How Students Learn New Technologies

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Abstract

High school students have typically obtained numerous technology skills by the time they reach junior and senior status. This paper addresses how and from whom high school juniors and seniors acquired technology skills and how best to present new technologies to students in this age group. Students in a high school video production class were observed and interviewed over the course of three weeks and information obtained from these methods was examined. Both constructivism and objectivism methodologies were examined to explore which methodology best fits the learning style of the targeted population. Also, an examination of what motivates students to learn new technologies is included.

Introduction

This paper addresses how and from whom high school juniors and seniors acquired technology skills. A review of the literature found little information on how high school students acquired technology skills. Although information was abundantly available on teaching methodologies and learning styles, information concerning specific methodologies and learning styles directly related to teaching new technologies was not found. This paper compares constructivist and objectivist methodologies used to teach new technologies and a proposal that is a compromise of the two methodologies is presented. The study involved students in a high school video production class. Students were observed and interviewed over the course of three weeks. The information gathered through observations and interviews was examined to better understand by which methods students learn technology skills and which methodology or methodologies are best suited for presenting technology skills to high school juniors and seniors.

Literature Review

The ways in which students learn have been studied for centuries. Socrates, Plato, and Aristotle were all interested in the ways in which people learn. Piaget provided the foundation for modern-day constructivists, who believe that people must first organize their thoughts and then adapt their thinking to include new ideas, as new experiences provide additional knowledge. The constructivists' basic principle is that learners must construct their own knowledge; teachers cannot supply knowledge (Schunk & Zimmerman, 1998). On the other hand, objectivists believe that knowledge is outside the learner, and that learners must memorize any knowledge in order to internalize knowledge (Jonassen, 1991). Today there is much debate about the ways in which students learn and teachers' roles in this process. Many base their theory on either the constructivist or objectivist approach.

Reingold (2001) found a number of educators see technology as both technical and social. Technology is forcing change in the ways in which students are taught according to Reingold. Reingold says education should create an awareness of technology's social context and implications. Reingold states that educators need to be prepared to adapt to changing situations quickly, in order for students to thrive in an information environment. Also, students must know how to make this information serve their needs. In addition, Reingold states that technology has increased demand for interpersonal skills as well as technical skills.

Collaboration

According to Riel and Fulton (2001) it is necessary to create learning communities when given the task of teaching students new technologies. Reil and Fulton defined learning communities as groups of students, teachers, and outside sources that share knowledge, practices and value of the knowledge. Community members were recognized for what members knew as well as what members needed to learn. Leadership came from people who inspired others to work together to accomplish shared goals. In the authors' view, learning communities created students with the skills needed for success. Reil and Fulton state these skills to be the abilities to

think quickly, to adapt to changing conditions, to build alliances, and to work comfortably in a global information environment. Riel and Fulton's research compared how students learn in a traditional classroom to how they learn in a classroom that is composed of a learning community. In the traditional classroom, help between students was viewed as cheating and competition, not cooperation. Riel and Fulton did not believe that students fit naturally into this rigid structure. The authors believed that the diverse interests and abilities of students in a classroom provide a resource that could be used to structure a learning environment that would be more effective than a programmed sequence of instruction. In learning communities, control of the learning became intrinsic to the student. According to the authors, when the students used available resources to create their own knowledge, students engaged other students in collaborative communities where work had value not only to themselves, but also to peers.

In a case study that focused on three pairs of students working together on an integrated math and science project, Venville, Wallace, Rennie, and Malone (2000) found that students' learning was enhanced as a result of the collaboration and communication between the students of the pairs. Students were able to research relevant science and math concepts that were, at times, beyond the expertise of the teacher. Also, students developed ideas for further research and study as a result of the team project.

Harrison (1999) found that many students have embraced the computer age and others are waiting for someone to help guide them. Harrison's research looked at assumptions made by teachers about what students know and what they want to know. Harrison found that once students were given minimal instructions, they were soon exploring with other students and entering into conversations with each other about how to complete a task on the computer. Harrison also looked at the ways in which teachers create opportunities for students to learn. Students in the study appeared to be pleased to have had the opportunity to explore new things with peers.

Cooperative learning consists of instructional techniques that require positive

interdependence between learners in order for learning to occur, according to Kagan (1992). Kagan found that competitive and cooperative interactions among students were keys to successful learning. Kagan also found that careful consideration about who should collaborate with whom should be an integral part of a teacher's job.

In a Global Education Telecommunications Network project (Morris, 2001), students in England and the Bronx, New York, collaborated. Students were eager to discuss and compose letters together. The author suggested that this type of collaboration among students will be needed more and more in the future, as students depend more on each other and less on their teachers. According to Morris, there is a shift for students from whole class to small group instruction, from lecture and recitation to coaching, and a shift from all students learning the same thing to students following learning pathways they set for themselves.

Research conducted at Apple Classrooms of Tomorrow (ACOT) demonstrated that teachers initially rely on traditional teaching strategies when teaching new technologies, but, over time, instruction shifts from lecture-recitation-seatwork to instruction heavily dependent on student collaboration and peer teaching. According to Morris (2001), students work more with each other in developing a shared product rather than listening as a group to the teacher or performing independently. In addition, Morris found when students shared expertise with each other, served as critics, and assisted others, as well as received assistance from their peers, they became aware of the qualities that made a good piece of work.

Obtaining Information

Jones and Berry (2000) looked at whether enough is being done to provide students with the necessary information and technical skills for successful participation in the business world and in society in general. Jones and Berry's interest was in whether experience, required use in a classroom, and owning a PC affected familiarity and use of technology, as well as selection of learning sources. They used a survey to assess seven sources used for learning about information technology. The results of the survey showed that newspapers/magazines and colleagues were

most heavily relied upon to learn about information technology. The fourth most popular source for their respondents was the classroom. The authors questioned whether or not educators are providing an opportunity for learning. Jones and Berry found that creating a thoughtful, learning-rich environment with connection-making is needed for insight and for the lively and flexible use of knowledge.

Dooling (2000) found that roughly 30% of students in 4th through 7th grades preferred to learn about technology by trial and error on their own. Dooling's study also found that family members and friends were a major source of information about new technologies for middle school students. The majority of the students surveyed felt they learned best by doing, not by listening. The study also found that a great deal of computer learning at school happens during periods of informal time students have to interact, such as lunch, recess and after school. Dooling also found that situations where the students knew more about technology than their teachers were not uncommon. In conclusion, Dooling suggested schools should integrate curriculum to use technology as a tool for teaching and learning, and that students appreciate learning experiences that are authentic and relevant. Additionally, Dooling stated that when students are taught skills on a need-to-know basis, within the context of a content-area assignment, students can apply and reinforce new knowledge immediately. According to Dooling, the role of the teacher is being redefined. The teacher is becoming more of a facilitator and the students are becoming the teachers.

Methodologies

Le Duc's Learning Mastery Approach (2001) to teaching required students be given the opportunity to solve problems on their own through exploration and communication with other students before using their teacher as a resource. Noble, Fiely, & Le Duc (2001) found that as students started to teach and help each other, they learned to be self-reliant, better communicators, and more accountable for what they did. Student comments from their research suggested that the Learning Mastery Approach gave students purpose for their research and

learning. The Learning Mastery Approach to learning gave students more free will to choose paths of their liking, with the teacher serving as a guide. Students also became guides for other students as expertise in certain areas increased.

Hargis (2001) was interested in educational theories used to determine how to maximize the learning potential of using the Internet. Hargis's study showed that older participants (post secondary) performed better using an objectivist approach to learning than did younger participants. Hargis advocated a constructivist format for younger ages; shifting the teacher's role from the transferor of knowledge to that of builder of knowledge. The differences in beneficial approaches used by each age group appeared to be related to the more extensive experience the younger students had with technology.

York Community High School in Elmhurst, New York used video production to teach higher level thinking and technical skills (Venetucci, 2001). Venetucci, who taught broadcast journalism at York, offered two semester-long production classes. Students learned all aspects of video production through the teacher's role as a consultant and teacher. The students filled the roles of teacher and consultant, as well. According to Venetucci, the system worked.

Kuperstein and Gentile (October, 2001) found that technology is a powerful way to call students back to a natural, experiential, and enjoyable way of learning. They supported the theory that engaged learning produces more acquisition of knowledge and understanding. Kuperstein and Gentile suggested being flexible in the ways in which new technologies are presented and learning how to guide students in asking probing questions.

Method

This study involved observing and interviewing junior and senior-level students taking Video Production II, an advanced video production class. The course was designed for students interested in Television/Broadcast Production. Completion of Video Production I class, which focused on the basics of broadcast production, was a prerequisite for admittance to the advanced class. In the advanced video production course, students were provided hands-on experience in

the roles of anchor, camera technician, director, and crewmember. A ten-minute student produced and directed video was broadcast throughout the school each morning. A traditional classroom setting, with desks in rows, was used by the instructor to prepare students for studio work. During this time, the instructor led brainstorming sessions, presented factual information, and discussed previous and upcoming projects with the entire class. Small groups of 3 to 5 students were periodically taken into the studio to learn about new technologies. The instructor chose which students would be taught new skills. The students not taken into the studio either remained in the classroom to work on upcoming projects individually or in groups or were sent on a camera shoot.

The advanced class was composed of twenty students, of whom 17 were seniors and 3 were juniors. The racial makeup of the class was 9 white students and 11 African-American students. The male population was 11 and the female population was 9. Forty-two percent of the school population was involved in a free or reduced lunch program. The students were observed in classroom and studio settings for a period of three weeks, from October 3, 2001 to October 23, 2001. Notes were taken on the students' interactions with the instructor and with each other. Also observed were the methodologies the instructor used to present information to the class.

The Video Production instructor possessed a Career/Technical certificate. The instructor's years of experience in the video production industry and a degree in broadcast journalism met the requirements for the Career/Technical certificate. The instructor had no formal training in educational pedagogy.

Seventeen of the twenty students were interviewed by the researcher. Interview questions focused on how the students acquired technology skills, what level of proficiency they felt they had achieved on various technologies, and attitudes toward technology. Questions pertaining to students' access to technology at home were also asked. Appendix 1 provides a list of questions asked during interviews.

Results

Interview questions provided information on the students' access to technology at home. Eighty-eight percent of the students interviewed had access to a computer at home. Of the students with home computers, 93% had access to the Internet. Only 5 of the 17 students interviewed had access to a video camera at home.

Prior to taking Video Production I, a prerequisite for Video Production II, only 25% of the students interviewed had previous knowledge of video camera operation. The students interviewed credited the instructor for providing the knowledge needed to shoot quality video. Several students interviewed said that they had picked up some camera skills from fellow classmates as well as from the instructor. However, observations of students on shoots provided evidence of peer instruction. Several times during the observations, students helped other students in camera operation or setup. Students gave a variety of responses concerning skills acquired in Video Production. Table 1 provides a list of skills the interviewed students indicated they had learned in Video Production. Many of the skills students listed, such as writing skills, organizational skills, and discipline were not directly related to technology. Students credited themselves for obtaining many of the non-technical skills mentioned. Students were observed to have acquired many of the skills Reil and Fulton (2001) suggested were needed for success, such as the ability to think quickly, adapt to change, build alliances, and work comfortably in an information environment.

Observations in the studio provided insight into how the students learned equipment operating skills. The various jobs, such as anchor, camera operator, audio board operator, and video operator, involved in producing a video had been assigned to individuals earlier in the year. As the students performed assigned tasks, other students were often observing and making suggestions. Although the instructor had not taught all students each job, most students interviewed felt some proficiency in the use of all the equipment. They stated they had learned additional skills through observing and asking questions of students who possessed the skills.

The instructor viewed this type of help between students positively.

Technical skills	**Non-technical skills**
Using camera functions	Speaking Communication
How to present self in front of a camera	
Video editing	Writing
Video shooting	Following Directions
	Organization
	Discipline
	Brainstorming
	Commitment
	Discipline

Table 1. *Skills Students Acquired in Video Production Class*

During broadcasts, students took the initiative to complete assigned tasks with no direction from the instructor. It was evident the broadcast belonged to the students, and the students were concerned about producing a quality product. Even when the instructor was absent, the broadcast continued without a problem.

Classroom observations provided information concerning the methodology the instructor used to present new information. Classroom discussions and brainstorming sessions about possible topics for broadcast were observed. The instructor asked probing questions and the students provided all topics for broadcast. The majority of the students in the class were actively involved in these discussions. The instructor also asked for feedback on the previous day's broadcast. Students were eager to offer ideas on how the broadcast could have been improved. Students were not allowed free communication privileges during these times, but were required to speak to the class as a whole and not to individuals.

All of the students interviewed considered themselves proficient in word processing, Internet usage, PowerPoint, and video camera usage. The students indicated they learned the skills in a variety of ways and from two primary sources: teachers and friends. Eighty-eight percent of the students interviewed credited listening to and observing a teacher as a primary source of their knowledge and skill in technology. Friends were an important source of technology information for 60% of the students participating in the study. Although 88% of the students interviewed had access to a computer at home, only 35% of the interviewees said they had learned any technology skills on their own. 12% of the students said they had learned some technology skills from their parents. The median length of time students had access to a computer at home was 7 years and access to the Internet was 4 years.

Of the 17 students interviewed, 12 chose to take the class because they were interested in video broadcasting and production. Seven students chose to take the class because they thought it would be fun and one indicated the reason for taking the class was that it was thought to be easy. All of the students interviewed described the video production class to be fun and interesting. All students said they had learned technical skills, such as video editing, camera usage, and audio equipment usage. Also, according to interviewees, skills such as teamwork, organization, and communication were learned.

Discussion

This study indicates that access to technology was not a problem among the high school juniors and seniors studied. Home access to computers and the Internet was common. Also, the majority of students in this study felt comfortable using technology. Contrary to Schunk & Zimmerman's (1998) belief that teachers cannot supply knowledge, teachers were found to be the most important suppliers of knowledge about new technologies for the high school students in this study. Although a very few students did become constructivist pursuers of knowledge, most felt the teacher's role in supplying knowledge about new technologies is vital to their acquiring new technology skills. Observations also found that peer interaction provided learning

opportunities for students to expand technology skills.

The high school juniors and seniors in this study paralleled the finding of Jones and Berry (2000) in that students found colleagues a valuable source of information when acquiring new technology skills. Dooling (2000) also found friends a major source of information about new technologies. In this study, high school students considered peers, second only to their teacher, as a primary source for gaining new information about technology. Students' learning was enhanced as a result of collaboration and communication among each other. This finding mirrored that of Venville et al. (2000). Additionally, this study supports the findings of Riel and Fulton (2001) on the importance of learning communities. Students need to be given opportunities to work together, feeding off each others strengths, or else valuable learning opportunities might be sacrificed. Informal time for students to interact with each other was found to provide critical learning opportunities.

Student interviews and observations conducted during this study suggest that when students teach and help each other, they learn to be self-reliant and more accountable for what they do. This study also indicated peer tutoring improves students' communication skills. Noble's 2001 study supports this conclusion as well. One might conclude that high school juniors and seniors need such learning communities in order to consider going out on their own in search of new knowledge.

The data in this study also supports Dooling's (2000) observation that students appreciate authentic and relevant learning experiences. Students were observed to be totally involved in the research and presentation of issues that were relevant to them. This relevancy drove the students to learn the technical skills necessary, through teacher or peer interaction, to make a worthwhile contribution to the class broadcast, whether these skills were writing, researching, videoing, or running the studio equipment during the broadcast. The students observed displayed a feeling of ownership in the broadcast; therefore, were concerned with producing a quality product.

As Harrison (1999) found, many students have embraced the computer age and others are

waiting for someone to provide the guiding light to help them grow. This study supports Kuperstein and Gentile's (2001) suggestion that teachers be flexible in the ways in which they present new technologies and learn how to guide students in asking probing questions.

Educators should be aware of how students learn new technologies and from whom students acquire information about new technologies in order to become proficient in teaching students. There is need for further research in creating the optimal learning environment for acquiring technology skills. A compromise between the total constructivist and the total objectivist classroom is a possible answer for creating an environment where students learn new technologies. Further research into the peripheral skills acquired through a technology class, such as writing, speaking, and organization, is also needed. Investigation is needed into ways in which students can be given opportunities to collaborate and communicate during technology classes. Finally, professional development needs to be available for teachers where models of student collaboration opportunities in the classroom are presented and flexible learning environment models are studied.

Contributors

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Appendix 1

Interview Questions

1. Do you have a computer at home? If yes, how long?
2. Do you have Internet access at home? If yes, how long?
3. Do you have access to a video camera at home? If yes, how long?
4. What, if any, experience did you have using a video camera prior to taking Video Production I?
5. What skills have you acquired, thus far, in your course with Mr. Raines?
6. How did you acquire these skills?
7. Have you taught your classmates any Video Production skills?
8. What additional skills do you expect to gain from this class?
9. What technology skills did you have before taking Video Production II?
10. How did you acquire these skills?
11. Have you taught your classmates any of these skills?
12. Have you discovered any aspects of video production on your own? If yes, did you share your new found knowledge with Mr. Raines?
13. From whom did you learn the majority of your technical skills?
14. What skills are necessary to make a quality broadcast?
15. Why did you choose to take this class?
16. Describe in one word how you feel about this class.