The Impact of Dunkirk High School Technology Education on Overall Student Report Card Grades

By

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IMPACT OF TECHNOLOGY ON OVERALL REPORT CARD GRADES

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CERTIFICATION OF PROJECT WORK

We, the undersigned, certify that this project entitled THE IMPACT OF DUNKIRK HIGH SCHOOL TECHNOLOGY EDUCATION ON OVERALL STUDENT REPORT CARD GRADES by Steven R. Wright Jr., candidate for the Degree of Masters of Science in Education, Curriculum and Instruction, is acceptable in form and content and demonstrates a satisfactory knowledge of the field covered by this project.

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Abstract

This study's focus was to identify whether or not Dunkirk high school technology courses had an impact on overall student report card grades. This research was conducted using the report card grades of roughly 600 students at Dunkirk High School in Dunkirk, NY. The data was collected through access of the schools computer software E-School. The report card scores were grouped into two groups: students who took technology education classes and students who did not take technology education classes. The mean averages of both groups' report card grades were calculated, and used to determine whether technology courses had an impact on overall student report card scores. The results indicate that students who were enrolled in technology education courses scored higher on their final report card compared to students who were not enrolled in technology classes.

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Introduction

Educators use several different tools and techniques to help students become successful. One focus is the use of technology by teachers and students in classrooms to improve achievement. Teachers implement new teaching strategies through computer programs and software that are engaging in nature. One example is the use of interactive whiteboards. Students interact with new technologies on a daily basis, whether it is on their cell phone, computer, calculator, or Apple iPod™. Do these every day interactions play a role on their success at school? If so what is the impact on student achievement? Technology is advancing at a rapid pace. It is the job of educators to prepare students for their future in a technology rich environment. Educators face several challenges when implementing technology into their curriculum such as, abiding by the school districts policies and procedures.

Review of the Literature

The selection of these articles for review was based on a search of technology and student achievement. The selected studies had to measure student achievement in order to be considered. Also, the use of technology had to be clearly defined. These studies can be grouped into three categories, technological intervention strategies, the impact of technology on student achievement, and perceptions of technology.

Technology and Student Achievement

Technology can have a significant influence on student achievement. According to Neil and Mathews (2009) “students who participated in the computer assisted instruction intervention performed at a level that was lower than the traditionally-educated students” (Neil and Mathews 2009). The researchers compared computer assisted instruction to traditional instruction. Student achievement was measured using the Rausch Unit (RIT) on the Western States Achievement Test (WSAT). The authors state that “the overall increase in achievement for the middle school

indicated a possible cause and effect of the technology intervention on language arts and math" Neill and Mathews (2009, p.64). Inequalities existed because teachers had different levels of training in using the technology, and some students are more familiar with technology than others.

Home computers certainly have an effect on student achievement at school. Attewell and Battle's (1999) study determined that having a home computer for educational use leads to higher family income, greater parental education, and higher occupational attainment. The authors conducted their research by first gathering data from the National Education Longitudinal survey of 1988 (NELS88). They then created multiple regression models that contained many determinants of educational performance in addition to home computing. Home computing was used as the predictor of educational success. The authors stated "home computers in 1988 were associated with higher reading and math scores for a large representative sample of eighth graders" (Attewell & Battle, 1999, p.5). Additionally, boys were more likely than girls to have home computers. It was also be determined that inequalities exist based on socioeconomic status as well as gender because ethnic minorities were found to own fewer home computers than whites.

Interactive whiteboards are increasing student achievement in the classroom. According to Marzano (2009) "Teachers that use whiteboards in their classrooms can expect to see gains of 16%" (p. 80). The author researched the effectiveness of whiteboards by conducting a study of 85 teacher's and 170 classrooms. The teachers conducted a set of lessons using the whiteboard to one group, and then repeated the lessons to a different group without using the whiteboards. Classrooms with whiteboards offer an interactive experience for students and teachers. Teacher

instruction and technological skills also play a major role in using a whiteboard in classrooms. This technology advanced student achievement at a significant gain.

Internet based learning is becoming popular among higher education programs because it is a convenient method for delivering instruction for both the teacher and student. Hammond's (2003) study found that "extensive web-based teaching material has not adversely affected student performance. Evidence suggests that classes benefitted from it" (p.97). The author conducted his research by sampling 3 different cohorts. The first cohort was taught 12 science modules using transparencies and traditional teaching methods, the second cohort was taught the same 12 science module using internet based instruction, and PowerPoint presentations. The third cohort was taught the same as the second, but was encouraged to print the notes and use the internet modules to guide them. The instructor also made class optional. Hammond's study indicates (2003) "this method of delivery allows students to be flexible in their use of time" (p. 98).

Wireless networks in schools are allowing easier access through portable devices like smartphones and tablets. According to Lam and Tong (2012) "The adoption of e-notebooks in classrooms produced a prominent effect in motivation and achievement" (p.393). The authors surveyed participants to self-report the types of activities they used the digital devices for in class. Participants were also asked to write down the amount of time they were on task using the devices. Examples of in-class activities included; reading course material, taking class notes, communicating with other classmates regarding class materials, and searching the web for subjects related to the class. Lam and Tong state (2012) "70% of students were on task using the devices for course related activities" (p.392). The authors further state "the use of digital devices

was effective in enhancing motivation, the conduct of meaningful course related interactions, active exploration of online information, and participation rates" (Lam & Tong, 2012, p. 393).

Computer based instruction (CBI) can have a significant effect on how students achieve. Serin (2011) found "teaching packages consisting of Compact Discs, animations, sounds, videos, and slides in science and technology classes had positive effects on student achievement" (p. 196). This study uses a pre-test/ post-test control group design. The participants consisted of 52 students; 26 in the experiment group, and 26 in the control group. The experimental group received computer-based science and technology instruction three hours a week over three weeks. The control group saw no computer-based instruction in the areas of science and technology. After the data was collected, Serin (2011) states "significant increases existed in the mean averages of the experimental groups post test results when compared to the control group" (p.193). This would indicate that computer based instruction had a positive impact in science and technology classes on student achievement.

Interactive multimedia software can support a teacher's instruction in any classroom setting. According to Boone & Kingsley (2008) "interactive multimedia software plays a vital role in efforts to move social studies from memorization of dates and information toward a more student centered, hands on, authentic experience" (p. 206). The researchers used a pre-test/ post-test design to analyze student achievement in an interactive multimedia middle school history class in the Southwestern United States. Subjects of this study were from a large urban middle school. The experimental group was taught using multimedia social studies instruction, and the control group was taught using traditional textbook and lecture instruction. Boone & Kingsley (2008) discovered "the experimental mean post-test averages to be 74.04%, and the control group mean post-test scores to be 73.32% (p. 213). Their research indicates a less than .01%

increase for the experimental group (Boon & Kingsley, 2008, p. 214). The multimedia software resulted in a small increase in student achievement. However, additional research is required because instructional technology is playing an increasingly central role in many academic areas.

E-portfolios are becoming a popular choice for educators when assessing student learning. They also allow educators to address the needs of 21st century learners by using technology and multimedia platforms. According to Robles (2011) "e-portfolios speed up the teaching-learning process and blend classroom activities with the latest technology available" (p.143). In this study the researcher used a qualitative research design to explore how e-portfolios meet the required 21st century learning skills of students. Twenty-five students were surveyed online to determine the effectiveness of e-portfolios. Eighteen of the 25 students supported the use of e-portfolios (Robles, 2011). Robles (2011) states "the use of e-portfolios is feasible, however the transition from conventional to outcome-based assessment model must be initiated with prudence" (p. 147). The results of this research indicated "the majority of students were able to complete their e-portfolios to a satisfactory level" (Robles, 2011, p. 147). E-portfolios are an efficient way to showcase a student's achievements and track a student's progress.

Students of impoverished school districts do not always get exposure to technology because of the costs that are associated. According to Page (2002) "computer technology, when integrated into the classroom for significant periods of time, may also have more significant effects among students classified as low socioeconomic status" (p. 393). Participants of this quasi-experimental study came from 10 Louisiana elementary schools. This research split 211 students into five treatment groups, and five control groups. The treatment groups received a variety of technology enriched instruction materials. The control groups were subjected to

traditional methods of instruction. The researcher analyzed the results from a pre-test/ post-test and found "participants in the technology enriched classrooms scored significantly higher in math achievement compared to their peers in the non-technology enriched classrooms" (Page, 2002, p. 402). This study also indicates "technology enriched classrooms are conducive to higher levels of math achievement, and promoting student centered environments among low socioeconomic students" (Page, 2002, p. 403).

Computer animation is one procedure used by educators to enhance student learning experiences. In a study done by Aksoy (2013) "computer animation was implemented to depict the solar system and beyond" (pg. 40). The researcher compared the use of computer animation to traditional means of instruction. A total of 60 students participated in this study throughout the course of one school year. The experimental group was provided computer animations, and the control group was taught using traditional lecture style instruction. The researcher compared results from a pre-test/post-test of the Academic Achievement Test (AAT) to determine student knowledge of the solar system. According to Aksoy (2013) "The experiment group was found out to be more successful than the control group in terms of the (AAT) post-test point" (pg. 44). Students in the experiment group scored a mean average of 80.53%, and students from the control group scored a mean average of 71.50%. Aksoy (2013) states "the experimental group was superior to the control group in increasing their academic achievement" (pg. 43). However, the author cautions "when using computer animations for future research, particular attention should be paid for ensuring animations are not distracting, suitable to the levels of the students" (Aksoy, 2013, pg. 45).

Technology Intervention Strategies

Technology interventions can impact student achievement greatly. Garthwait and Weller (2005) state "laptops engage and help students achieve at a higher rate as well as challenge their teachers to come up with new and interesting lessons" (p. 366). This research focuses on the study of two different seventh grade classes and the impact of 1:1 computing on their achievement. The study was part of the Maine Learning Technology Initiative (MLTI), which placed a laptop in the hands of each student and teacher. The study began by researchers examining two groups of seventh graders that were split into two "houses" and each having two different social studies teachers. Garthwait and Weller (2005) determined "the school was middle-class and had average student performance (p. 365). It is important to note that both teachers had backgrounds in using instructional technology. The researchers stated that "In group 1 motivation increased and students that were identified as disinterested in textbooks were now 8 times more engaged in the Webquest activities" (Garthwait and Weller, 2005, p. 366). In the second group the authors state that "the laptop allowed for independence and discovery in solving problems" (Garthwait and Weller, 2005, p. 367). For example the teacher of group 2 stated "One of the greatest changes I've experienced since the arrival of the laptops has been my increased opportunities to act spontaneously. Every educator realizes that when a teachable moment presents itself, one must act accordingly" (Garthwait and Weller, 2005, p. 368). The research also suggested that "creative and innovative laptop use presented itself often and this intervention increased the technical skills of each teacher" (Garthwait and Weller, 2005, p. 373). The benefits of having a teacher who is technologically savvy will undoubtedly make this process easier. The teacher will be able to pass these traits and ideas on to the student more efficiently if they have the expertise in dealing with the new technology.

A pretest-posttest control group can be used to measure the effects of a technology intervention in the area of Science. According to Dunleavy & Heinecke (2007) "This program suggests that 1:1 laptop usage facilitates student achievement in science and not math (p. 18). Their study was conducted on middle school math and science tests to examine the impact of laptops on student achievement. The study was conducted for two years. At the end of the study the researchers asked the question "Was the laptop initiative more thoroughly implemented in the science classrooms at the school being studied?" (Dunleavy and Heinecke, 2007, p. 18). This would indicate that future research needs to address implementation across the content area.

At Mooresville Graded School District (MGSD) in North Carolina, USA 5,000 laptops were given to each student. Edwards, Smith, & Wirt (2012) state "an exciting result of the study was an increase in graduation rate, decrease in dropout rate, and increase in college enrollment" (Edwards et al., 2012 p.15). This study was conducted for four years to analyze the effectiveness of 1 to 1 laptop intervention. Each student in grades 2-12 received a laptop for school use as well as 500 licensed school professionals. The researchers analyzed graduation, and drop-out rates and stated "this program has resulted in a 3.5% increase in graduation rate per year" (Edwards et al., 2012, p. 15). The benefits of a successfully implemented technology intervention are tremendous when the entire district is motivated to increase student achievement.

Implementation of new technology can have many obstacles when trying to increase student achievement. According to Lowther, Inan, Daniel, Strahl, & Ross (2008)."when technological interventions are used, and technology coaches are implemented for teachers. The result is higher gains in students' achievement" (Lowther et al., 2008, p.205). This study examined how technology works when key barriers are removed such as, the use of technology coaches, and teacher attitudes toward learning new to technologies to create new lessons. This

study started by designating two cohorts "Launches 1 and 2". This was a three year study that included 26 schools, 12,420 students, and 927 teachers. The researchers identified key barriers to be: availability and access of computers, teacher beliefs, technological knowledge, and technological support (Lowther et al., 2008). Researchers used direct observation of computer use, teacher surveys, technology skills assessment, and student achievement to measure the effectiveness of the intervention. The program students were better able than the control students to demonstrate the application of critical thinking skills, which for some students resulted in superior or comparable math and language arts performance (Lowther et al., 2008). Support systems play a major role in overcoming obstacles in a student's education. Implementing new technology is no different. If a teacher has adequate help in implementing the new technology all students will benefit. If teachers and students have support from specialized technology coaches they will feel more comfortable when using the technology.

Visual and computer instruction are a common way to motivate students when presenting classroom materials. At the United States Air Force Academy a video intervention was applied to help students retain information on American government topics. The experiment split 117 freshmen into six sections. The intervention was applied to three of the sections. In the intervention group students watched short video clips on American government concepts. In the other three sections students were taught using traditional means of instruction. By analyzing post-test scores Jordan & Sanchez (1994) found "exposure to the in class videos only produced a minor impact on a students' ability to retain materials" (p.66). The researchers concluded "the videos used in this study may not have adequately explained the concepts being taught" (Jordan & Sanchez, 1994, p.66). The small sample size of the experiment may have also played a role in the results.

Technology professional development interventions are becoming increasingly popular to increase teacher awareness. According to Unger & Tracy (2013) “teachers must effectively model the appropriate use of emerging technological tools and concepts to students, our nation’s future leaders” (pg.124). Qualitative multiple case research methods were used to analyze the effectiveness of teacher professional development interventions (TPDI). The researchers state “teachers received instruction in the online environment using the same Google™ applications they later used in their teaching practice with students, providing an authentic learning environment” (Unger & Tracy, 2013, pg.127). According to Unger & Tracy (2013) “teachers perceived that the most beneficial factors of technology professional development are relevant to their teaching responsibilities, and most importantly, impact student learning” (pg.135). Time is an important factor when discussing professional development opportunities. It takes a lot of time to implement what is learned from professional development workshops.

Technology is being used to break through restrictions of older traditional print based reading and writing. According to Mills & Chandra (2011) “microblogging through the use of Twitter™, can play a powerful role in supporting the professional and personal growth of teachers in supporting learning communities” (pg.35). Researchers asked the question “what are the potentials of microblogging for literacy learning in an educational community?” (Mills & Chandra, 2011, pg.37). The researchers examined 166 pre-service teachers in six implementation groups at a University in Australia. All participants were required to use the microblogging platform EDMODO™ throughout their pre-service teaching course. 330 digital artifacts were collected as part of the case study. Mills & Chandra (2011) determined “a benefit of microblogging is that the complexity of the writing task, in terms of both structure and content, can be modified to suit a wide range of literacy abilities” (pg.40). The researchers added

"microblogging establishes an active social dynamic among the participants to create an open, fluid, and continuous dialogue, rather than one that is closed, static, and bound" (Mills & Chandra, 2011, pg.44). With the increasing ability of free and secure microblogging platforms teachers can begin to implement literacy learning by using resources other than print.

Perceptions of New Technology

Technology changes rapidly. Users of the new technology have to adapt quickly in order to grasp its capabilities. According to Rossing, Miller, Cecil, & Stamper, (2012). "educators must continually gauge students' level of knowledge and comfort with new information and communication technologies, and they must not assume that students are prepared for new technologies" (Rossing et al., 2012, p.17). This research examines the use of mobile technologies specifically the Apple Ipad™ in classrooms. The researchers surveyed 209 students in 9 classrooms using both Likert-scale and open ended responses to determine the views of students on using the Apple Ipad™. Students in this study embraced the Apple Ipad™. They found it easy and convenient to connect and share information with peers (Rossing et al., 2012, p.12). However, the researchers state "elements of the Apple Ipad™ design created barriers to learning, specifically the touch screen keyboard" (Rossing et al., 2012, p.12). Apple Ipad™ technology is relatively new and further research on this topic is necessary to gain new insights into student perceptions.

A teachers' attitude and beliefs can influence the learning environment in a classroom. It is the teachers' responsibility to plan and execute daily lessons. It is their choice whether or not to infuse technology into the lesson. Levin & Wadmany's (2006) study discovered "after three years in a technology rich classroom, teachers exhibited fewer positive beliefs in regards to

technology" (p.168). The authors conducted their study using interviews, questionnaires, and observations focusing on teacher beliefs and classroom practices. They analyzed teacher perceptions of; concepts of learning, concepts of teaching, teaching models, and views on technology. The study lasted for three years and was conducted on nine teachers. According to Levin & Wadmany (2006) "technology is not a unitary concept: It means different things to different teachers, and the practices associated with each concept lead to quite different outcomes" (p.170). This study supports the idea that teacher beliefs have an effect on technology in a learning environment.

New teachers face several challenges when beginning their careers. The implementation of technology into their classrooms is one such challenge. According to Bang & Luft (2013) "the 21st century science classroom now contains nontraditional teaching tools, including laptops, personal digital assistants, and digital measuring devices" (p.118). The purpose of this study was to examine the use of technology by new secondary science teachers. They also explored the factors facilitating or inhibiting their use of technology. The study lasted for five years and was conducted on 95 teachers. Researchers collected and analyzed observational data and interviews of 65 female, and 35 male beginning secondary science teachers across five United States to determine how they used technology. Bang & Luft (2013) state "beginning secondary science teachers used Microsoft PowerPoint™ the most, and software programs the least" (p.122). PowerPoint™ was used primarily to assist in teacher-centered lectures. Based on the findings of this study the researchers recommend "it would be most effective for secondary science teachers to initiate or increase technological enhancements at natural insertion points when they were comfortable using various types of technology" (Bang & Luft, 2013, p. 123). Technology is always evolving. New teachers have to stay ahead of the curve when implementing new

technology. Bang & Luft (2013) encourage new teachers to "participate in technology embedded mentoring programs" (p.123). New teachers have to be open and accepting in utilizing technology. Teacher perceptions of technology can undermine or help when implementing technology lessons. The technology mentoring programs will assist new teachers in collaborating, and sharing ideas that increase student engagement and achievement.

Computer and technology access is on the rise throughout the United States. According to Lanahan & Boysen (2006) "the amount of United States public schools internet access increased from 35% in 1994, to 99% in 2002" (p.1). Their study analyzed teacher beliefs about essential technology, and sufficient technology. Lanahan & Boysen (2006) determined "essential technology for teachers to be the internet, email, and the telephone, and that it was sufficiently available in their classrooms" (p.2). They used data from the 2000-2001 Teacher Follow-up Survey (TFS) on technology to examine teachers' perspectives. The researchers concluded "teachers who were familiar with computers found technology to be sufficiently available in their classrooms" (Lanahan & Boysen, 2006, p.1). School districts with larger technology budgets are able to provide more access to technology, than districts with smaller technology budgets. This would have a direct influence on whether or not teachers found classroom technology to be sufficiently available.

A students' prior experiences with technology has an influence on their beliefs regarding technology. According to Eisenkraft (2011) "to uncover student background knowledge we must assess students' technological literacy" (p.26). The International Technology and Engineering Educators Association defines technology literacy as "the innovation, change, or modification of the natural environment to satisfy perceived human wants and needs" (ITEEA, 2007). The author conducted this study by analyzing 1157 student entries from the Toshiba ExploraVision™ competition in 2006. Eisenkraft (2011) discovered "students' viewpoints can change from kindergarten to high school"

(p.27). This is beneficial because it can aide educators in lesson planning and administrators when designing curriculum.

Teachers and students are two important stakeholders in the effort to integrate technology. Their views and beliefs should be considered when a technology initiative takes place. Li's (2007) study examines "teachers' and students' views about the integration of technology in schools focusing on urban and rural secondary math and science teachers, and their students" (p.377). Data was collected from 15 science and math teachers, and 450 secondary students. The author used interviews and surveys to collect data regarding technology integration. Li (2007) found "students generally hold more positive attitudes toward technology than their teachers" (p.391). According to Li (2007) "75% of students found technology to be very useful because of its efficiency" (p.383). The technology was also helpful in providing concrete examples of abstract concepts through visual materials, and animated models. Even though students were enthusiastic about using technology teachers remained unwilling to use technology. Li (2007) states "teachers appear to have little appreciation of advanced technology in teaching practices and are reluctant to consider the idea of engaging students in computer supported activities" (p.391). A troubling result of this study was teachers were ignoring their students' positive views on technology because they feared being replaced by technology. The author states "teachers and students share the belief that technology may replace teachers" Li (2007, p.393). This troubling viewpoint could have a serious impact on the education system because it contributes to teachers' opposition to use technology.

Social media is a rapidly evolving technology that is used at educational institutions. According to Sessa (2014) "it is crucial that educational institutions use social media strategically to engage this generation of students" (pg.1). In this study the researcher used a quantitative survey developed using a web-based questionnaire to collect the data. Social media

managers of educational institutions were asked to complete the surveys. 189 institutions in the United States completed the survey. The goal of this research was to determine the most popular social media being used in educational institutions. According to Sessa (2014) "facebook™ was the most popular social media used by educational institutions" (pg.9). The author identifies "the lack of dedicated social media managers proved challenging, when finding a qualified person to take the survey." (Sessa, 2014, pg.11).

Methodology

Participants and Setting

The research will be conducted within the high school of a small city school district in Dunkirk, New York. Roughly 600 students attend the high school at Dunkirk City School District. The high school has a diverse student population 56% are White, 35% are Hispanic, and 9% are Black. There are 36 (6%) students that are English Language Learners (ELLs). At the high school level 360 (60%) of the total student population qualifies for free/reduced lunch.

The entire high school was selected for this research to determine the impact of technology education on overall student report card grades during the 2013-2014 school year. During this time 330 (55%) students were enrolled in 15 technology courses at Dunkirk High School. There were 275 (83%) male and 55 (17%) female students ranging in age from 14-19 years old. Fifteen (22%) students had an Individualized Education Plans (IEP), and 14 (4%) had a Behavior Management Plan (Section 504 Plan). All student data and research will be collected using the BOCES computer software E-School. There will be no direct involvement of students in the research as all data collection is done online.

The setting will be a typical high school Technology Education classroom. A total of three Technology classrooms exist at Dunkirk High School. The first classroom consists of 20

student desks that all have their own computer and internet access. The teacher desk has a computer, projector, colored laser jet printer, and three-dimensional printer. All students have access to a black and white laser jet printer. This classroom houses four Communication Systems classes, and one Robotics class. The second classroom has 22 student desks and one teacher desk with computer and projector. All computers have internet access. It also has a small lab area with table top equipment such as band saws, sanders, and drill presses. This room houses one Engineering, two Drawing and Design for Production (DDP), and two Computer Aided Drawing/Drafting (CADD) courses. The final technology classroom is a large room with 24 student desks. It has one teacher desk equipped with a computer that has internet access and laser jet printer. The majority of space in this room is taken up by the construction lab area. In this area there are two drill presses, table saw, planer/jointer, chop saw, air compressor, and three large workbenches. The courses in this classroom are; three World of Technology, one Construction Systems, and one Production Systems classes. The three teachers in the technology department are all middle aged Caucasian males, and range in years taught from 8 to 10 years' experience. All possess New York State Certification in the area of Technology Education.

Dependent Variables

Overall student report card grades are the dependent variable for this research. Overall student report card grades are defined as end of the year averaged percentages out of 100 for 180 days during the 2013-2014 school year. The data collected will be end of the year overall averages of students in grades 9-12. The computer software E-school will be used to generate this report. The report will consist of overall student averages out of 100. Each student will be assigned an identification number by E-School so their identity remains anonymous throughout the course of the study.

Independent Variable

The independent variable for this research will be overall student report card grades of Dunkirk High School students enrolled in Technology Education class. Overall student report card grades of Dunkirk High School students enrolled in Technology Education class are defined as "Any Dunkirk High School student in grades 9-12 enrolled in a Technology Education class during the 2013-2014 school year. The data collected will be overall report card averages out of 100 of 330 students that were enrolled in the Dunkirk High School Technology Education courses. The computer software E-School will be used to generate this report. All students will be assigned an identification number when the report is generated to protect their identity throughout the course of the study.

Design

The instrument used for researching will be the overall report card grades of Dunkirk High School students in grades 9-12 and the overall report card grades of Dunkirk High School students in 9-12 that were enrolled in Technology Education courses. The purpose of this study is to determine whether students enrolled in Dunkirk High School Technology Education courses had higher overall report card grades than students who did not take Dunkirk High School Technology Education courses.

Data Collection and Analysis

This research will take place on my personal computer at home from 3:00pm to 9:00pm using the computer software E-School. At this time I will be analyzing the overall report card averages of students who took Technology Education courses and students who did not take Technology Education courses at Dunkirk High School. The computer software E-School will generate a report that consists of overall grades of Technology Education students and non-

Technology Education students. Any report that is generated using E-School will be kept anonymous. E-School will also separate Technology students and non-Technology students into two different categories. Once each group is separated the data will be analyzed to determine if being enrolled in a Dunkirk High School Technology course resulted in a higher overall report card grade. Once the report is analyzed and all data is collected it will be saved on the hard drive of my computer. I will keep the data on my hard drive for three years, after that it will be destroyed.

Findings

The results of this research indicate that students who participated in Dunkirk High School technology classes scored higher on their report cards than students not enrolled in technology classes at Dunkirk High School. The purpose of this research was to determine if Dunkirk High School technology classes had an impact on final report card averages. The data was separated into two groups. Students who were enrolled in Dunkirk technology classes and students who were not enrolled in Dunkirk technology classes. By examining the data it is clear that students enrolled in Dunkirk technology classes scored higher on their final report card averages.

Non-Technology Students

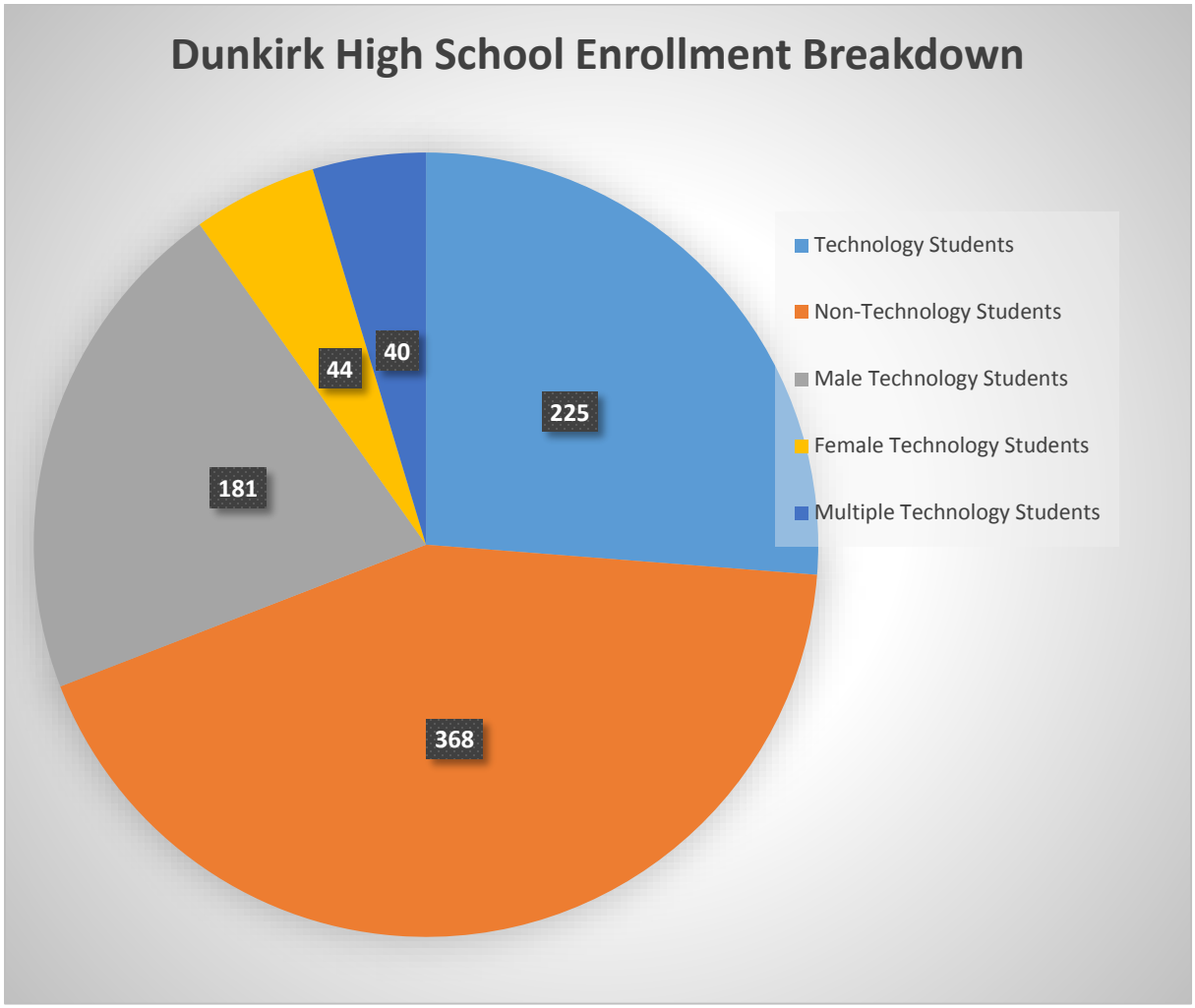
Dunkirk High School had 593 total students enrolled at the time of this study. During this time 368 (62%) students were not enrolled in Dunkirk High school technology courses. These students participated in courses from departments such as; Social Studies, Math, Science, English, Music, Business, and Art. They were enrolled in no technology classes at Dunkirk High school. All report card final averages were totaled up and divided by the number of students in

the group to discover the mean report card average for non-technology students. This mean average was 79%. (See Figure 1)

Technology Students

In order to be considered a Dunkirk High school technology student. A student had to be enrolled in one or more of the possible fifteen technology courses at the high school. Out of 593 total students, 225 (38%) were enrolled in Dunkirk technology courses at the high school. Of the 225 enrolled 44 (20%) were female, and 181 (80%) were male. Forty (17%) students took multiple (two or more) technology classes, 11 (28%) females, and 29 (72%) males. (See Chart 1).

Figure 1



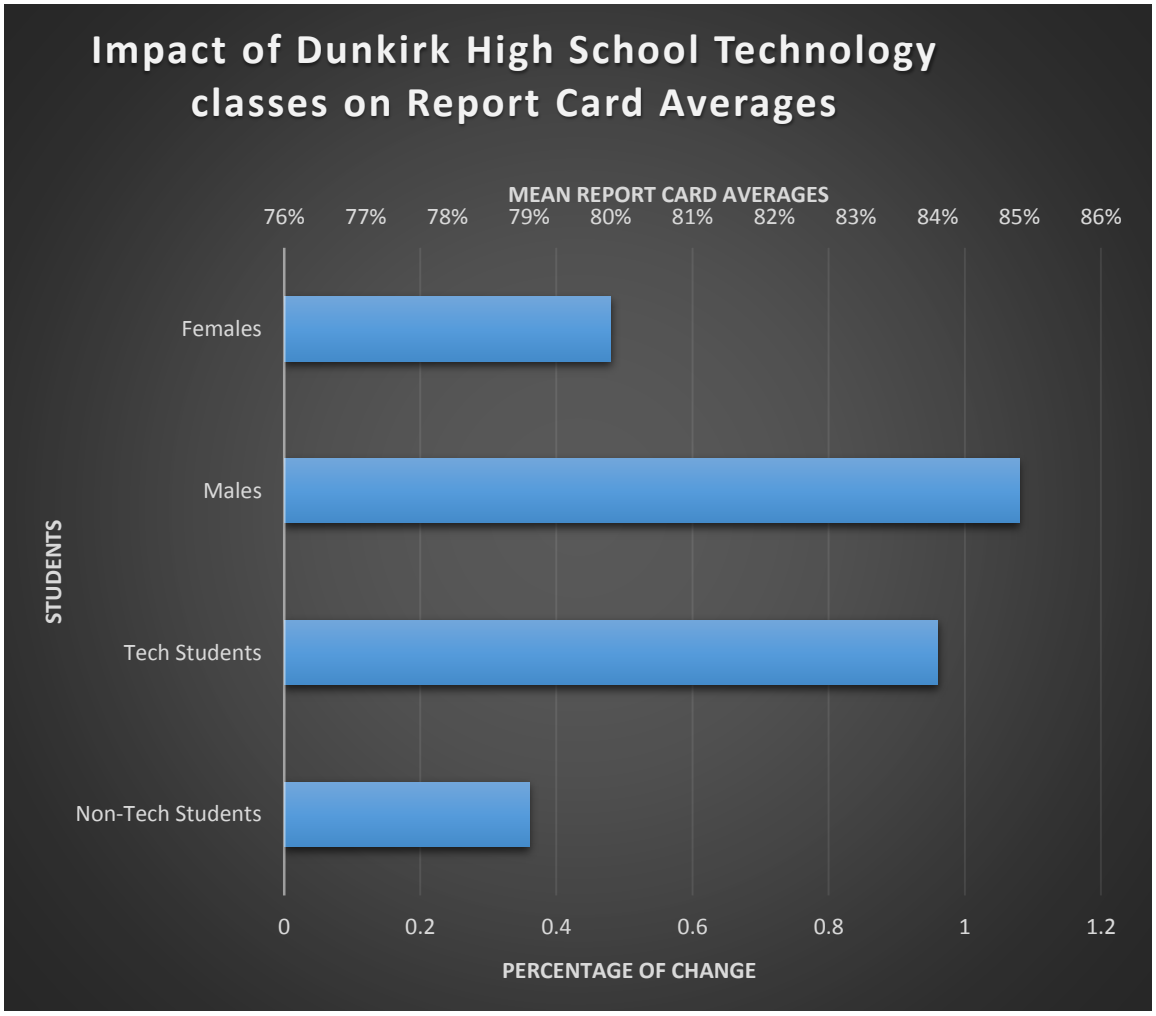
Students in this group had a mean final report card grade of 84%. Technology students showed a .95% increase in report card grades compared to non-technology students. (See Figure 2).

Results of Technology Students by Gender

The goal of separating the data based on gender was to determine if technology courses had a greater impact on report card averages of females or males. Eighty percent of the technology student enrollment were males, and 20% were female students. The group of female technology students scored a mean report card average of 80%. The group of males achieved a mean average of 85% on final report card averages. Male students' report card averages showed

an increase of .94% compared to female report card averages. (See Figure 2). The data suggests that technology classes had a greater impact on final report card averages of males than females. However, many factors can contribute to males scoring higher than females. One factor being technology class material is geared more toward the interests of males. Also, females could have been intimidated because male technology students outnumbered female students.

Figure 2



Discussion

As explained in the results, students who participated in technology classes at Dunkirk High school had higher overall report card averages than students who did not. This indicates that being enrolled in a technology class increases students' overall report card grades. However, several factors play a role in a student's final report card average. For instance, a student could be enrolled in several Advanced Placement courses where the academic rigor is higher than a high school level technology course. This could play a contributing factor in a student's report card average being lower. When comparing technology students' averages to non-technology students' averages it is important to note that technology courses take a more hands-on learning approach. The students in these classes use materials to design and build a finished product. This type of learning environment has obvious benefits for students that are hands-on, kinesthetic learners. The learning environments of technology classes differ from other courses because students have opportunities to be up out of their seats interacting with one another and manipulating machinery, whereas in a business course, for example, they are seated in a desk or in front of a computer. Another potential factor that could cause non-technology students to have lower grades at Dunkirk High School is the larger amount of money that is given to the technology department as part of their yearly budget. The technology department at Dunkirk High school receives $6000.00 annually to split between three teachers ($2000.00/ teacher). This money is used to buy materials and supplies for each student as well as new equipment.

Relationship to Literature

In the review of the literature the results were all conclusive - exposure to a technology-rich environment influenced student achievement positively. The results of this study confirm those found in the literature. Dunkirk students taking technology classes at the high school achieved higher report card overall averages than students who did not participate in the classes. The literature that was reviewed showed higher gains in achievement, while the results of this study showed minor increases in percentage changes. For example students of technology courses final report card averages that were .95% than non- technology students, and male technology students had averages .94% higher than female technology students. In a study done by Neil and Mathews (2009) the researches compared computer assisted learning to traditionally educated students and saw gains in achievement. This relates to the results of this study because most non-technology students at Dunkirk high school are taught in a traditional manner from teachers outside the technology department. However, with many professional development opportunities available, technology is becoming more integrated into core area classes, making it easier for those teachers to use it in their classrooms.

Implications for Practice

The results of this study can be applied by educators to address the lack of technology and hands-on learning experiences in their classrooms. The data from this study shows that providing a technology-rich environment in their classrooms, like the environment found in a Dunkirk technology class, gives students the opportunity to increase their achievement. If teachers from other subject areas made time to use technology more often, and in a meaningful way, there is strong evidence that it would increase students' final report card averages.

I am currently a technology educator who strives to use technology in every aspect of my classroom. Several methods of my instruction require the use of technology, whether it be an

interactive whiteboard, laptop, Apple Ipad™, Adobe Photoshop, or a drill press. These tools are used every day in my classroom; not only do I use them, but each and every student is required to. For example, I teach the engineering design process in my Robotics class. As a result, each student is required to build and program a working robotic arm. Throughout this process the students will use a laptop to document all their work, watch online videos of specific processes, and manipulate computer-aided design software (CAD) to design their robotic arms. They then build a working replica of a robotic arm that is programmed using the software necessary. Once the building and programming phase is complete, each student must test their arms to complete specific operations like pick/place and organization. The final steps are to record a video of their arm completing the tests and create a movie using Adobe Premiere™ video editing software. Throughout this project students are engaged and motivated to use all of the technology. As a direct result their final averages in my class increase significantly.

There are currently three teachers in the technology department at Dunkirk high school. We teach a variety of courses such as Construction, Computer Aided Design (CAD), TV Production, and Communication Systems to name a few. Throughout these courses students are immersed in a technology rich environment that allows them to experience the use of several new and emerging fields of technology. A typical student in the Communication Systems class would have his/her very own student computer which would give him/her access to the latest 3D printing software, or the entire Adobe creative suite. A student who participates in Construction class would be using the newest techniques and tools of the carpentry trade.

One major difference between a student who takes technology class and a student who does not is that technology students make things. Our students are given real-world problems and have to use problem solving skill in order to create a solution. These projects that they make are

theirs to keep. They get to take them home and use them. Technology students typically develop a sense of ownership of their projects, which makes the learning more meaningful. These meaningful learning experiences may be why technology students have higher report card grades than students that do not take technology classes.

Lastly, the results of this research can be used by school district administrators to determine what meaningful technology professional development opportunities to offer educators in other subjects. For example, a principal could chose to offer a professional development workshop in interactive whiteboards for English teachers. The English teachers could learn how to use the whiteboards to create interesting interactive lessons for students on whatever novel they are learning about. Also this research can be used by guidance counselors when creating a students' course schedules. If a student appears to be low achieving in traditionally taught core subjects, and expresses a high level of interest in building, or hands on activities, the student may explore appropriate technology courses where he/she can apply his/her skills and achieve at a higher rate. One example of this is several students struggle to get necessary math and science credits in high school. The New York State Department of Education allows a student to acquire a Math or Science credit by taking and completing a high school technology class called World of Technology. These students still get the necessary math and science skills throughout this course. However, there is one difference - all the math and science is learned, practiced, and applied through the use of technology. Many times in a traditional math or science course the formulas or theories are learned briefly and never applied. In the World of Technology class all the math and science is applied to solve real world problems. One example would be the bridge building project. This projects requires a student to build a small scale bridge that spans a certain distance. The student uses geometry to calculate the angle of the

strongest bridge truss design. The student also learns the strength of materials and determines which should be used to support the most weight under certain stresses. After they learn all the math and science required they build the bridge apply all their math and science skills.

Implications for Future Research

This study focused on Dunkirk high school technology students' increases on report cards compared to non-technology students. Further research with other populations is necessary to help understand why technology students had higher report card grades than non-technology students. For example, if a study were done that focused on all students from a different high school who took technology compared to all non-technology students, other interesting differences between technology students and non-technology students might be evident. Future studies could then be used by administrators to help determine the best pathway for a student to take in order to graduate successfully. As more research on this topic becomes available it would also be interesting to see how older teachers' attitudes about technology affect the use of technology in their classrooms. Another aspect that could be addressed by future studies on this topic might be the overall costs associated with integrating new and emerging technologies in the classroom. This would be beneficial information for school district administrators when they make important financial decisions based on what new technologies to buy for teachers and students.

Limitations

This study contained limitations. This study was conducted at one small urban school district in Western New York. More studies will need to be conducted in other high schools to gain a better understanding of whether technology students achieved higher on report card averages. These studies should be done at other high schools with similar student populations to

make the results more complete. Also, every school is different and no two technology programs offer the exact same technology courses. In addition, all technology teachers have different backgrounds and professional experiences.

The last limitation was the amount of technology training teachers received. Teachers of subjects other than technology do not get the amount of training in the area of technology that technology education teachers receive. It is the professional duty of a technology educator to stay up-to-date with new and emerging technologies in order to facilitate them to their students. Teachers of other subjects are not obligated to focus on technology in their classrooms.

This study contains data that is accurate, and clearly defines that Technology does in fact impact student achievement at Dunkirk high school. An increase of .95% in final report card averages of technology students can be seen, when compared to non-technology students at Dunkirk high school. The results of this study can be used by teachers and administrators to determine the technology needs of students. It can also be utilized by guidance counselors, parents, and administrators to determine the course load a student should take in order to graduate. Technology integration in schools is an expensive endeavor. Schools must allocate enough funding to be ready for the constant changes in technology. Additionally, meaningful professional development opportunities for teachers need to exist regularly. If teachers do not feel comfortable with technology they will be less likely to implement it in their classrooms. This will have a negative impact on student learning. In this study technology had a positive impact on student achievement, and led to more meaningful experiences in the learning environment. Schools should strive to producing technology savvy students that are college and career ready.

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