

DETERMINE IF UW STOUT MASTERS DEGREE STUDENTS
IN TRAINING AND HUMAN RESOURCE DEVELOPMENT POSSESS THE
NECESSARY SKILLS TO DESIGN AND DEVELOP TRAINING
MATERIALS USING CURRENT AUTHORING RELATED SOFTWARE

by

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ABSTRACT

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DETERMINE IF UW STOUT MASTERS DEGREE STUDENTS IN TRAINING AND HUMAN RESOURCE DEVELOPMENT POSSESS THE NECESSARY SKILLS TO DESIGN AND DEVELOP TRAINING MATERIALS USING CURRENT AUTHORIZING RELATED SOFTWARE

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This research study examines the Spring semester-2002, University of Wisconsin-Stout Training and Human Resource Development Master's Degree students, to determine their ability to use seven industry-standard interactive multimedia authoring software tools.

The major objectives of this research were to: (1) Identify authoring software commonly used to develop interactive multimedia training; (2) Identify skills necessary to use the most common authoring software; and (3) Determine whether the TRHRD Master's Degree Students possess these skills.

A questionnaire was developed that measured the student's perception of their ability to use seven authoring related software tools and a demographic questionnaire was used to correlate previous training with current software skills, competency level, as well as program completion.

Findings revealed that the TRHRD Master's Degree students are ill equipped to develop CBT & WBT. The majority of the students are either incompetent or uncertain in their ability to perform basic tasks related to authoring software.

With respect to demographic factors, there seems to be little relation between the student's program completion and their authoring abilities.

Recommendations were that the UW-Stout TRHRD Master's Degree Program include an introductory authoring course into the curriculum and include authoring competencies in the program's core competencies.

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Chapter I

Introduction

Overview of Interactive Multimedia Training

“The future of training is in technology... Training and technology are converging in rapid and radical ways.” Fueled by the Internet and by the expansion of company intranets and extranets, this combination of factors is having a radical impact on the training industry and the skills that trainers will need to function in the next century (Koonce, R. 2002, p.1).

What does this mean to us, as trainers? Are we prepared to meet the challenges? Moreover, are we preparing students to accept the challenges? Are we equipping learners to utilize these technologies and the new modalities of learning that are emerging? Or, are we focused on teaching the use of flipcharts and stand-up presentations?

It's no secret that technology is rapidly changing the way we learn and train in the 21st century workplace. In their book, *Technology-Based Learning Maximizing Human Performance and Corporate Success* (1999), Marquardt and Kearsley suggested that many of today's HRD tasks can only be achieved through technological means. The traditional but antiquated methods of learning have become “irrelevant” and are being replaced by new technologies.

Interactive multimedia is just one of the technologies being used in training today. However, according to Marquardt and Kearsley (1999), with the exception of the Internet, interactive multimedia remains the most significant development in the history of technology-based learning. Presently, Interactive Multimedia gives HRD professionals the capabilities of creating and delivering interactive computer based

training (CBT) that includes text, graphics, sound, video, animation, and speech output and speech recognition.

To appreciate the value and impact of this development, it is essential to understand how far we have come. From the Ishango bone tally stick in 6000 B.C., to the first digital computer developed by Vincent Atanasoff and Clifford Berry from Iowa State College (Now Iowa State University) in 1939, computing machines have dealt with numeric information. The development of the Personal Computer (PC) transformed the world of computing with its capacity to handle textual information. The ability to handle other forms of media is a relatively recent phenomenon (Jones Telecommunications & Multimedia Encyclopedia, 2002).

While media presentations with multiple formats have been around for a long time, probably since communication itself, they haven't been linked to computers until recently. In the past, in order to produce "multimedia", separate pieces of equipment were needed to develop each type of media, each piece of equipment being incompatible with the other. The camera produced photos and slides, while the tape recorder was used to provide sound and the Camcorders/VCRs and televisions were used for video. Today, multimedia technologies allow all of these media forms to be captured digitally, combined and presented in one program (The Media History Project, August. 2002).

In recent years, the entertainment industry merged with the computer industry and provided us with a plethora of new multimedia technologies (software and hardware) that make the development process seem almost effortless and allow the developed presentations to be run on the common PC. Additionally, it's quite simple to spice up a presentation or training program with customized pictures taken from any low-cost

digital camera. Moreover, once these photos are transferred to the computer, they can be modified using any graphics editor (such as Adobe Photoshop). Similarly, creating digital sound, video, and animation sequences also seem effortless compared to previous analog methods (Marquardt & Kearsley, 1999).

While the technological aspects of interactive multimedia have changed the world, the interactive component has revolutionized education and the training industry. The term “interactive” in interactive multimedia “refers to the capability of a program to respond to user input and in doing so provide unique experiences” (Marquardt & Kearsley, 1999, p. 116).

The most basic type of interactivity comes in the form of a menu or navigation button. The user “interacts” with the computer to direct them to the next page or a specific place in the program. This is similar to the type of interactivity of a person engages in while watching TV. Though TV is generally considered a passive activity, it requires the viewer to select a channel, turn up the volume or at a minimum turn the power switch to “ON”. This is the most basic level of interactivity. It is crucial, even at the most basic level, that interactive multimedia gives its user the opportunity to interact with it. A common way of doing this in CBT is by providing clickable objects or clickable spots called “hot spots” or “hot links”. Clicking these spots will connect the user to new information that may include a variety of media (e.g., illustration, photograph, audio, video etc.) Increasing these links enhances the level of interactivity giving the user more unique paths of information to follow (Marquardt & Kearsley, 1999). Jeff Harris, vice president of marketing for Trivantis Corporation, called these paths “multiple learning paths.” Allowing the learner to take multiple learning paths

accommodates for different learning styles allowing for “adaptive learning” and that is key with interactive multimedia (Harris, 2002). The multimedia training experience tends to increase proportionally with the level of interactivity.

Professional authoring systems are frequently used by organizations when they get serious about developing computer based instruction (Merrill, 1997). This is true regardless of the electronic platform. Authoring systems are used to develop training via the Internet, a corporate intranet, LAN or a stand alone CD-ROM.

Statement of Problem

Web Based Training (WBT) and Computer-Based Training (CBT) using disk or hard drives are two of the more common training delivery techniques in today’s business environment. This research attempted to answer the question: Do the Training and Human Resource Development (TRHRD) Master’s degree students at University of Wisconsin-Stout possess the skills necessary to design and develop WBT and CBT materials using common authoring software available on the market today?

Purpose of the Study

There has been no research to identify the authoring competencies of University of Wisconsin-Stout’s Training and Human Resource Development (TRHRD) Master’s degree students. The purpose of this study was to determine whether there is a need in the TRHRD Master’s program at UW STOUT to develop a course that ensures interactive multimedia authoring competencies of its students.

Research Objectives

The three objectives for this research were to:

1. Identify authoring software commonly used to develop WBT and CBT.

2. Identify skills necessary to use the most common authoring software.
3. Determine whether the TRHRD Master's Degree Students have these skills.

Significance of the Study

“Custom content is the new frontier of e-learning,” said Jeff Harris, vice president of marketing for Trivantis Corporation. “Trainers are trying to identify ways to create and publish custom digital content for use on the Internet, intranets, or CD-ROMs.”

While some trainers outsource their development to multimedia developers, others want to keep development “in house” in order to reduce training costs and maintain control and independence. (Harris, 2002)

While authoring skills are becoming expected competencies for trainers, UW-Stout's TRHRD Master's Degree Program offers a technology course (Media 560) to its students and expects students to be technologically literate. This course, however, does not ensure competency in interactive multimedia authoring. This study will provide an analysis of the existing skill level of UW-Stout TRHRD Master's Degree students and determine needed authoring skills.

Limitations of the Study

There are three limitations of this study.

1. Technology changes rapidly. These software tools are also susceptible to the rapid change of technology, making it difficult to make absolute statements about any of the software.
2. Online references need to be continually changed, deleted and updated to be consistent with the websites.

3. Many of the original online references continue to be changed. Some of the references need to be excluded because the reference disappeared.

Definition of Terms

For clarity of understanding, the following terms are defined as follows:

Authoring System - A software program that contains pre-programmed components that are used to develop interactive multimedia (Jasiglar, 1999).

CBT- Acronym for computer-based training, a type of education in which the student learns by executing special training programs on a computer. CBT is especially effective for training people to use computer applications because the CBT program can be integrated with the applications so that students can practice using the application as they learn. (<http://www.webopedia.com/TERM/C/CBT.html>)

CD-ROM- “Pronounced see-dee-rom, abbreviation of Compact Disc-Read-Only Memory. A type of optical disk capable of storing large amounts of data -- up to 1GB, although the most common size is 650MB (megabytes). A single CD-ROM has the storage capacity of 700 floppy disks, enough memory to store about 300,000 text pages” (http://www.webopedia.com/TERM/C/CD_ROM.html).

Courseware - CBT that is designed for education (<http://www.webopedia.com/TERM/c/courseware.html>).

Extranet - An intranet that is partially accessible to authorized outsiders (<http://www.webopedia.com/TERM/e/extranet.html>).

Hotlinks - Words or images that connect you to new information when clicked (Marquardt & Kearsley, 1999).

Intranet - A network based on TCP/IP protocols (an internet) belonging to an organization, and accessible only by the organization's members.

(<http://www.webopedia.com/TERM/i/intranet.html>).

Internet - A global network connecting millions of computers. More than 100 countries are linked into exchanges of data, news and opinions

(<http://www.webopedia.com/TERM/i/Internet.html>).

Ishango bone tally stick - One of the first mathematical objects constructed from an Ishango Bone. Dated 30,000 B.C. the Ishango Bone became a notched tally stick system used for counting (<http://www.math.buffalo.edu/mad/Ancient-Africa/ishango.html>).

LAN - A computer network that covers a relatively small area. Generally, LANs are confined to a single building or group of buildings

(http://www.webopedia.com/TERM/l/local_area_network_LAN.html).

Operating System - “Every general-purpose computer must have an operating system to run other programs. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers” (http://www.webopedia.com/TERM/o/operating_system.html).

Software - “Software is a term used to define the tools you use on the computer to create or process objects and tasks. There are several categories of software tools commonly used to create interactive multimedia”

(<http://www.iim.uts.edu.au/creating/csoftware.shtml>).

WBT- Acronym for Web-based training, a type of education in which the student learns by executing special training programs using the World Wide Web.

Word Processor - “A program or computer that enables you to perform word processing functions” (http://www.webopedia.com/TERM/W/word_processor.html).

Chapter II

Review of Related Literature

Introduction

The literature related to interactive multimedia authoring systems is quite varied. To fully understand what an authoring system is one must define what it does and how it is used. Furthermore, to appreciate the authoring development process, it's crucial to become familiar with the roles of each authoring team member and the tools necessary perform their job. The literature reviewed defines an authoring system, explores the development process, and examines some of the software tools used in that process.

Authoring Systems

An Authoring System is a software program that contains pre-programmed components that are used to develop interactive multimedia (Jasiglar, 1999). These software products are designed to enhance a courseware developer's productivity. Gloria Gery (1987), independent training consultant and pioneer in the CBT industry, compared authoring systems to other productivity tools such as Microsoft Word or Excel. While Word and Excel are primarily concerned with word processing and spreadsheets, authoring systems are concerned primarily with the instructional needs of the developer. Lessons or learning activities are entered into the authoring system just as words are entered into a word processor. However, the type of content entered into an authoring system is generally more interactive and engaging. "Just as spreadsheet and word processing programs vary in features, functions and ease of use, user interfaces, and ability to integrate with other software, so do authoring systems"(Gery, 1987, p.72).

Authoring systems can be organized in numerous ways. Typically, they are organized by one or more of the following:

- Type of Author (e.g., corporate developer/teacher educator)
- Type of Delivery Medium (e.g., CD-ROM versus Internet/intranet)
- Type of Operating System (Windows versus Macintosh)
- Type of Scripting Metaphor
- Type of Interface
- Cost
- Ease of Use
- User Base (e.g., learners, instructors, developers)
- Level of technical support
- Market Share
- Media Capabilities
- Instructional Design Capabilities, etc. (Dabbagh, 2002)

In this paper, authoring systems are sorted into the most fundamental class by delivery medium; either CD-ROM or Internet/Intranet.

Nada Dabbagh, Professor of Instructional Design and Development at George Mason University, referred to these learning environments as bounded (CBT) and unbounded (WBT). With CD-ROM-based authoring tools, the organization and structure of the instruction is dependent on stable content. This is why Dabbagh referred to the learning system as “bounded and program-controlled.” On the other hand, Web-based authoring tools allow developers and end users to “modify content and contribute resources resulting in flexible and active information structures.” (Dabbagh, 2002, p.26)

Over the past 10 years, we've seen a continuing shift from bounded authoring to unbounded authoring environments. To grasp this evolution from an academic perspective, we need to contrast several of the instructional attributes of computer-based training (CBT) and Web-based training (WBT). Dabbagh (2002, p.25) organized CBT & WBT into table form, which compared and contrasted ten instructional attributes of CBT and WBT.

Table 1

CBT & WBT Instructional Attributes

CBT Instructional Attributes	WBT Instructional Attributes
1. Program-centered or instructivist approach.	1. Student-centered or constructivist approach.
2. Content is fixed, has an inherent structure, and remains generally stable no matter when it is accessed.	2. Content is dynamic; instructors and learners can contribute new knowledge and add new resources.
3. Instructional sequence and learning contexts are externally driven by objectives/tasks	3. Instructional sequence and learning context can be internally driven by learners.
4. Restricted to references and resources embedded in product.	4. Links to a multitude of Web sites can be readily embedded (browsing is limited).
5. Focus is generally on creating sequential media, such as print, audio, and video.	5. Focus is shifting from media delivery tools to communication tools.
6. Instant feedback is available through programmed interactions, but there is less potential for personal feedback	6. Learner-to-learner and instructor-to-learner interaction options, providing meaningful peer and instructor feedback.
7. Limited interaction with other learners and instructor.	7. Unlimited interaction with other learners and instructor

Table 1

CBT/WBT Attributes (Continued)

CBT Instructional Attributes	WBT Instructional Attributes
<p>8. Instructional activities typically consist of drill and practice exercises, trial and error learning, or stimulations with accelerated rounds of skill practice.</p> <p>9. Testing of learner outcomes generally involves pretests, posttests, and multiple-choice questions.</p> <p>10. Lends itself to criterion-referenced assessment.</p>	<p>8. Instructional activities generally consist of browsing links, searching online databases, threaded discussions, email and Web publishing.</p> <p>9. Testing of learner outcomes generally involves assessing communication skills, organization of information, and synthesis of content.</p> <p>10. Lends itself to authentic assessment (peer evaluations, multiple forms of assessment)</p>

Dabbagh (2002, p.25)

The type of delivery medium plays a vital role in determining what instructional designs are possible (Dabbagh, 2002). Over the decades of technological evolution, each new medium provides its own distinct instructional capabilities. Each medium uses a different approach to promote learning (Clark & Lyons, 1999).

Essentially, authoring systems automate the courseware development process. They allow the developer to perform tasks that, in the past, would have required a specialized programming background. Using the Authoring system, the author/trainer/developer can easily perform tasks such as creating screens or interface items (e.g., menus and buttons), linking content to other content, and sequence material (Bell, 1998).

It is commonly thought that people remember only 10 percent of what they read, 20 percent of what they hear, 30 percent of what they see, and 70 percent of what they

see and hear. Perreault (1995) took this a step further and suggested that multimedia presentations actually shrink learning cycles because students have the opportunity to interact with the material in several ways.

While training time is significant, Marquardt and Kearsley (1999) suggested that Multimedia has an even greater impact on motivation. By interacting with a multitude of senses and requiring a response from the users, interactive multimedia programs tend to capture more attention and engage user in the learning process. Since getting and keeping a person's attention is fundamental in the learning process, this capacity of multimedia is significant. This is especially true in the case of self-study and distance-education environments. Students in these environments are inherently plagued with distractions and lack of motivation.

Authoring Development Models

Gloria Gery stated it well, in her book *Making CBT Happen* (1987), when she said; "You can't wing it with CBT. The very nature of the computer medium requires specificity in articulating design, scripts, displays, and logic beyond that required in any other environment" (p.94). It's a simple concept; if CBT is not planned and programmed precisely, the program won't execute. If the program does not execute, the learner will not be able to access the program and will no opportunity to learn. While she encouraged a development process that includes eight phases with distinct steps and sign-off pointed at the conclusion of each phase, she also made sure to point out that, "Far less important than the number of steps involved in creating CBT is the realization that there are discrete steps at all"(p.93).

She suggested that these eight CBT development phases should occur sequentially. Gery's model assumed that a team of people will be producing the CBT. If there was only one person involved, that person would also carry out the functions of the program manager. According to Gery, creating a common methodology in CBT development has three primary objectives:

1. Assuring a timely production of a superior quality CBT that achieves specific learning objectives and meets the development timelines.
2. Assuring the client maintains control of the content, structure, design, screen displays, and interactivity levels by being involved throughout the development process and reviewing, approving, and signing-off on paper-based deliverables as each major development phase concludes.
3. Assuring that the team members know their roles, responsibility and priorities early in the development process.

Knowing a team member's role up front in the development process allows time for being creative and productive instead of being confused. This model encourages constant contact with the developer and the client and doesn't allow for development on any phase until the previous phase is signed off.

Most development plans follow the traditional five-phase ADDIE (Analyze, Design, Develop, Implement, and Evaluate) instructional systems design model. Gery (1987) divided the CBT development process into eight phases. She indicated that it is common for project managers to subdivide some of the phases even further. According to Gery, having specific sign-off points throughout the development was more important than the "number" of steps or the "name of the phase." To ensure steps are not missed,

Gary Powell of Wayne State University further recommended that an activity log be used to record events (Powell, 1997).

WBT Development Model

William Horton, president of William Horton Consulting, Inc., suggested a model for WBT development that parallels the ADDIE instructional design model (Horton, 2000).

1. Analyze—During this phase the necessary learning is determined by identifying the learner and its current level of knowledge or performance. Target levels of knowledge and performance are and overall learning goals are defined.
2. Design—Meeting the learning goals, requires that specific learning objectives are identified and instructional activities are planned to meet each objective.
3. Build—During this phase the designer selects the best technologies to incorporate into the WBT.
4. Evaluate—Course success is determined by measuring learning results (through quizzes, etc.) against learning objectives

An Eight Phase Approach for converting Training to CBT/WBT

While the Gery and Horton models are adequate design models, Web Training & Design Solutions, Inc., developed an eight phase approach for converting standard training to CBT/WBT (<http://www.web-train.com/cbtdemo/developmentWBT-CBT.htm>). The eight phases are described below:

1. Sorting out the content—During this phase, the developer works with the client to collect any written materials used in the non CBT/WBT course. This allows the developer to become familiar with the content and get prepared for the next stage.

2. Developing the Content—The developer works directly with the clients training and development department to determine where multimedia and text content will be used.

3. Storyboarding—The developer creates a flowchart that depicts the stages in which the information will be taught in each CBT/WBT capsule. During this phase, the client is asked to approve the modality of concepts presented. Adjustments are made by the developer and revision is given to the graphic artist who creates a graphical storyboard with content captions. Reviews and adjustments occur as needed. The developer doesn't begin any actual production until the client has "bought off" on the storyboard.

4. Designing the Multimedia—The developer will meet the client at the workplace to video any procedures and processes necessary in the CBT/WBT. If the work environment is noisy, sound will be recorded separately in the studio.

5. Designing the Non Multimedia Features—The developer converts the storyboard into a customized WBT/CBT courseware by using the company's course material, photos, animations and artist renditions.

6. First Phase of Production—This phase is the first of the final stages of production. After being tested extensively, the client gets to see the CBT/WBT in its final form and suggest any changes where appropriate.

7. Second Phase of Production—The developer corrects any errors pointed out in the previous phase of production and then submits it to the client for a final sign-off.

8. Testing & Delivery of Final Courseware—After the client has signed-off on the CBT/WBT, the CD is burned and the CD-ROM is distributed to the client.

Multimedia Development Team

Typically, a team of 10 people work together to build a high-quality, professional multimedia presentation. The team often consists of the following specialists: production manager, content specialist, instructional designer, script writer, text editor, program author, computer graphic artist, audio and video specialist, computer programmer, and Webmaster (Horton, 2000). This section examines the roles of these team members.

1. Production Manager

Keeping project on track in terms of deadlines and budget is the role of the production manager. This person is in charge of the business and financial aspects of the multimedia project; delegating responsibilities to the team members; and guaranteeing that all equipment and software are functioning well enough to delivery the product on time. (Holden, 1997)

2. Content Specialist

The content specialist becomes the subject matter expert for the project. After researching the topic carefully, this person summarizes and reports the content to the team members. (Holden, 1997)

3. Instructional Designer

The main concern of the Instructional designer is that project maintains sound pedagogical principles. His or her primary responsibility areas include the learning process, learning styles, interactivity, content structure, and evaluation methods. He or she also must ensure that learning activities are never thwarted by the project's technical details but instead are centered on concrete learning goals and objectives. (Holden, 1997)

4. Script Writer

The script writher creates a storyboard that communicates everything in the project. Since interactive multimedia is non-linear and has the ability to branch between various topics within the program, the script writer must think in a non-linear fashion and imagine how the program might be used by the student (Holden, 1997).

5. Text Editor

Writing and editing skills are imperative since much of a multimedia project is text-based. This team member oversees the project's narration and maintains a smooth content flow. He or she also supervises the development of supplementary documentation as well as the end product's packaging material (Holden, 1997).

6. Program Authoring Specialist

Knowledge of the standard multimedia authoring software is crucial to the program authoring specialist. This person uses the authoring software to integrate graphics, text, audio, music, video, photos, and animation into the project. He or she communicates routinely with the other production team members to guarantee the accuracy of all the project's elements (Holden, 1997).

7. Computer Graphic Artist

The computer graphic artist ensures the entire look and feel of the finished product is in harmony and balance. He or she creates the project's graphical elements, which include color scheme, backgrounds, navigation panel, buttons, logos, 3-D objects, and animations. (Holden, 1997).

8. Audio/Video specialists

The music and sound effects can be custom developed by the audio specialist or purchased and used from a media library. The audio specialist edits the text narration first and then integrates it into the project. The video producer shoots, digitizes and edits the movies or videos used in the multimedia project. A strong digital sound or video background is imperative for this person (Holden, 1997).

9. Computer Programmer

Authoring systems generally include a high-level scripting language that controls the content sequence, interactivity and media elements. Special code or scripts are often necessary to produce a high-class, professional multimedia project. An educational background in computer programming isn't necessary but a can be beneficial. Knowledge of the authoring scripting language is vital for the computer programmer (Holden, 1997).

10. Web Master

The Web Master position is important if multimedia development team is producing a WBT program. Since the Internet is a dynamic environment the skills necessary for a Web Master evolve rapidly. Currently, this individual should possess skills in Java, Hypertext Markup Language (HTML), Web authoring software, C++, and

other programming languages. Ultimately, the Web Master must transform the multimedia production into Web-based training (Holden, 1997).

Authoring Metaphors

Authoring systems are commonly designed with an instructional metaphor in mind. Fred Hofstetter, author of *Multimedia Literacy*, describes a metaphor as “a way of thinking about new media in terms of something the user already knows” (1997). Four common authoring metaphors used today in authoring systems are:

- 1.) Time-based applications—Villamil and Molina (1997) defined this as Multimedia events including: Text, graphics, video and animation are sequenced based on a time line. The sequence of each of these elements is determined by the speed and length of time it plays or remains on the screen. The developer organizes each event via this time line.
- 2.) Card/Page-based relational databases—Villamil and Molina (1997) defined this as Information contained on each page acts as a relational database. It's easy to move between pages because each page is solid.
- 3.) Icon-based programs—Holden (1997) pointed out that this is one of the most visual and logical authoring paradigms. Each icon contains the code necessary to make it function. For instance, when programming with an icon-based, object oriented authoring system such as Authorware, the user must drag icons onto the flowline and then assigns properties to each event (Holden, 1997).
- 4.) Theatre-based applications—Media elements and sequences are cast members and they enter the stage and are precisely timed by direction of the score.

Current Authoring Tools

Authoring tools have been in existence since the 1960's when "computer-assisted instruction was viewed as an economically viable way to distribute teaching expertise" (Huntley & Alessi, 1987, p.259). To date, there are hundreds of multimedia authoring tools in existence. However, in 1997, Kozel documented approximately 50 commercially produced authoring tools. At that time the market share was spread among several companies including: Aimtech, Allegiant, Allen Communication, Asymetrix (Which is currently Click2learn), Macromedia, and mFactory. Currently, Macromedia, (who's eLearning Suite includes Authorware, Flash, and Dreamweaver) dominates the multimedia industry and claims to hold, over 80% of the authoring market.

Deciding which authoring system to use is not always an easy decision and may hinge on several different factors. "Author knowledge level, resource availability, multimedia project goal, time element, budget, and product sophistication" are just a few (Holden, 1997).

Chapter III

Methodology and Approach

Overview of the Study

This research evaluated the Interactive Multimedia Authoring Competencies of the UW-Stout TRHRD Master's Degree students. Interactive Multimedia is a medium that is being used increasingly in the training industry, yet no research has been done to identify the student's competencies in this area. The purpose of this study was to determine whether there is a need in the TRHRD Master's program at UW STOUT to develop a course that ensures interactive multimedia authoring competencies of its students.

Research Design

The quasi-experimental design process determined the student's competency by examining the student's perception of their ability to use several different interactive multimedia authoring related software tools.

The Literature Review revealed that the seven common industry-standard software production tools currently used to develop interactive multimedia were categorized into three separate groups (See Figure 1.)

CBT Authoring tools

- Authorware
- Director

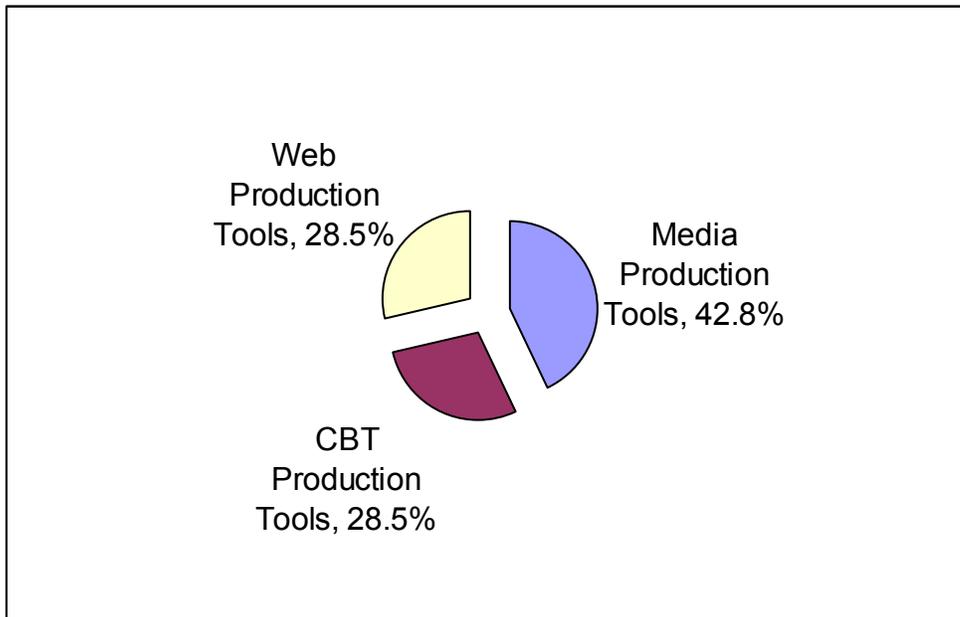
Web Authoring Tools

- Flash
- Dreamweaver

Media Production Tools

- Photoshop (Raster-based graphic design tool)
- Illustrator (a vector-based design tool)
- Premiere

Figure 1. Three Categories of Multimedia Production Tools



Further analysis of the Literature Review showed that functioning proficiently with Authorware included 24 tasks, while director included six tasks, Flash 23 tasks, Dreamweaver six tasks, Premiere 13 tasks, Photoshop nine tasks and Illustrator five tasks. (See survey in appendix B.)

Population

The survey was mailed to the entire population of the Training and Development Master's Degree students from the year 2002. This population consisted of 34 females

and 23 Males. The researcher used this population because it most accurately represented the current state of UW-Stout's Training and Development Master's Degree program.

Instrumentation

The data collection instrument (Appendix B) was created by examining the seven authoring related software tools commonly used by developers. Each software tool was examined and literature was reviewed to collect a list of tasks necessary for basic proficiency. The student's overall authoring competency was measured based on each student's perceived ability to complete all of the tasks. The instrument was separated into seven different sections; each relating to a different software tool. Each section contained a list of basic tasks necessary to use the software of that section and used a Likert scale measuring between 1 and 5 (1—extremely competent, 2—somewhat competent, 3—competent, 4—incompetent and 5—uncertain.) The scale was used to ultimately determine how competent the user felt he or she was in using each one of the software packages.

Data Collection

A list of the entire student population was collected from the registrar's office. The researcher sent out fifty-six surveys on May 13, 2002 and the cut-off date was June 15, 2001. Each survey was mailed with a self-addressed, self-stamped envelope to provide some degree of anonymity. The back of each survey was coded to allow the researcher to perform a follow-up mailing.

The data collection instrument (Appendix B) revealed each participants authoring competency on seven current software tools. These tools included: Authorware, Director, Flash, Dreamweaver, Premiere, Photoshop, and Illustrator.

Data Analysis

The returned surveys were collected and the data were analyzed by comparing each respondent's self-evaluation of common authoring related tool proficiency. An analysis of the surveys revealed that most of the respondents lacked proficiency in using any of the seven common authoring related software tools. The tools most respondents were most confident were the graphic design tools Photoshop and Illustrator. The respondents were less competent with the Web Authoring, CBT Authoring and Video Production software tools.

Chapter IV

Data Analysis and Results

Introduction

The purpose of this study was to determine if interactive multimedia authoring competencies should be included in the core competencies of the TRHRD Master's Degree Program.

This chapter considers each of the three research objectives. First, it examines seven different software tools that are commonly used in CBT and WBT development, secondly it examines the skills associated with each of the software tools and finally it examines the student's ability to use the software tools.

Common Authoring Software

As suggested in the Literature Review, creating a functional and professional looking multimedia or Web program requires the use of multiple skills and the use of various software tools. These skills may be possessed by an individual or represented in the combined skills of an entire team. There are two broad categories of the production process.

- Authoring Production (CBT & WBT)
- Media Production (Graphic Design and Video Production)

Each category requires the use a variety of different software to achieve its goals.

Research Objective One was to identify authoring software commonly used to develop WBT and CBT. The literature review revealed seven different software packages commonly used during media production and WBT/CBT production cycles. Further, it revealed that these seven software tools were available through only two

primary multimedia software production tool companies—Macromedia and Adobe. Multimedia giant, Macromedia has clearly become a leader in the multimedia industry with its software packages Authorware, Director, Flash, and Dreamweaver which have become industry-standards for CBT and WBT authoring software (<http://www.macromedia.com/software/>). Adobe is another leader with its multiple software packages. Their Premiere is an industry-standard video editing tool, while Illustrator and Photoshop have become industry-standard graphic editing tools (<http://www.adobe.com/products/main.html>).

As shown in Table 2, each software tool plays a different role in the development process. It's common for several of these software packages to be used in conjunction with one another throughout the entire production process. For example, Authorware is an authoring system that is used to develop CBT or WBT, while Photoshop is a graphics editor used to create and manipulate images prior to being imported into Authorware. Other tools can be used during both authoring production and media production. For example, Flash can be used as a WBT Authoring tool but is primarily used as an animation tool.

Table 2

Software Roles

Software Titles	CBT/WBT Authoring Production	Media Production
1. Authorware	X	
2. Director	X	
3. Flash	X	X
4. Dreamweaver	X	
5. Photoshop		X
6. Illustrator		X
7. Premiere		X

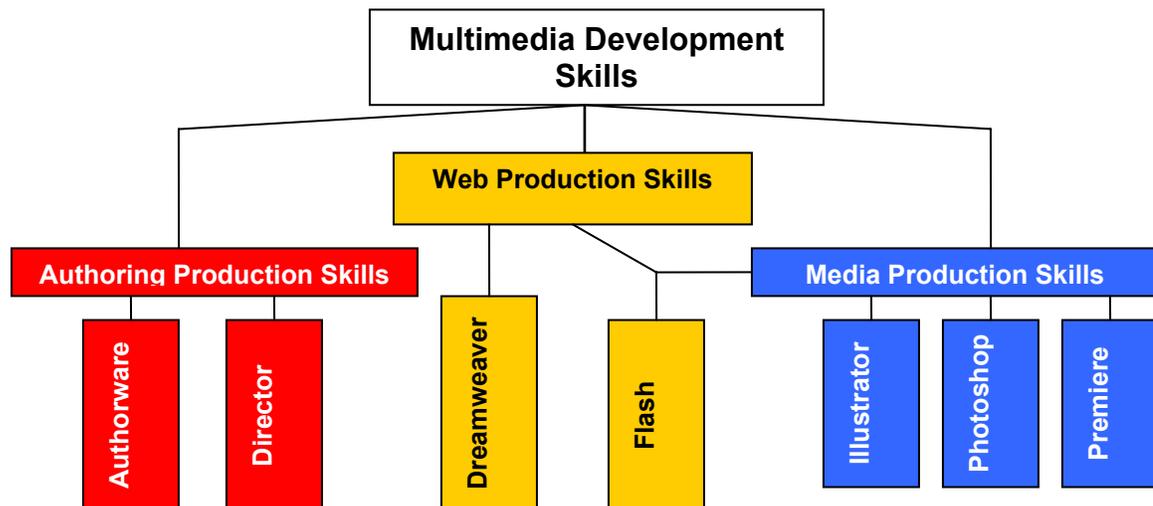
Skills Common to Authoring Software

While each software package contains its own set of tasks necessary to use the software proficiently, the literature identified three broad categories of skills necessary in multimedia development:

- Authoring Production Skills
- Media Production Skills
- Web Production Skills

Each can be achieved by one or more of the seven multimedia tools listed in Figure 2.

Figure 2. Seven common software tools can be found in one or more of the three broad Multimedia production categories.



All of the seven software packages fit into CBT/WBT Authoring Production or Media Production. All of these tools have some similarities and some differences.

Research Objective two was to identify skills necessary to use the most common authoring software. Using new software can seem overwhelming, especially for a novice user. Fortunately, there are similarities among these seven software tools that make them easier to use. Even though each of the tools is a separate program, has its own function and uses its own design metaphor, they have similarities, which make them easier to use. One set of similarities is with the file handling capabilities. All of the programs have the capacity to create, save, retrieve, and import files. They also have the ability to select, cut, copy, and paste content. In fact, their menus are virtually the same. Both Macromedia (Authorware, Director, Dreamweaver, and Flash) and Adobe (Photoshop, Illustrator and Premiere) use common interfaces with their products. The process of learning multiple Adobe products and multiple Macromedia products is second-hand once the interfaces for each product are learned.

Though the primary media production tools (Photoshop, Illustrator, and Premiere) have similar interface features, they have different functions. Photoshop functions as a raster-based graphics creation and manipulation tool. Illustrator functions as a vector-based graphics creation and manipulation. Premiere is used for an entirely different purpose. Premiere functions as a digital movie creation and manipulation tool. The basic menu features and drawing capabilities are similar among all of these media production tools. The authoring production tools also have similarities. They all share the ability to import media and manipulate media to some degree. Each software package has its own programming language and some allow the user to track data. The main difference in the authoring tools is the design metaphor they are created with. Authorware was designed using a flowline metaphor. All of the content is designed logically and the icon-based

programming follows a flowline in a linear style. On the other hand, Director was designed using a movie metaphor. The programmer becomes a “director” and the programming is done on a score. The contents become cast members in a “movie.” Once the tool’s interface and metaphor are understood, the program seems almost transparent.

While the authoring production tools (Authorware, Director, Flash, and Dreamweaver) share a common interface, and the three media production tools (Photoshop, Illustrator and Premiere) share a common interface, there is more to consider. Interface skills are certainly an important element. In addition to understanding the Macromedia and Adobe interfaces, proficiency in multimedia requires that one have the ability to:

1. Use a mouse
2. Design and layout screen content
3. Think metaphorically
4. Think logically
5. Use drawing tools

Demographics of Population

The data collection survey (Appendix B) was mailed to 57 current and former UW-Stout TRHRD Master’s Degree Program students (34 females and 23 males.) This comprised the entire TRHRD Master’s Degree student population from the year 2002. The survey return rate was 66.77%.

Student Skills

Research objective three was to determine the authoring related software skills that the TRHRD Master's Degree students possessed. Figures 3 through 9 revealed a high level of incompetence and uncertainty with common authoring software tools. Figure 3 showed that 87.50% described themselves as incompetent or uncertain with Authorware. Figure 4 showed that 95.61% described themselves as incompetent or uncertain with Director. Figure 5 showed that 82.03% described themselves as incompetent or uncertain with Flash. Figure 6 showed that 78.08% described themselves as incompetent or uncertain with Dreamweaver. Figure 7 showed that 89.07% described themselves as incompetent or uncertain with Premiere. Figure 8 showed that 59.94% described themselves as incompetent or uncertain with Photoshop. Figure 9 showed that 76.32% described themselves as incompetent or uncertain with Illustrator.

Figure 3. Students' competency level with Authorware

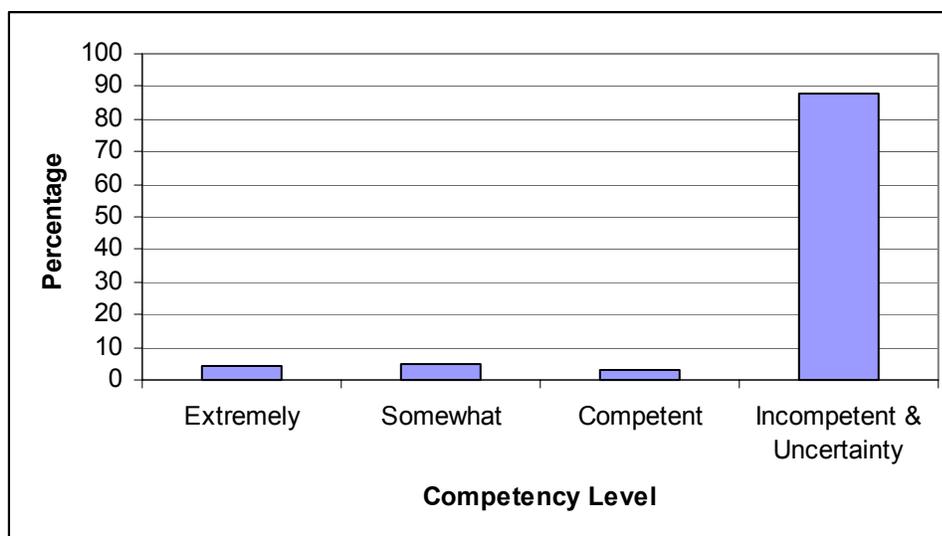


Figure 4. Students' competency level with Director

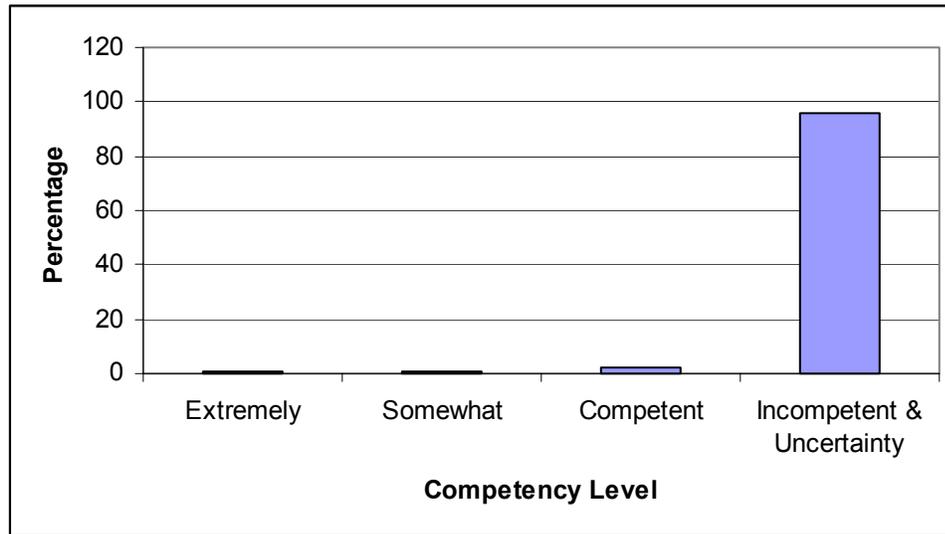


Figure 5. Students' competency level with Flash

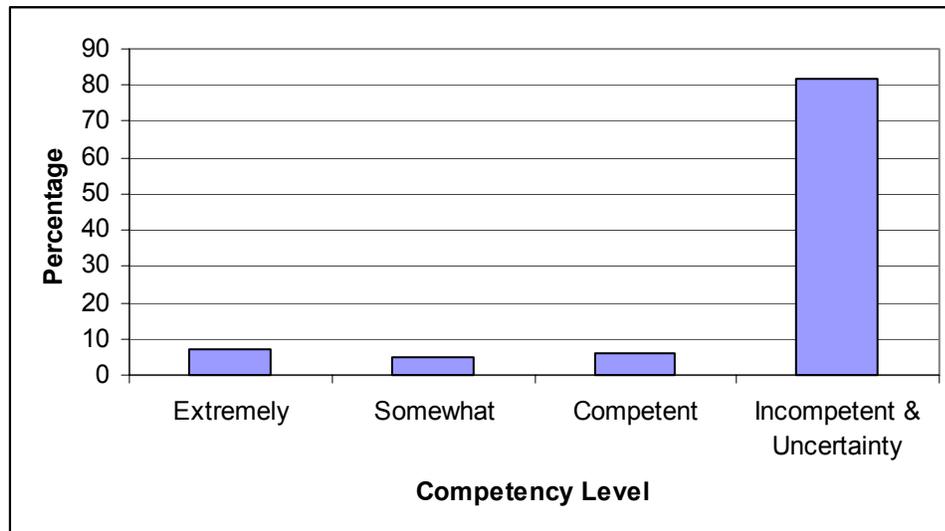


Figure 6. Students' competency level with Dreamweaver

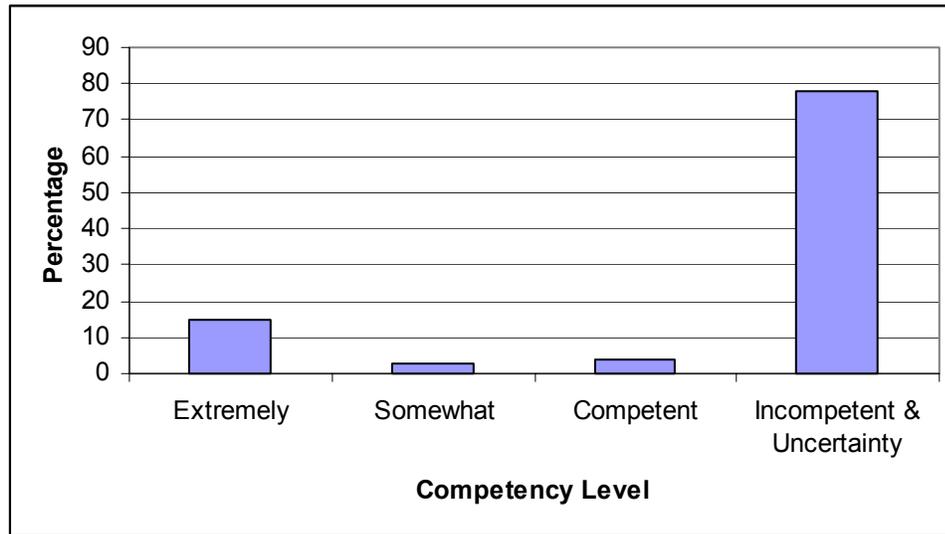


Figure 7. Students' competency level with Premiere

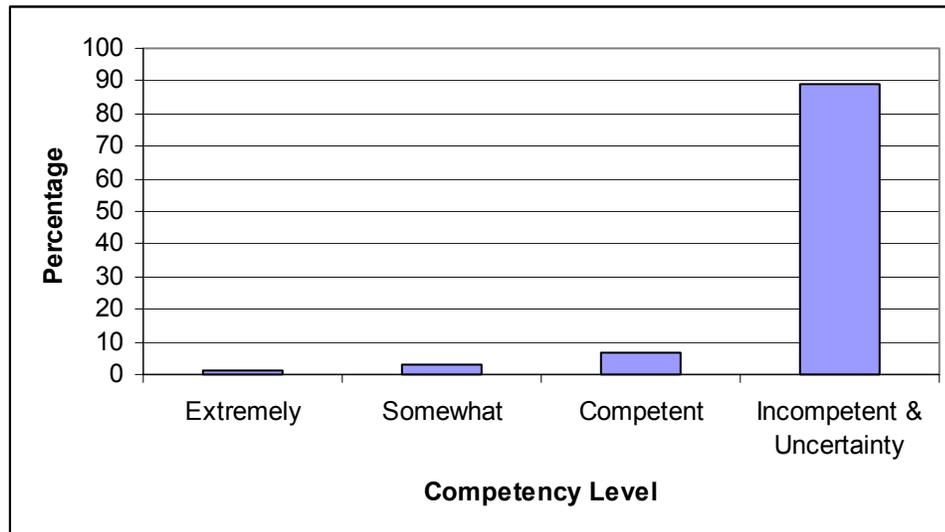


Figure 8. Students' competency level with Photoshop

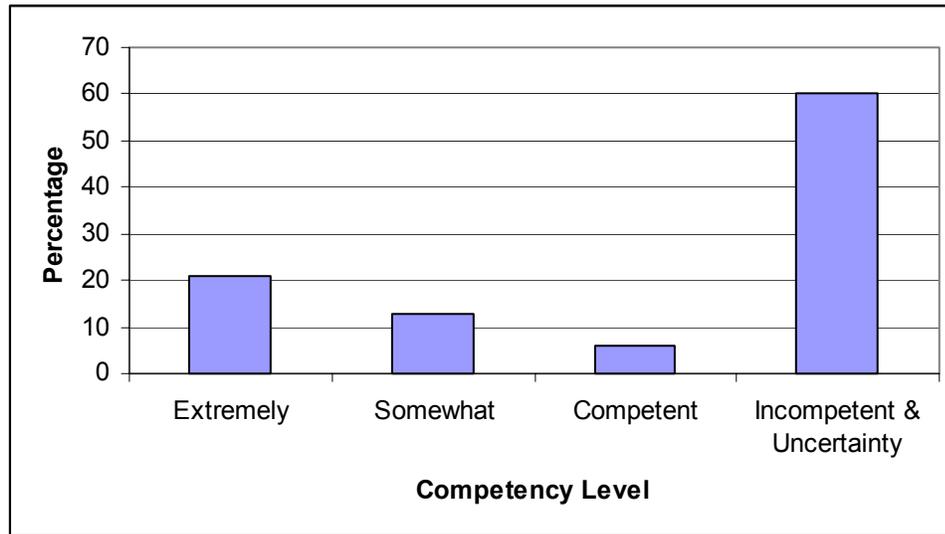
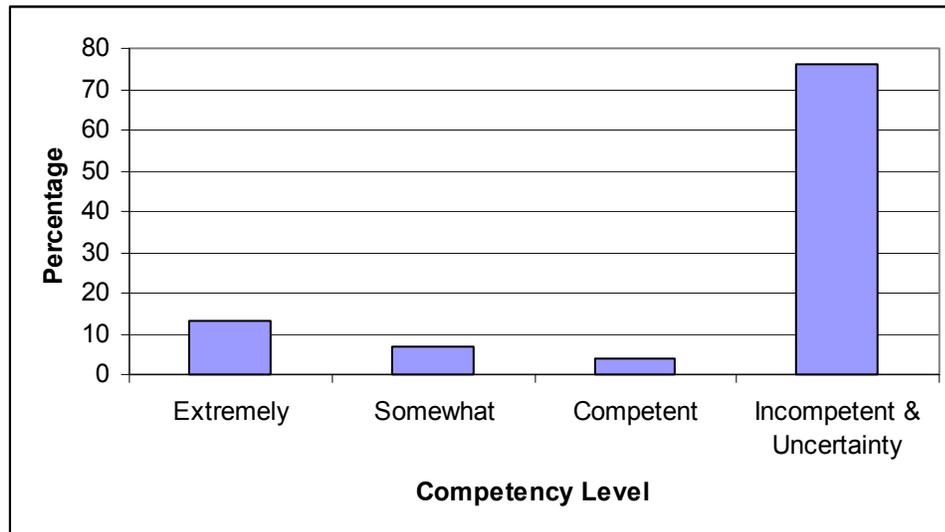
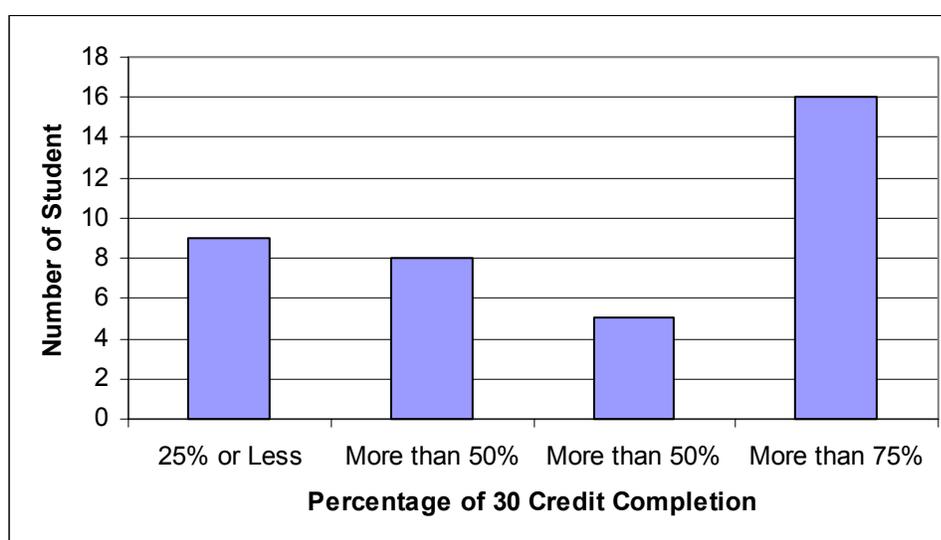


Figure 9. Students' competency level with Illustrator



While students showed a clear absence of ability to use the seven software tools, a significant number of students (14) did have prior training in at least one of the tools mentioned. Despite not having authoring related software skills, Figure 10 revealed that the majority of the respondents (16 Students) had completed more than 75% of their 30 credit TRHRD curriculum.

Figure 10. Percentage of TRHRD Master's Degree Program Completion.



As shown in Figure 11 through 13, the 14 respondents that indicated prior training in one or more of the software packages had the most training with media production tools (Premiere, Photoshop and Illustrator.) Figure 12 shows that the most often used method of learning Web Production tools Dreamweaver and Flash was through self-study. As seen in Figure 13, 86% had training with Photoshop and 64% with Illustrator. Fifty percent were trained on Flash (which can also be used as a graphics editor). Only 29 % were trained on Authorware and 14% on Director. Only 21% of the students were previously trained on Premiere and 43% on Dreamweaver.

Figure 11. Where students obtained training using authoring production software tools.

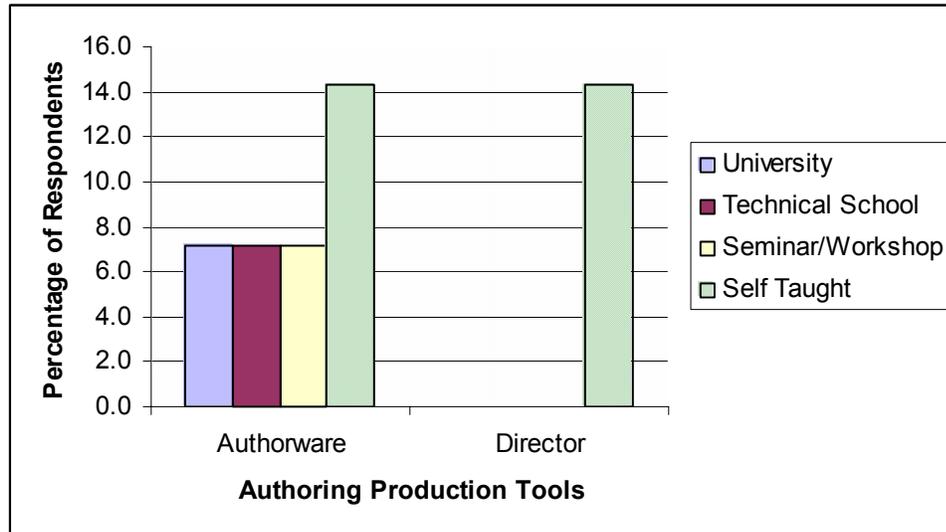


Figure 12. Where students obtained training using Web production software tools.

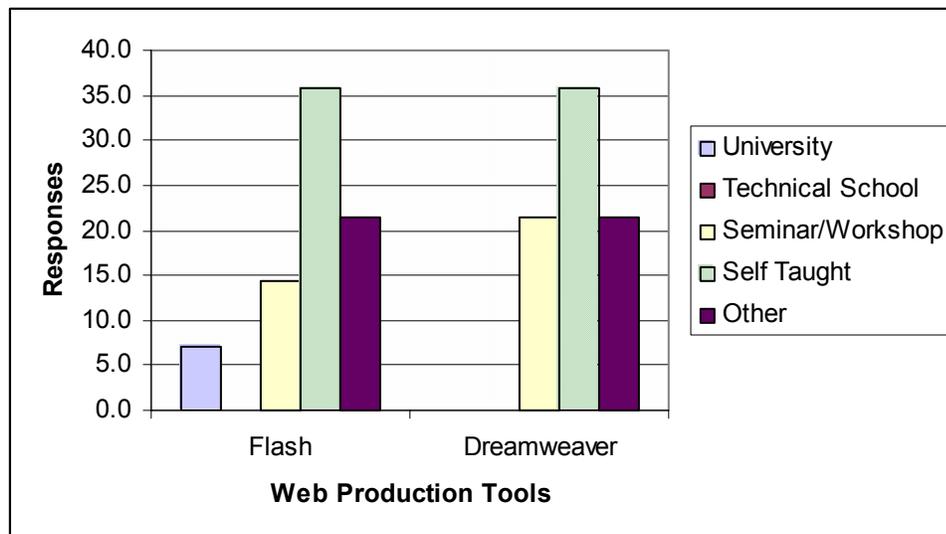
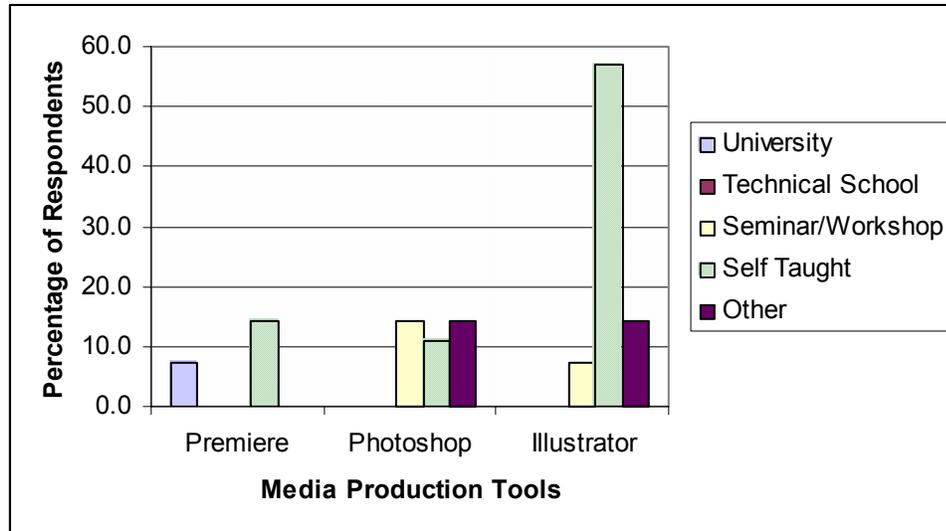


Figure 13. Where students obtained training using media production software tools.



Of these 14 respondents, Fifty-eight percent were self-taught, 18% indicated learning by some other method, 17% were taught through a seminar/workshop, 5% were taught at the University and 2% learned at a Technical school.

Chapter V

Conclusions and Recommendations

Overview

Web Based Training (WBT) and Computer-Based Training (CBT) using disk or hard drive are two of the more common training delivery techniques in today's business environment. This study examined whether the TRHRD Master's degree students at UW-Stout possess the skills necessary to design and develop WBT and CBT materials using common authoring software available on the market today.

Methods and Procedures

This research study examined the authoring competencies of the UW-Stout TRHRD Master's Degree students. A questionnaire, focusing on seven different authoring related software tools, was distributed to the entire Spring Semester- 2001 student population. This instrument measured student competency using a Likert scale measuring competency with the software between 1 and 5 (1—extremely competent, 2—somewhat competent, 3—competent, 4—incompetent and 5—uncertain.)

Major Findings

The findings of this research were as follows:

- Seven common authoring related software tools were grouped into three categories: CBT Authoring, WBT Authoring, and Media Production tools.
- Most UW-Stout TRHRD Master's Degree students authoring related software knowledge/expertise was gained through workshops and/or self-study.

- Most students were incompetent and/or uncertain in their ability to use all seven industry-standard authoring related software tools; however, most were more proficient using the media production tools Photoshop and Illustrator.

Conclusions and Recommendations

Research objective one was to identify authoring software commonly used to develop WBT and CBT. The data revealed seven common authoring related tools that are used in conjunction with one another during the production process.

1. Authorware
2. Director
3. Flash
4. Dreamweaver
5. Photoshop
6. Illustrator
7. Premiere

Based on this research, it can be concluded that being proficient with these industry-standard software tools will allow a trainer to produce a quality, professional interactive multimedia project. It is recommended that UW-Stout Training and Development Master's Degree students interested in multimedia production learn these seven software tools.

Research objective two was to identify skills necessary to use the most common authoring software. The data showed that there were six primary skills necessary. Being able to:

1. Use the Macromedia and Adobe user interfaces.

2. Use a Mouse
3. Design and layout screen content
4. Think metaphorically
5. Think logically
6. Use drawing tools

Based on this study, it can be concluded that a student needs to be proficient in these skill areas in order to produce CBT or WBT. Therefore, it is recommended that the UW-Stout THRD Master's Degree Program include a basic course, which ensures these six competencies are gained.

Research objective three was to determine whether the TRHRD Master's Degree Students have authoring software skills. The data showed a high degree of incompetence or uncertainty using each of the seven tools; 87.50 % with Authorware; 95.61% with Director; 82.03% with Flash; 78.08% with Dreamweaver; 89.07% with Premiere; 59.94% with Photoshop; and 76.32% with Illustrator. Based on this study, it can be concluded that UW-Stout's TRHRD graduate students lack the skills necessary to use common authoring software.

As shown in the literature review (Chapter II), the field of Training and HRD is rapidly moving toward more computer-based teaching/learning strategies. This movement requires additional skills in using common authoring software tools. Accordingly, it is recommended that UW-Stout TRHRD Master's Degree Program curriculum offer an introductory authoring class and include these software skills in the core competencies.

Recommendations for further Research

Since Macromedia Inc. and Adobe Inc. dominate the interactive multimedia industry, this study focused largely on the student's ability to use Macromedia and Adobe interfaces. Future research could be expanded to include a broader base of authoring tools and more generalized questions could be asked to determine what aptitudes the students might need in relation to authoring software.

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Web Training and Design Solutions. What is involved in developing WBT or CBT Courseware? <http://www.web-train.com/cbtdemo/developmentWBT-CBT.htm>

Appendix A

Consent Form

I understand that by returning the/this questionnaire, I am giving my informed consent as a participating volunteer in this study. I understand the basic nature of the study and agree that any potential risks are exceedingly small. I also understand the potential benefits that might be realized from the successful completion of this study. I am aware that the information is being sought in a specific manner so that no identifiers are needed and so that confidentiality is guaranteed. I realize that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

NOTE: Questions or concerns about the research study should be addressed to the researcher (Timothy Johnson, phone 715/232-2202 email johnsonti@post.uwstout.edu) or research advisor (Michael Galloy, Professor, Dept. of Vocational and Technical Education, 148 Communication Technologies Bldg., phone 715/232-2163 email galloym@uwstout.edu).

Questions about the rights of research subjects can be addressed to Sue Foxwell, Human Protections Administrator, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 Harvey Hall, Menomonie, WI, 54751, phone (715) 232-1126

Appendix B

Survey Letter

1902 Pine Avenue
Menomonie, WI 54751
Phone: 715-235-6410
Email: timothywestern@charter.net

May 16, 2002

Computer Based Training (*CBT*) and Web Based Training (*WBT*) are becoming increasingly important in business and industry. As these delivery techniques continue to become more common, competency in CBT/WBT authoring systems is essential.

I am conducting a study that analyzes authoring competencies of students that are currently enrolled or recently graduated from University of Wisconsin-Stout's Master of Science Degree program in Training and Development. Current literature and interviews with multimedia developers suggested the following seven software programs necessary for competency in multimedia development are:

-
- | | |
|----------------|------------------|
| ◆ Authorware, | ◆ Premiere, |
| ◆ Director, | ◆ Photoshop, and |
| ◆ Flash, | ◆ Illustrator |
| ◆ Dreamweaver, | |
-

As a current Training and Development student or recent graduate, your input is essential to my study and may be used to improve UW-Stout's Training and Development program. Please fill out the enclosed survey and return to me as soon as possible. To ensure anonymity a self-addressed stamped envelope has been provided.

Thank you in advance for your help with this study.

Sincerely,

Timothy W. Johnson

Enclosure: Survey

Appendix C

Multimedia Authoring Competencies found in Training and Development Master's Degree Students

On a rating scale from 1-5 how competent are you at using the following software?

(1) Extremely (2) Somewhat (3) Competent (4) Incompetent (5) Uncertain

1	Authorware	1	2	3	4	5
1.1	Create a new file					
1.2	Use a knowledge Object in an file					
1.3	Open a pre-existing file					
1.4	Insert an icon on the flowline					
1.5	Setup icon properties					
1.6	Edit an icon					
1.7	Add text to a display					
1.8	Add images to a display					
1.9	Display the content of several icons in the Presentation window at the same time					
1.10	Add sound					
1.11	Add digital movies					
1.12	Play video					
1.13	Group icons					
1.14	Move icons from one part of the flowline to another					
1.15	Reuse content					
1.16	Create interactivity					
1.17	Track a user's performance					
1.18	Track information					
1.19	Set up paging and navigation structures					
1.20	Add functions to an Authorware file					
1.21	Reuse flowline structures					
1.22	Use the Authorware Control Panel					
1.23	Package an Authorware file for distribution					
1.24	Package an Authorware file to be played over the web					

2	Director	1	2	3	4	5
2.1	Create cast members					
2.2	Create animations in Director					
2.3	Use Lingo to control movies elements					
2.4	Create interactivity					
2.5	Use sound and video files in Director					
2.6	Create projectors in Director					

3	Flash	1	2	3	4	5
3.1	Use a Flash Interface					
3.2	Draw simple objects in Flash					
3.3	Select objects in Flash using any of the selection tools					
3.4	Create and Edit Text in Flash					
3.5	Create Custom Colors and Gradients					
3.6	Create and Edit layers					
3.7	Use symbols and instances in Flash					
3.8	Create Motion Tween in Flash					
3.9	Use scenes to organize a Flash movie					
3.10	Attach actions to an object in Flash					
3.11	Export a Flash file					
3.12	Make use of the selection tools in Flash					
3.13	Modify shapes with the Arrow Tool					
3.14	Change Color with Selection					
3.15	Create Symbols					
3.16	Import and Edit Bitmaps in Flash					
3.17	Convert Bitmaps to Shapes (Vectors)					
3.18	Import Vector Images					
3.19	Edit Symbols on the Main Stage					
3.20	Create a Button					
3.21	Control Timelines with Action-Script					
3.22	Import and Manipulate Sound in Flash					
3.23	Publish Flash Movies					

4	Dreamweaver	1	2	3	4	5
4.1	Organize and set up a Web site					
4.2	Set up a Web page and modify its properties					
4.3	Add elements to a Web page					
4.4	Create and edit a table					
4.5	Create frames					
4.6	Publish your Web site					

5	Premiere	1	2	3	4	5
5.1	Start Adobe Premiere and open a project file					
5.2	Work with the Timeline window					
5.3	Work with the Monitor Window					
5.4	Navigate to a specific time in your video program					
5.5	Work with palettes					
5.6	Discover keyboard shortcuts					

5.7	Measure video time					
5.8	Measure frame size and resolution					
5.9	Create final video					
5.11	Assemble clips in the timeline					
5.15	Set in and out points					
5.14	Add transitions to video using premiere					
5.15	Add Audio to video using premiere					

6	Photoshop	1	2	3	4	5
6.1	Use the Painting and Drawing Tools to edit Images					
6.2	Use different size brushes to create different effects					
6.3	Use Gradient Editor to change the size of the gradient					
6.4	Use different Filters to change the appearance of an image					
6.5	Align Images using Guides and the Grid					
6.6	Scanning Images into Photoshop					
6.7	Manipulate and arrange shapes					
6.8	Draw basic shapes using different shape tools					
6.9	Import Images into Photoshop					

7	Illustrator	1	2	3	4	5
7.1	Draw and edit simple and complex geometric shapes					
7.2	Use the arrow and pen tools for effective object reshaping					
7.3	Apply color to strokes and fills					
7.4	Create templates and edit paths					
7.5	Apply and arrange text for graphic effects, callouts, and tables					

Demographics

Of the 30 Credit Degree Requirement, how many credits have you completed?

(Check each box that applies)

- 25% or Under
 Over 25%
 Over 50%
 Over 75%

Appendix D:

Follow-Up Letter

On May 13, 2002 you were mailed a survey to rate your competency using seven industry-standard multimedia authoring tools. I am happy with the response rate but really would like to include your data to ensure that our research is valid. If you have already mailed your response, please disregard this request. Let me also be the first to thank you again for your time and effort. If you have not mailed your survey yet, I have included a new copy lest the original has been misplaced. Please respond by June 15, because our project will be concluding soon.

Please remember that your input could have a great impact on the UW-Stout TRHRD Master's Degree Program. So please take the time to offer some information that could greatly impact the curriculum. If any questions or concerns come to mind, please do not hesitate to call me at (715) 232-2202.

Thanks for your time,

Timothy W. Johnson