AC 2012-5246: YOUTUBE: AN EFFECTIVE CAD TRAINING RESOURCE

Prof. Richard Cozzens, Southern Utah University

Richard Cozzens's background includes industry training and university training, and he is author of several CAD-related workbooks (reference publication). He has developed training material for the aerospace industry for the past 12 years. He has taught CAD classes in the university setting for 12 years. During the 12 years, he has developed online training for the courses taught. These online courses have been used through much of the world. He has also authored several CAD workbooks. One workbook in particular (CATIA V5 Workbook) has been an industry leading workbook for several years.

YouTube: An Effective CAD Training Resource

1. Introduction

This paper is a continuation of my research in the area of web-based CAD training. Phase I (Ethicomp2008 conference[i]) of my research was where I addressed the "Feasibility of Web-Based Training for CAD". Phase II (Ethicomp2010 conference[ii]) of my research was "What is Quality Web-Based CAD Training". This paper is organized in the following order: 1. Introduction, 2. Overview of this Research, 3. Methodology, 4. Results/Data, 5.Conclusion and Future Direction followed by References. Section 2 (Overview of this Research) describes the main motivation behind my research.

2. Overview of this Research

In this section, I discuss the various studies conducted in this field of study, including a brief history of this research and a discussion of Phase I, Phase II and Phase III of this research.

2.1 Phase I

In the fall of 2000 I published a CAD Training workbook. The workbook was the "CATIA V5 Workbook" [iii](Cozzens 2000). The book was the first of its kind. The demand for the book continued to grow. At one point there were 150 colleges and universities throughout the world using the workbook. The success of the book prompted me research and develop more efficient methods of delivering the training material. The method I developed was a web-based training system. The web site was "CATIA V5 Workbook.com" [iv](Cozzens 2003). It was a little rough at first but through data collection of the 1,500 plus users I was able to improve the web-based training experience. The research conducted indicated that web-based CAD training was a feasible method of training given the training had the right components. This brought up the question of "What is Quality Web-Based Training". I addressed this question in Phase II of my research.

2.2 Phase II

In Phase II the history of the web-based CAD training is discussed. In the year 2001 there was virtually no web-based CAD training. By the year 2005, there was an abundance of web-based CAD training companies. The training companies grew, the amount of curriculum increased, and the technology for web-based training improved. In the year 2007 and later, the market for this training had shifted slowly, yet dramatically. The number of companies had declined slightly, but the biggest shift was in the volume of business the companies were experiencing. The volume has declined significantly. The data found in this research was recorded from observations and conversations. There are numerous things that contributed to this decline but the most significant was the growing access to free tutorials, training videos and exercises on home grown sites as well as websites such as YouTube. In certain instances web-based CAD training was a more economical and practical way of training. At the very minimum it was a great supplement to traditional face to face training (hybrid course). Phase III of this research is an in depth look at free web-based CAD knowledge and training via YouTube.

2.3 Phase III

It is clear that technology is changing the way web-based training in general is managed and accessed. An example, a recent article in Time Magazine (Rosedale 2010) Philip Rosedale stated "Anything that can be made and recorded becomes essentially free." Anita Hamilton in another Time Magazine article stated, "What's certain is that the $4 billion college text book market is ripe for a digital makeover" (Hamilton 2010). The market is changing and will continue to change. The time magazine article did not specifically state that web-based training or YouTube would be the replacement but my research shows that it has and will have a significant part in the "digital makeover".

Interestingly, I attended a conference recently "Solidworks World conference". A conference like this usually has at least four to five web-based CAD training vendors. This particular conference there was only one web-based CAD training vendor. There are two main reasons for this decline in market share. The first is a mature and shrinking market. The second reason is what I refer to as the phenomena of CAD training using social media platforms such as YouTube. Training on YouTube is essentially free and the quality is getting better as the content grows. Web-based CAD training is also socially gaining acceptance as a viable method of training. At the "SolidWorks World Conference", I had the opportunity to attend several training sessions. In those training sessions, references to YouTube Channels, podcasts, and blogs were listed as external references and/or additional training for the specific SolidWorks tool being presented in the session. June 2011, I attended a UACTE (Utah Association for Career and Technical Education) Conference. At this conference, the training for all the state CAD instructors included how to access and use free web-based training material. All the instructors were eager to view and sample the training. Most of the instructors were eager to implement the training into their class rooms.

Keeping this in mind, in this paper I describe changes implemented in my web-based CAD training used at a university level for students. I have also implemented these changes into the training outside of the university such as the Solidworks training I conducted at ITSON (Insituto Technologico De Sonora) in Ciudad Obregon, Mexico May 2010. I am implementing these changes into my YouTube and WebCT accounts as well. During this training, students have access to social media platforms such as YouTube which includes tools and techniques. During the semester, students were interviewed and asked to provide feedback on the usefulness of the training material.

2.4 Summary of the Research History

My motivation for this paper started with an attempt to supply needed training material to the students, instructors and practitioners so they could learn CAD in the most efficient method possible. My attempt to do this has been a journey because of the continuous advances in technology; starting with a workbook moving to WebCT, to my own web site and now to YouTube. Phase I of my research answered the question as to the feasibility of web-based CAD training. In Phase II, I provided a definition of and explored the characteristics of quality web-based CAD training. In Phase III I explore the effectiveness and practicality of using YouTube as an effective web-based CAD training resource.

2.5 Updated Literature Review

Since the initial literature review and data collection of Phase I, the technology, curriculum, student and teacher perception (social aspect) and philosophies have matured shifted and/or changed. A majority of the literature was from existing books that discussed what a web-based course should look like and what components the site should contain. A majority of the literature review used in Phase II was the web-based training sites themselves such as 'SolidProfessor" and "I Get It CATIA V5 Training". The literature review for Phase III is so new because of the ongoing evolution that the knowledge is being discussed mostly in the digital world such as blogs and forums created for that specific technology such as the I Get It CATIA V5 Training.   As referenced earlier some current magazine articles are discussing the changes and discussing how it might change the way we currently do business particularly in the college and university level. Table one was included in the earlier research phases but has been updated to include the Phase III information. The last column displays the results of the web-based component in relation to YouTube.

Web-Based Component	Phase I of web-based CAD training	Phase II of web-based CAD Training	Phase III YouTube
Certification	None existing	Yes	No
Limited Technology and resources	problem	User dependent	Improved but still User dependent
Communication	problem	Site dependent	Yes
New Way to procrastinate	Problem	Student dependent *	Student dependent
Course management	problem	Improved	Limited
Dissemination of information	Site & Student dependent	Improved with technology	Limited
Student management	Site dependent	Improved	None
Grading	Site dependent	Improved	None
Accessibility and flexibility	Site dependent	Improved with technology	Improved with technology
Cost efficient	Expensive	Greatly improved	Yes
Surfing/Skimming	Not included in phase I	Site dependent.	Yes

Table 1: Comparison between Phase I, Phase II and Phase III

*(Artino and Stephens (2009) stated " To succeed in autonomous online learning environments, it helps to be a highly motivated, self-regulated learner.")

3. Methodology

3.1 The Process

This information was obtained using action research. Action Research is a specific variation of Evaluation Research. McMillan and Schumacher state (2001) "Evaluation Research focuses on a particular practice at a given site(s). The practice may be a program, a product, or a process". In this research the product is web-based CAD curriculum. Action Research is specific to education and learning, this research is also specific to education and learning using web-based technology and applying to CAD curriculum. Even though Action Research is often mentioned as lacking a distinct theoretical base it is a powerful tool in stimulating social change and exploring how to change a situation or practice. Eileen Ferrance (Ferrance 2000) definition of Action Research is, "It is a reflective process that allows for inquiry and discussion as components of the "research." Often, action research is a collaborative activity among colleagues searching for solutions to everyday, real problems experienced in schools, or looking for ways to improve instruction and increase student achievement". As mentioned earlier there is a social acceptance issue involved and the objective is to increase student achievement with effective curriculum resources via YouTube. The information learned from Phase I and Phase II of this research has been implemented. This continuous process is exactly what I have been doing starting with Phase I and continuing to Phase II and now Phase III.

3.2 Continuous Improvement

In Phase I the goal was to find the most efficient method of delivering CAD training. In the beginning the only method was the workbook, then the online (web-based) training, then WebCT. The second step Phase II required an evaluation of the results. Was the quality accepted (i.e. used). Phase III provides an opportunity to compare the results to some underlying assumptions or governing variables. In this case the effect that YouTube is having on the web-based CAD training market. I have laid out a plan and implemented my plan into my training courses. I have collected and evaluated the resultant data. I have revised my training as a result of what I have learned from this continuous process of improvement.

3.3 The Underlying Assumptions

The underlying assumptions for Phase II of my research was that web-based training was available only from companies such as (I Get It, Solidprofessor and Practical CATIA) and from university supported web-based courses on WebCT. I attempted to experience and document as many different types of CAD Training as possible. In Phase III the guidelines or underlying assumptions were changed. These changes implemented YouTube as the access method to the knowledge and training. I attempted to implement YouTube media tools into my classes and document the results and opinions of the students. Since there are so many different forms and applications to YouTube I also surveyed classes (instructors and students) from Southern Utah area to collect data on how YouTube was being used and if it was being used successfully.

The action portion of this research was to incorporate YouTube links to My CCET (CAD/CAM Engineering Technology) 1040 "AutoCAD" class into WebCT course management tool for the Fall Semester of 2011. YouTube links were also used in my CCET

1030 "Introduction to CAD/CAM Engineering Technology" class, also in the Spring and Fall Semester of 2011.

As I have attended numerous workshops and training seminars over the past two years I have had the opportunity to discuss this topic with professors and administrators from all over the world. These discussions have provided me with valuable information and insight regarding this subject.

As in the previous phases documented this research has allowed me the opportunity to reflect on the different types of training and the advantages and disadvantages of each. Table II contains the components being compared between the different types of training.

This is a continuous process, reflecting on the findings will help plan the next needed action and start the process again.

Online Components	Class Room Training	CATIA V5 Companion	I Get it	Practical CATIA Training	CATIA Forum	SUU WebCT	YouTube
Training Cost	$1,200	w/ software	$2,800.0	$1,200.	Free	Tuition	Free
Travel Cost	$1,500	None	No	None	None	None	None
Certification	Yes	No	Yes	Yes	No	Some	No
Table of contents (Training road map)	Yes	Yes	Yes	Yes	No	Yes	No
Instruction (Video)	Yes	Some	Yes	Yes	Some	Some	Yes
Documentation	Yes	Some	Yes	No	No	Yes	No
Power Point	Yes	Some	Yes	No	No	Some	No
Examples (Tutorials)	Yes	Yes	Yes	Yes	Some	Some	Some
Definitions & Terms	Yes	Yes	Yes	Some	Some	Yes	Some
exercises w/feedback	Yes	Some	Yes	Some	No	Yes	No
Exercise flexibility	Yes	Yes	No	Yes	Yes	Some	Yes
Exercises (Key)	Yes	Yes	Yes	Yes	Some	Yes	No
Tests (assessments)	No	No	Yes	Some	No	Yes	No
Access to Instructor E-mail (Questions)	Yes	No	Yes	No	No	Yes	No
Grade	No	No	Yes	No	No	Yes	No
Certificate	Yes	No	Yes	No	No	No	No
Learning Objectives?	Yes	Some	Yes	Yes	No	Yes	Some
Allows Skimming	No	Yes	Limited	yes	Yes	No	Yes

YouTube: The quality and amount of information is spotty but over all there is an amazing amount of quality information available. For CAD this training is not organized or sequential. If it is just information you are seeking and you are a motivated learner, this is a powerful resource. If you are looking for structure and sequence this type of training would not meet the learner's needs.

4. Results/Data

As I mentioned in the previous section I have implemented YouTube into two of my Spring 2011 Semester classes. Near the end of the semester I had the students fill out survey regarding their experience with using YouTube in the class. YouTube was used in some cases in the place of lecture and in other cases just as supplemental information.

CCET 1040 AutoCAD Statement/Question	No	Not Sure	Yes
General Learning Techniques			
1) I prefer learning on my own and at my own pace?	10	11	11
2) I am a self-motivated and disciplined learner?	2	7	23
3) I am open to new and innovative learning strategies?	1	1	29
4) I learn best from reading the material (words)?	26	6	
5) I learn best from watching someone else (instructor working examples)?	9	5	18
6) I have used eLearning or other types of web-based training before?	9		23
7) If you have experienced some type of web-based training was it a good experience?	4	10	17
8) Have you used YouTube to learn more about a tool or process in this class?	9	1	22
9) If so, was it helpful?	1	5	19
10) Have you used YouTube to learn more about any other subject?	7	1	24
11) If so, was if helpful?	1	2	24

Table 3 (contains the captured information).

Some of the students added some comments on their experience using YouTube. The comments are listed below:

- Could go either way, some were good, some were bad.
- On the last assignment I liked watching the movie on how to do the dynamic block. If I had a question or missed something I could go back over it.
- YouTube has helped me a lot.
- It is very impersonal. There is quite a lot of good detailed info on web based training.
- It allows you to have examples to work along with.
- For some classes it worked really well for others there were so many internet problems that it wasn't worth it.

- I enjoyed being able to study and do work on my time. . . Helps allow a student have a set job.
- The information is always available online and the is more information to be accessed.
- It's easy to have everything online because it limits the amount of paper we have to keep track of.
- It was good because I could access it anywhere.
- If you don't understand right away you can watch it over and over.

5. Conclusion and Future Direction

My experience working with students and professors at the different workshops around the world along with the collected data (table 3) strongly suggest that YouTube has and will continue to play a growing role in web-based CAD training particularly as a learning resource. YouTube is still missing many critical components needed to be a complete training tool and training option (reference Table 1). The fact that YouTube is free to use and free to host training video makes it difficult to ignore. The training quality and quantity is growing at an astounding rate. The data shows that students use it even if it is not linked to WebCT or any other course management system (reference questions 8-11 in Table 3). It can be a valuable (free) resource.

The information gathered and processed in this phase of my research has motivated me to take the next step in web-based CAD training. That next step is to use YouTube to host my entire curriculum for the ENGR1030 "Introduction to Solidworks" course for the Fall Semester 2012. This means that the students will have full access to a free digital form of my Solidworks Workbook (PDF format). The students will have access to the Power Point Presentations and all the lecture videos. The course will be organized on WebCT and linked to my YouTube Station. The students experience will be documented and evaluated. This new information will be used to make the needed adjustments to the course.

In this paper, I have covered a history and a development of web-based CAD training for a period of about 12 years. During those 12 years, data has been collected which is represented in Phase I, Phase II and Phase III of this research. I have compared the findings between the different phases and included the new data for Phase III. Incorporated YouTube into my courses and asked the students to evaluate the results. I have investigated numerous other YouTube Stations. I have attended numerous workshops and Seminars where YouTube was the main topic of discussion and/or training. The technology is continually improving. Teachers as well as student's perception (the social aspect) and thus their acceptance of YouTube as a training resource will continually be changing. All these variables make for a moving target. The conclusion reached in today's research may not be so valid or pertinent next year or the year after.

References

Artino, Anthony & Stephens, Jason (2009), Academic Motivation and Self-Regulation: A Comparative Analysis of Undergraduate and Graduate Students Learning Online, Internet and Higher Education, V12, n3-4 p146-151.

Cozzens, R. "Feasibility of Web-based Training." Proceedings of ETHICOMP 2008, Pavia Matua, Italy.

Cozzens, R. "What is Quality Web-Based CAD (Computer Aided Design) Training." Proceedings of ETHICOMP 2010, Tarragona, Spain.

Ferrance, E 2000, "Action Research." Providence, RI: The Education alliance, viewed 7 February 2012 <http:// www.alliance.brown.edu/pubs/themes_ed/act_research.pdf>.

Hamilton, A., "Global Business," Time Magazine, November 11, 2010.

McMillan, J & Schumacher, S 2001, "Research in Education a Conceptual Introduction", 5th edition, Priscilla McGeehom, USA

Rosedale, P., "The Future of Content," Time Magazine, November 11, 2010.

Endnotes

[i] See "Feasibility of Web-Based CAD Training".
[ii] See "What is Quality Web-Based CAD (Computer Aided Design) Training".
[iii] CATIA V5 Workbook Author Richard Cozzens Publisher Schroff Development Corporation
[iv] http://www.CATIAVTWorkbook.com   Online (2003-2006)
[v] For details, see SolidWorks World 2011 http://www.solidworks.com/swworld2011/why_attend.htm
[vi] For details, see Solidprofessor http://www.solidprofessor.com/
[vii] http://www.myigetit.com/home/home.aspx