts and Sciences	This course Explores ways in which interactive digital media enhances understanding of basic classroom concepts and principles in the liberal arts and sciences. . The content of this course

Course Name and Number*	Course Description
IDM 3020 Virtual Arts and Sciences	arts and sciences. . The content of this course may vary, depending on the instructor. In that case the course may be repeated for credit.
IDM 3030 e-Business Fundamentals (Can be taken 2x)	This course explores the growth of e-Business on the Internet. The course provides an opportunity for students to research, develop a business plan, and consider how to create a successful web based business. The content of this course may vary, depending on the instructor. In that case the course may be repeated for credit.
IDM 3810 Special Topics for the Internet (Can be taken 2x)	This course provides an opportunity for students to create a web site relevant to the special interests and skills of the students and the expertise of the instructor. The content of this course may vary, depending on the instructor. In that case the course may be repeated for credit.
IDM 4990 Portfolio	This course consists of the completion of the required graduation portfolio, which is reviewed by a faculty member.

Secondary Requirements

This is a self-designed program of study in the Liberal Arts, sciences, or professional programs. Students must work closely with their academic advisor to develop a coherent theme and focus that integrate traditional academic disciplines with digital technology

Minimum required credits for the Bachelor degree 43

Table A2: New DM Curriculum (Implemented 2005-2006)

Course Name and Number*	Course Description
	Introductory and Foundation Courses
IDM 1015 Web Style and Usability	This course concentrates on web interface, site structure, page design, typography, editorial style, and elementary web graphics. Students will also study and explore fundamental web-usability topics. There is a lab fee. This course is offered every fall.
CIS 2141 Programming Internet & Web Applications I	This course focuses on the creation of web pages and web sites and the subsequent development of software application that will serve those sites. The major emphasis is on client-side scripting (JavaScript, Jscript) and related programming concepts, Dynamic HTML
IDM 2050 Web Design and Digital Imaging	This course examines the use of digital imaging software and design tools. Students will explore and develop digital images. They will also learn how to include interactivity into their web site designs. The prerequisites are IDM 1015 and IDM 1020. There is a lab fee. This course will be offered every fall.
DGC 1010 Intro to Graphic Design I	This course offers a basic study of the elements and principles of design and provides a visual problem-solving experience in an interactive studio setting. The instructor and students both participate in class critiques of projects.
DGC 1011 Intro to Graphic Design II	This course offers a continued basic study of the elements and principles of design and provides a visual problem-solving experience in an interactive studio setting with a focus on color theory. The instructor and students both participate in class critiques of projects
DGC 2025 Photographic Manipulation Software for Design	This course focuses on the use of the design industry's standard electronic image alteration program. The instruction consists of exercises, which focus on both articulation and visualization of design principles and concepts by manipulating and altering photographic imagery, by selecting, specifying, and

Course Name and Number*	Course Description
DGC 2025 Photographic Manipulation Software for Design (con't)	changing spot color; and by isolating, combining, and manipulating only selected areas of images. The instruction eventually covers more creative challenges involving typographic and photographic special effects. Knowledge of photography is helpful, but not essential.
IDM 3040 Motion Graphics	This course introduces web animation software. Students will learn how to create advanced web animations. The prerequisites are IDM 2050. There is a lab fee. This course will be offered every fall.
IDM 3050 Non-Linear Video Editing for the Internet	This course introduces the student to non-linear video and audio editing software. Students will be provided opportunities in shooting/recording, digitizing, editing, and compressing their video and audio so it is Internet ready. The prerequisites are IDM 2050. There is a lab fee. This course will be offered every spring
Computer Applications: (6 Credits) Choose 2	
IDM 2160 Instructional Design	This course teaches students how to maximize the use of computer hardware and software applications for instructional purposes. The course focuses on specific hardware and software solutions for creating, storing, transferring, and presenting digital media in the classroom or workplace.
IDM 3020 Virtual Arts and Sciences	This course will provide students with an opportunity to work with an on campus client to design and develop a departmental or faculty web site. Students will work in a collaborative environment utilizing individual skills toward the completion of the semester long project.
IDM 3030 e-Business Fundamentals (Can be taken 2x)	This course explores the growth of e-Business on the Internet. The course provides an opportunity for students to research, develop a business plan, and consider how to create a successful web based business. The content of this course may vary, depending on the instructor. In that case the course may be repeated for credit.

Course Name and Number*		Course Description
Advanced Computer Applications and Exploratory Courses (9 Credits)		
IDM 3810	Special Topics for the Internet (Can be taken 2x)	This course provides an opportunity for students to create a web site relevant to the special interests and skills of the students and the expertise of the instructor. The content of this course may vary, depending on the instructor. In that case the course may be repeated for credit.
IDM 4010	Multimedia Authoring	This course will introduce students to multimedia authoring. Multimedia authoring software can create multimedia projects allowing output to a variety of digital media such as: DVD, CD-ROMS, and kiosks. The prerequisites are IDM 2050, IDM 3040, and IDM 3050.There is a lab fee. This course will be offered every fall.
IDM 4030	Basic 3D Animation	This course will introduce students to multimedia authoring. Multimedia authoring software can create multimedia projects allowing output to a variety of digital media such as DVD, CD-Roms, and kiosks. The prerequisites IDM 2050, IDM 3040, and IDM 3050.There is a lab fee. This course is offered every fall.
Senior Completion Courses		
IDM 4990	Portfolio	This course prepares the digital media senor to design, develop and launch a digital portfolio. Students will be required to purchase Internet server space. The digital portfolio will be posted to the Internet. In addition, students will write a résumé and start a job search.
Choose 1 Senior Collaborative Completion Course		
IDM 4030 Digital Media Studio 5 Credits		This course provides students with the experience of working in a digital media studio. Students will work collaboratively (as a class) or individually (as interns) with community

Course Name and Number*	Course Description
IDM 4030 Digital Media Studio 5 Credits (con't)	organizations on their digital media project(s). The instructor will supervise and mentor to meet professional digital media standards. The prerequisites are senior standing in the department and instructor permission. Students need to apply in advance by submitting a portfolio. There is a lab fee. This course is offered every fall.
IDM 4810 Senior Internship 5 Credits	Students will plan and develop a major interactive digital media project or serve in an internship with supervision from the instructor. The prerequisites are senior standing in the IDM major or consent of the instructor.
Minimum required credits for the Bachelor degree	47

* All courses are 3 credits unless indicated differently