Relationship Between Student Achievement and Use of Power Videos Digital Educational Videos

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Relationships between Student Achievement and Use of Power Videos Digital Educational Videos

by

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ABSTRACT

In classrooms with limited instructional time and many resources, teachers must decide which resources positively affect student achievement. Power Videos (PV), produced by DCS, is one such product used at the 373 elementary campuses in the greater Dallas, Texas, area.

This research examined the relationship between teachers' usage of the DCS PV product on a campus and the performance of students on that campus on the Texas Assessment of Knowledge and Skills (TAKS) test in the areas of reading, math, science, and all tests. A random sample of 61 campuses was included in the study.

This research was a nonexperimental, correlational, quantitative, and evaluative study. The methods included collection of quantitative data for the 2006–2007 school year regarding TAKS performance from the TEA Web site. Data for PV usage were collected from standard reports generated by DCS. Pearson r values were generated for the following comparisons: Power Video usage vs. elementary TAKS scores—reading, Power Video usage vs. elementary TAKS scores—math, Power Video usage vs. elementary TAKS scores—science, and Power Video usage vs. elementary TAKS scores—all tests.

There were statistically significant correlations between the use of PV and student performance on the reading, math, and all-tests sections of the TAKS test. There were no statistically significant correlations between the use of PV and student achievement on the science portion of the TAKS test.
ACKNOWLEDGMENTS

I wish to thank my mentor, Dr. Charles Achilles, for the time, guidance, candor, and APA notations. I always enjoyed the humor and even the notes and suggestions on the drafts of this paper, especially the last word, cheers!

Thanks to Dr. Barbara Strobert, Dr. Chris Tienken, and Joseph Martinelli for words of encouragement and taking time from your busy schedules to provide advice and feedback.

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I also want to especially thank Dr. Dick Hughes. Without Dick’s constant support, advice, counsel, and friendship, this journey would have taken a lot longer! I will be forever grateful for the time he set aside on multiple Fridays to provide advice. I am so thankful that I had Dick in Dallas to push me while Chuck was pushing from SHU.

Finally, thanks to my wonderful wife (who underwent two surgeries while I was in New Jersey) and my loving family, who always supports me and provides encouragement.
DEDICATION

This is dedicated to my mom, dad, grandmother, and father-in-law, who always inspired me to believe I could achieve anything I tried. My grandmother got to see me start the program and was looking forward to calling me Dr. Rick. They all are watching from above still helping me meet my goals.
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Chapter 1: Introduction

In Texas, high-stakes testing has recently risen to a new level, as the Texas Legislature enacted legislation to influence the finances of districts and individual teachers based on student achievement. Individual and campus-level district scores on the Texas Assessment of Knowledge and Skills (TAKS) test are now a mechanism to provide bonus incentive pay for teachers whose students' scores improve or whose students meet predetermined levels of achievement. Additionally, individual schools and districts receive annual accountability ratings based on students' TAKS scores. The accountability ratings also have financial ramifications.

In classrooms with limited instructional time and many resources, teachers must decide which resources positively affect student achievement. Resources are costly, and administrators want to maximize dollars spent for student achievement. Dallas County Schools (DCS) provide digital educational videos to support teacher instruction and student achievement. Local school districts supported by DCS are asking for additional dollars to be spent to increase bandwidth and expand the library of digital titles to be downloaded or streamed. Understanding that the quality of a decision can be no better than the data/information upon which the decision is based, DCS leadership seeks to determine the relationship between the DCS digital educational video program and student achievement.

A leadership and management issue, then, becomes which instructional products funded by tax dollars improve student performance. Power Videos (PV), produced by DCS, is one such product used at the 373 elementary campuses in the greater Dallas, Texas, area. The issue confronted by DCS leadership is, "Are the dollars being spent on
PV having a positive, measurable influence on student achievement?” DCS administrators are seeking information that will inform the leadership about this question.

Background

Texas has had some form of statewide student assessment for more than 29 years. High-stakes testing in Texas began in 1979 when the Texas State Legislature passed a bill amending the Texas Education Code to require the Texas Education Agency (TEA) to adopt a series of criterion-referenced assessments. These assessments were designed to assess basic skill competencies in mathematics, reading, and writing for students in Grades 3, 5, and 9. The formal assessment that linked student assessment results to the statewide curriculum in Texas was the Texas Assessment of Basic Skills (TABS). Learning objectives for the TABS test were developed by the TEA. The objectives were designed to represent a portion of the skills students were expected to learn in Texas public schools. The TABS objectives were reviewed and revised by committees of educators as a checkpoint to ensure that the objectives accurately reflected the curriculum.

The state then changed the requirements from basic skill competencies to minimum skills. This change was the basis to change the test from the TABS test to the Texas Educational Assessment of Minimum Skills (TEAMS) test in 1984. TEAMS was administered to students in Grades 1, 3, 5, 7, 9, and 11, with the Grade 11 test an exit-level assessment.

In 1988, the legislature decided to make changes to the standardized TEAMS test. The changes were designed to expand the subject content being measured. A prime focus
was to place a greater emphasis on the assessment of problem-solving skills and exceeding the minimum skill levels. This new program, TAAS, was implemented in 1990. The TAAS testing program required that students attain higher levels of academic achievement. TAAS assessed higher-order thinking skills and problem-solving in math, reading, and writing for Grades 3, 5, 7, and 9 and the Grade 11 exit-level assessment. In 1993, the legislature created a new statewide accountability system that included the rating of campuses and districts.

Then in 1999, under another new law, students in Grades 3 (reading), 5, and 8 (reading and math) were required to demonstrate proficiency on a new state assessment test, and achieve passing grades to advance to the next grade level. This new test was called the Texas Assessment of Knowledge and Skills (TAKS). At the 11th-grade level, students were required to pass the TAKS to receive a high school diploma upon graduation. The test required passing scores in reading, writing, math, science, and social studies.

The current standardized test is the TAKS test that is used in Texas primary and secondary public schools to assess student skills in multiple subject areas (Table 1). The Texas Education Agency (TEA), Pearson Education Inc., and Texas educators collaboratively create the TAKS test, which is based on the state-mandated curriculum, the Texas Essential Knowledge and Skills (TEKS). High school seniors must pass the exit-level TAKS tests in English language arts, social studies, math, and science to be eligible to graduate. Students are given five chances to pass the test. Some of the tests, such as high-school-level reading and language arts, contain short-answer questions in
addition to the standard multiple-choice questions. For each test, a scaled score of 2100 is required to pass. To earn commended status, a score of 2400 is required.

In the spring of 2007, Texas legislators repealed TAKS in favor of End of Course (EOC) exams in high school to be phased in over time. The first class to take the EOC exams will be the freshman class of 2011–2012.

Table 1
*TAKS Test Subjects by Grade Level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>ELA</th>
<th>Reading</th>
<th>Writing</th>
<th>Math</th>
<th>Science</th>
<th>Social Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Grade 4</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Grade 5</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Grade 6</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Grade 7</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Grade 8</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Grade 9</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Grade 10</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Exit Level</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

✔=tested

The report mechanism that collects the TAKS data also collects a significant
amount of other information useful in determining students’ performance. This system, known as the Academic Excellence Indicator System (AEIS), is annually updated with new information based on TAKS results, the alternative assessment, progress of students who previously failed the TAKS, and many more performance indicators. The AEIS system was a product of Texas House Bill 72 in 1984. The Texas Legislature looked for a system to emphasize student achievement as a means for accountability of the Texas education system. Table 2 highlights the information collected in the AEIS.

Many different tools have been introduced and implemented in an effort to improve education achievement. A number of these tools have involved what is described as educational technology. Roblyer and Edwards (2000) defined educational technology as “a combination of the processes and tools involved in addressing educational needs and problems, with an emphasis on applying the most current tools: computers and their related technologies” (p. 6).

Rodney (2002) reported that educational technology was a conduit between the learner and the teacher to help meet the stated educational goals and needs of all parties in the educational process. Rodney stated that educational technology could create an interdependent relationship that would result in improved learning and performance. Figure 1 depicts this researcher’s adaptation of Rodney’s perception of the interdependence on educational technology. This interdependent relationship was also echoed by Fullan and Hargraves (1996) as the researchers argued that relationships were critical in creating and maintaining a learning environment for the future.
Table 2  
*A Brief Description of the AEIS System*

The Academic Excellence Indicator System (AEIS) pulls together a wide range of information on the performance of students in each school and district in Texas every year. This information is put into the annual AEIS reports, which are available each year in the fall. The performance indicators are as follows:

- Results of Texas Assessment of Knowledge and Skills (TAKS*); by grade, by subject, and by all grades tested;
- Results of State-Developed Alternative Assessment II (SDAA II);
- Participation in the statewide assessment programs (TAKS/SDAA II/TAKS-I/TAKS-Alt);
- Exit-level TAKS Cumulative Passing Rates;
- Progress of Prior Year TAKS Failers;
- Results of Student Success Initiative;
- Results of Texas Assessment of Knowledge and Skills-Inclusive (TAKS-I); by subject;
- Progress of English Language Learners (ELL);
- Performance-Based Monitoring (PBM) Special Education Monitoring Results Status;
- Attendance Rates;
- Annual Dropout Rates (grades 7-8, grades 7-12, and grades 9-12);
- Completion Rates (4-year longitudinal);
- College Readiness Indicators;
  - Completion of Advanced / Dual Enrollment Courses;
  - Completion of the Recommended High School Program or Distinguished Achievement Program;
  - Participation and Performance on Advanced Placement (AP) and International Baccalaureate (IB) Examinations;
  - College-Ready Graduates;
  - Texas Success Initiative (TSI) – Higher Education Readiness Component; and
  - Participation and Performance on the College Admissions Tests (SAT I and ACT).

Performance on each of these indicators is shown disaggregated by ethnicity, sex, special education, low-income status, limited English proficient status (since 2002-03), and, beginning in 2003-04, at-risk status (district only). The reports also provide extensive information on school and district staff, finances, programs, and student demographics.

* The TAKS (Texas Assessment of Knowledge and Skills) replaced the TAAS (Texas Assessment of Academic Skills) in the 2002-03 school year as the state-administered assessment. AEIS reports before 2002-03 show performance on the TAAS test.

Source Information: TEA Web site
One such educational technology that has been involved in schools for more than a century is the use of film and multimedia in the classroom. Film was first introduced in schools nearly a century ago as a means to inspire students and add reality to the curriculum. In the early 1900s, Rochester, New York (home of the Eastman Kodak film and camera company), led the utilization of film in public schools. Technological innovations have rapidly changed the use of video in the educational sector from film to videotape and videodisk to digital desktop video to multimedia to CD-ROM and even Web-based media.

Educators frequently use educational media in instructional settings. Educators considering the use of educational media must consider the various characteristics of the media and instructional goals. The typology of the media being used also helped researchers develop a framework for analyzing the use of media. Table 3 presents a typology of the use of educational media. The typology includes major features associated with the use of the media in the classroom.

In 1977, DCS began program development of numerous tools designed to support...
instruction in the classroom. Initially, reel-to-reel films and videos were available to local schools and delivered via van transport.

Table 3
*A Typology of the Use of Educational Media*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Audience</td>
<td>Individual/group/or both</td>
</tr>
<tr>
<td>2 Location</td>
<td>Learners are in the same location or different location synchronous/asynchronous</td>
</tr>
<tr>
<td>3 Time</td>
<td></td>
</tr>
<tr>
<td>4 Information display</td>
<td>Text, audio, graphic, 3D animation</td>
</tr>
<tr>
<td>5 Information extension</td>
<td>Does the information in the media allow future extension?</td>
</tr>
<tr>
<td>6 Information updating</td>
<td>Does the information in the media keep updating?</td>
</tr>
<tr>
<td>7 Content structure</td>
<td>Does the content in the media display clear structure about the knowledge being taught?</td>
</tr>
<tr>
<td>8 Content Flexibility</td>
<td>Does the content in the media allow teachers’ or learners’ flexibility about the knowledge being taught?</td>
</tr>
<tr>
<td>9 Interactivity with instructional content or with ‘virtual’ instructor in the media</td>
<td>Do the media allow content-learner interaction?</td>
</tr>
<tr>
<td>10 Interactivity with other learners</td>
<td>Do the media allow learner-learner interaction?</td>
</tr>
<tr>
<td>11 Production cost</td>
<td>High/low</td>
</tr>
<tr>
<td>12 Cost of use</td>
<td>High/low</td>
</tr>
<tr>
<td>13 Teacher’s training</td>
<td>Does the use of the media require teacher’s relevant training in advance?</td>
</tr>
<tr>
<td>14 Student’s training</td>
<td>Does the use of the media require student’s relevant training in advance?</td>
</tr>
</tbody>
</table>


DCS next added an interactive virtual expedition (IVE). An IVE enables learners
of all ages to experience and interact with a virtual field trip, in real or near real time from a distant location. IVE provides a unique insight into the very nature of discovery. Students are linked via technology to the field trip, where they have the ability to ask questions, interact, and become more engaged in the discovery process without ever leaving the school building. Participants include students and other educators from multiple classes across the United States. Questions submitted by the students range in theme from specific questions about the IVE to questions requiring higher-level thinking skills.

Since 2002, DCS personnel have taken advantage of technological advancements and now deliver requested media products to local campuses via Power Videos (PV), a copyright-protected product designed by DCS programmers. The product is composed of more than 1,200 educational videos, all of which have been aligned to the state-mandated TEKS curriculum. The videos are delivered digitally to classrooms throughout Dallas County. DCS offers two types of technologies to access the media. Videos can be either streamed or downloaded for viewing. The terms film, media, and video are used interchangeably throughout this study.

Video streaming is delivered via a sequence of moving images that are sent from compressed files over the Internet. The streaming takes place without the need to wait for the entire file to be transmitted to the desktop. Instead, the file is sent in a continuous stream to the desktop and played as the file is streamed. The end user must have a media player that decompresses the data.

To play correctly, the video needs to run uninterrupted or without significant pauses. Streaming technologies buffer in the computer’s memory the files to be played.
As soon as the computer has a sufficient amount of the file buffered, the computer begins to stream the media. The video file is not permanently stored in the computer files. Poorly performing networks or a lack of sufficient bandwidth provides a poor learning experience. Figure 2 denotes a typical streaming arrangement as noted by Vanbuel, Bijnens, and Bijnens (2004).

Since bandwidth can become an issue with streaming, some teachers download the media. Downloading the PV allows teachers to store the video permanently on the computer’s hard drive in accordance with a digital rights management system to ensure compliance with copyright laws. Many videos have also been subdivided into 3- to 5-minute clips for teachers to use in their classrooms for better time management. Some schools have electronically linked PV to online curriculums.

Learning strategies for video-based instruction have been categorized into three types: (a) passive watching, (b) learning/practicing while watching, and (c) learning/practicing after watching (DeMartino, 2001). In the passive-watching strategy, students were not involved in any discussion or hands-on learning activities. According to Schluger, Hayes, Turino, Fishman, and Fox (1987), the passive watching strategy generally resulted in poor long-term learning outcomes. The learning/practicing-while-watching strategy occurred when students paused, stopped, forwarded, or rewound video with the requirement of some form of discussion or hands-on activities with other students. DeMartino’s learning/practicing-after-watching strategy involved a discussion or hands-on activity first, followed by a video that provided an opportunity to reinforce the concept learned.
Figure 2. Typical media streaming arrangement.

Step 1: User connects to the Power Video streaming server.

Step 2: User (Client) requests streaming media from the server.

Step 3: Streaming server acknowledges login credentials and prepares for transmission.
Figure 2. Typical media streaming arrangement (continued).

Step 4: Streaming server begins transmission of the media.

Step 5: Buffer fills up as media segments reach the client.

Step 6: Streaming client displays media as the server sends additional media segments.
Statement of the Problem

There is constantly a shortage of financial resources for education. The dollar crunch requires scrutiny of products and programs before additional monies are spent. DCS administrators need data that will inform the leadership how to best allocate these scarce financial resources. In this study, the researcher analyzed data to assist administrators in prioritizing investments. That is, are monies best targeted in select PV product subject areas that have a positive statistical correlation to student achievement, or are resources better used to support other products? The results of this study provide essential data for DCS leadership to make clearer decisions.

Purpose of the Study

The purpose of this study was to obtain valid and reliable information to allow school administrators to make informed decisions regarding data management, student achievement, and budget requirements. What are the relationships between the use of PV in elementary classrooms and student achievement as measured by the TAKS test? For the purposes of this study, TAKS scores were obtained from the TEA Web site’s AEIS reports. The researcher examined the relationship (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in the areas of reading, math, science, and all tests.

The null hypothesis underlying this nonexperimental quantitative study is $H_0 = \mu = 0$, indicating that the results are due to chance such that there is no patterned influence of the use of PV in the classroom on student achievement. The alternative hypothesis can be stated as $H_A = \mu \neq 0$ and that the results are not due to chance.
There are conflicting research studies and theories (as well as opinion) on the merits of media use in the classroom. The PV study will add to research data that either confirm or refute the conflicting research.

Research Questions

Question 1. What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in reading?

Question 2. What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in math?

Question 3. What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in science?

Question 4. What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in all tests?

Significance of the Study

Texas politicians (e.g., legislators), parents, and others continue to strongly emphasize student achievement. There is significant pressure from the community, state leaders, and the media to justify the investment of tax dollars in schools. The mechanism used to determine success in the schools is student performance on the state-mandated
TAKS test. Results from this study will be combined with outcomes of other studies regarding the efficacy of digital educational product in the classroom. Prior researchers reached widely varying conclusions. This study will add to the existing research to assist in determining relationships between digital educational product usage in the classroom and student achievement. This study may also serve to extend the knowledge-building and reasoning processes identified by English, Nason, and Duncan-Howell (2007). English et al. noted that interactive digital media (IDM) have been used to gain greater depth in learning that could result in measurable differences in student achievement. The results will also be a tool for DCS administration to use in evaluating the expenditure of tax dollars on PV to improve academic achievement.

Design and Methods of the Study

This research was a nonexperimental, correlational, quantitative, and evaluative study. Nonexperimental research is an important education research tool. Some researchers suggest that nonexperimental research might be more important than experimental research. Kerlinger (1986) noted that most education research problems do not lend themselves to experimental research. Johnson (2001) noted that education researchers are often in situations where neither experimental nor quasi-experimental methods are feasible.

The methods included collection of quantitative data for the 2006–2007 school year regarding TAKS performance from the TEA Web site, which publishes accountability ratings and test scores for students in public school districts in Texas. Data for PV usage were collected from standard reports generated by DCS and available on the
DCS Web site. All documents existed in the public domain, and none contained data identifying individual students. Of the population of 373 elementary public school campuses served by DCS, a sample was derived using a random number generator to identify K–6 schools to be included in the sample for this study. The sample size was determined using a computerized sample size calculator. The model was taken from the MedCalc Sample Size Calculator. With the alpha level set at 0.05 and the beta level at 0.10 and a presumed correlation coefficient of 0.40, the minimal sample size was calculated to be 61, as noted in Figure 3.

Sampling from the population of 373 schools continued until 61 campuses had been identified that met the criteria regarding exclusion of specialty schools, socioeconomic status (SES), limited English proficiency (LEP), and class size. Sample size is one of several quality characteristics of a statistical study that this researcher focused on for a quality study.

![MedCalc sample size calculation](image)

*Figure 3. MedCalc sample size calculation.*
Delimitations of the Study

The researcher did not examine how individual teachers use PV. Specialty schools, such as schools for gifted and talented youths and dedicated disciplinary/juvenile justice centers, were excluded from the study. Exclusion of these specialty schools served as a control for the misleading effect that outliers can have in a correlational study. Restricting the range of the variables of SES, language, and class size was also a delimitation as the range of these three variables was defined to narrow the rival explanations possible. These confounding variables were limited by controls imposed by the researcher. To control for SES, the researcher included only those campuses where the percentage of economically disadvantaged students fell within ± one (1) standard deviation of the State of Texas mean for economically disadvantaged students for major urban areas as reported in the AEIS database. Major urban areas were defined as the largest school districts in the state that serve the seven metropolitan areas of Houston, Dallas, San Antonio, Fort Worth, Austin, El Paso, and McAllen. To limit confounding effects for LEP, this researcher included only those campuses where ≥50% of students are proficient in English as identified in the State of Texas AEIS reports. The delimitation for class size was controlled by including in the study only those campuses where average class size is within ± one standard deviation of the average class size for elementary schools in major urban areas as defined by the AEIS report. Additional delimitations were as follows: (a) male-to-female ratio of teachers or students and (b) student special needs classification.

Additionally, if, during the sampling procedure, the researcher found that either SES, LEP, or class size controls had created a scenario where ≥70% of the population
was excluded following use of the control strategies, then that control was released. Any control that eliminated 70% of the total population threatened to skew the sample and would likely yield a nonrepresentative sample of the actual population.

Another delimitation at the time of the present study was that training was not required before Power Video use.

**Limitations of the Study**

Limitations are associated with this nonexperimental evaluative research study. In the analysis, the researcher considered only the percentage of the total teacher population on a campus that had either downloaded or streamed a PV product into the classroom, and did not examine the impact of PV at the individual student level. Given longstanding research documenting dramatic differences in individual student learning styles (e.g., Grimley, 2007; Moallem, 2007), the use of aggregated data may mask some value of PV use for either an individual student or select subgroups of students.

Differences in grouping of students into particular classrooms, levels, and difficulty of the classes using PV were also limitations. Although the statistical analysis was not conducted to demonstrate if the use of PV resulted in a change in student achievement, the strength of the relationship would provide school district leadership with information needed to analyze and justify monies spent on the program.

Another limitation of the study involved a limitation of the literature. Not all of the research in the review included effect size calculations. This limited the researcher’s ability to determine the strength of the effects produced for those studies. This study also had a similar limitation as there was no control group appropriate for use in computing
effect sizes.

Potential teacher selection bias was also a limitation. Teachers who downloaded Power Videos could have been more skilled, more interested in using technology, or more motivated.

Another limitation is that the all-test section of the TAKS test includes areas of reading, math, and science that have previously been reported separately.

Assumptions Made for This Study

The following assumptions were made in this study: (a) Students’ scores on the TAKS test reflect the amount of student achievement, (b) higher use of PV on a campus is indicated by a higher percentage of instructional staff streaming or downloading the PV product, and (c) streaming or downloading of PV on a campus indicates usage of PV in the classroom.

Definitions

The terms used in this study are defined to ensure consistency in interpretation of the language used.

Bandwidth. The amount of data per second that can be delivered to a computer. A 56K modem has a bandwidth of 56 kilobits/second. The term bandwidth is also used in conjunction with data rate when discussing video.

Campus usage. This is the percentage of credentialed instructional staff who use the DCS digital delivery program, Power Videos.

Capturing. This is the process of saving video from an external source to a hard
drive. Analogue video is converted to digital.

*Computer-assisted instruction (CAI).* This refers to a program of instructional material presented by means of a computer or computer systems. This may include drill and practice, tutorials, games, simulation, discovery, or problem solving. This may take the form of software, media products, or interactive learning. Modern technologies have added to these hypertext, hypermedia, and multimedia. Also, this may be referred to as computer-assisted learning (CAL) or computer-based instruction (CBI).

*Digital.* Information represented as discrete numeric values, e.g., in binary format (zeros or ones), as opposed to information in continuous or analogue form. Binary digits (bits) are typically grouped into words of various lengths; 8-bit words are called bytes.

*Digital educational videos.* These are defined as the Power Videos product provided by DCS.

*Digital Rights Management (DRM).* Digital media files can be easily copied and distributed, without any reduction in quality. Digital media files are now distributed widely on the Internet, through authorized and unauthorized distribution channels. Piracy is a concern when security measures are not in place to protect content. Digital Rights Management (DRM) enables content providers to protect their content and maintain control over distribution. Content providers can protect and manage their rights by creating licenses for each digital media file. Consumers are also able to access higher-quality digital media content on the Internet because content providers using DRM are more willing to make such content more widely available. Windows Media DRM is one of the systems that provides end-to-end DRM offering content providers and retailers a flexible platform for the secure distribution of digital media files.
**Digital Video (DV).** A video signal stored in binary format. To process and store video on a computer, the video must first be converted to a binary format. Most digital video cameras are capable of outputting video directly to a hard drive in this format via the IEEE 1394 interface. DV is a good format to input into a compression and editing application, but the file sizes are too large for effective delivery over the Internet without large bandwidth.

**Download.** This term means to move a digital file (such as a media file) from a server where the file is stored to a local system for viewing or editing.

**Effect Size.** This is a measure of the strength of the relationship between two variables.

**Grade equivalent score.** This is a score reported on norm-referenced tests that allows educators and parents to compare students based on the performance of other students relative to the school year.

**Media.** The term media is used throughout this study interchangeably with videos.

**Meta-analysis.** Meta-analysis is a statistical procedure that allows researchers to synthesize the results of numerous research studies comparing different treatments.

**Multimedia.** The term multimedia is used throughout this study interchangeably with videos.

**On demand.** This term refers to the ability to request at any moment video, audio, or information to be sent to the screen immediately by clicking on the appropriate position on the screen.

**Player.** Software running on the client to view a stream.

**Power Videos.** Power Videos is a DCS developed program using multiple
vendors’ videos delivered to the desktop. A Power Video may be viewed on multiple platforms, such as on individual computers or via a single room projection by the teacher. See Appendix A.

Reliable data. Reliability is the consistency of a measurement, or the degree to which an instrument measures the same way each time the instrument is used under the same conditions. It is sometimes called the repeatability of a measurement.

Streaming. Video or audio transmitted over a network that users can begin to play immediately instead of waiting for the entire file to download. Typically, a few seconds of data are sent ahead and buffered in case of network transmission delays (although some data are buffered to the hard drive, the data are written to temporary storage and are gone once viewing is complete).

Student achievement. Achievement is defined by results on the Texas state required test, the TAKS.

Type I error. Alpha: the probability of making a Type I error (α-level, two sided), i.e., the probability of rejecting the null hypothesis when in fact it is true.

Type II error. Beta: the probability of making a Type II error (β-level), i.e., the probability of accepting the null hypothesis when in fact it is false.

Valid data. Cook and Campbell (1979) defined this term as the “best available approximation to the truth or falsity of a given inference, proposition or conclusion.”

VOD (video-on-demand). VOD is prerecorded video stored on a server for access at the user’s convenience. Power Videos is an example of a program that can provide VOD.
Summary of Chapter 1 and Organization of the Study

Chapter 1 provided background information regarding the use of digital media in the classroom to support student learning and student achievement. This chapter included the problem statement, background information about the study, the research questions, the significance of the study, assumptions, delimitations and limitations of the study, and identification of the design and methods.

Chapter 2 provides a review of pertinent research and literature that deal with the use of media in the classroom to support student learning and achievement. This literature review discusses the use of media, factors that influence its usage, its effectiveness, and student achievement results when used in the classroom. This chapter also provides a basis for the theoretical framework for the study.

Chapter 3 presents the design and methodology of the study. This chapter highlights the procedures for collecting and analyzing the data. It denotes specific steps taken to compile the data.

Chapter 4 presents the data with the analysis that has been conducted. Data from the TEA Web site and standard reports from the DCS Power Videos program are used in the analysis.

Chapter 5 includes the summary of findings from the data analysis in chapter 4. This chapter also includes conclusions related to the findings of the study. Chapter 5 concludes with recommendations for practices and policies and future research regarding the use of media in the classroom.
Chapter 2:

Review of Research, Theory, and Literature

Introduction

The U.S. Department of Education’s National Center for Education Statistics has produced a number of issue briefs and reports concerning the use of technology and media in the classroom. Many of these briefs evaluate teacher perceptions of how these tools are best used in the classroom but do not address any effect on achievement. The researcher’s review in this study focused on studies more closely related to student achievement.

Desktop video, multimedia, virtual reality, and a number of other technologies will be used to teach K–12 students in the future (Holden & Holmes, 1995). As noted by Mayer (1997, p. 4), “At this time, the technology for multimedia education is developing at a faster pace than the corresponding science of how people learn in multimedia environments.” Mayer’s comments direct researchers to try and understand how people learn in the multimedia environment. Many educators understand the powerful impact of visual learning. One reason teachers use videos in classroom instruction is because they help explore meanings beyond the superficial and allow multiple teaching techniques to meet students’ learning needs (Aiex, 1999).

A number of research studies regarding educational technology’s effect on student achievement found that educational technology had a positive effect on student achievement. Researchers must measure the effectiveness of educational technology on achievement. Numerous studies have compared the effectiveness based on an analysis of
an effect size comparison. Effect size is a measure of the strength of the relationship between two variables, such as the use of the technology and student achievement. Many researchers have analyzed multiple studies and made effect size comparisons. Kulik and Kulik (1991) noted that a moderate but significant effect size for educational technology is between 0.3 and 0.4.

Koechel (1970) studied the effects of visual teaching, specifically concept videos, in multiple chemistry classes. The researcher found that students were more engaged in the topic when video was used. Test scores were compared by analysis of variance and $F$ tests. The $p$ values converted from the $F$ ratios were transformed into chi-square statistics. The results were significant at the $p \leq 0.05$ level. Koechel found that more involved learners also performed better on assessments.

Thomas and Thomas (1984) noted that videos are a dense medium and an appropriate choice when large amounts of information are to be disseminated in a short time. The researchers suggested pre-, post-, and progress testing to validate that the objectives are being achieved. Other researchers have noted positive attributes of the use of media.

Cowen (1984) concluded that video was important for representing character-driven stories. The researcher established the equivalence of text and video versions of short vignettes depicting a main character. The study found that the video version led to better recall of story details than the text version. The study also included text information followed by conflicting video information (and vice versa). The results indicated that participants were more positively influenced by the video version in their recall than the text version.
Niemiec and Walberg (1987) reported an average effect size of 0.42 in their meta-analysis of 16 studies. Of these 16 studies reviewed, 11 were meta-analytic reviews that discussed the relationships between the use of technology, such as media, and achievement. Table 4 highlights the findings with specific effect size and percentile gains found. The results showed a moderate effect, with students using the technology scoring at the 66th percentile on achievement tests compared to students in the control group who scored at the 50th percentile. The researchers also noted that achievement may be related to instructional level. Niemiec and Walberg found effect size student gains were the highest at the elementary school level (.46) and lowest at the college/university level (.26), with the high school level between the two (.32).

Riskin (1990) used interactive media in a sociology course. The researcher concluded that the use of media promoted creative thinking and assisted in transforming the new information into learning. Riskin’s research also tied the new information to past knowledge (memory) for learning to occur.

Fletcher (1990) also conducted a meta-analysis of interactive videodisc instruction. The analysis was composed of 28 studies that compared the effectiveness of videodisc instruction to traditional classroom instruction. Average effect sizes were calculated using control group standard deviations. The researcher reported moderate positive effect sizes for knowledge (.36) and performance (.33). Fletcher also reported that the time to complete tasks compared to traditional instruction was a large effect size at 1.19.

Information that is presented visually is more powerful and easier to recall than information that is presented verbally according to Egan, Welch, Page, and
Table 4
Findings from Eleven Meta-analyses (1978–1985)

<table>
<thead>
<tr>
<th>Researchers</th>
<th>Instructional level</th>
<th>Number of studies</th>
<th>Effect size</th>
<th>Percentile gain over control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangert-Drowns et al. (1985)</td>
<td>Secondary</td>
<td>42</td>
<td>.42</td>
<td>16</td>
</tr>
<tr>
<td>Hartley (1978)</td>
<td>Elementary, secondary</td>
<td>33</td>
<td>.42</td>
<td>16</td>
</tr>
<tr>
<td>Kulik &amp; Kulik (1985)</td>
<td>College</td>
<td>101</td>
<td>.26</td>
<td>10</td>
</tr>
<tr>
<td>Kulik et al. (1985)</td>
<td>Elementary</td>
<td>28</td>
<td>.47</td>
<td>18</td>
</tr>
<tr>
<td>Kulik et al. (1984)</td>
<td>Adult</td>
<td>24</td>
<td>.42</td>
<td>16</td>
</tr>
<tr>
<td>Niemiec et al. (1984)</td>
<td>Elementary</td>
<td>48</td>
<td>.45</td>
<td>17</td>
</tr>
<tr>
<td>Samson et al. (1985)</td>
<td>Secondary</td>
<td>42</td>
<td>.32</td>
<td>13</td>
</tr>
<tr>
<td>Schmidt et al. (1985-86)</td>
<td>Special education</td>
<td>26</td>
<td>.56</td>
<td>21</td>
</tr>
</tbody>
</table>

Source Information: Niemiec and Walberg (1987)

Sebastian (1992). The researchers used a Likert-type scale in which students measured the quality of course features such as organization, content clarity, instructor’s delivery, and course difficulty. Significant differences were established between selected variables. Similarly, Cronin and Cronin (1992) found improved content comprehension when video was used. The researchers stated that “[i]nteractive video instruction allows learners to link specific visual images with specific text or graphic information” (p. 38). The researchers further noted that if the video activity was well designed, the learner reacted and interacted, which resulted in increased learning.

Bain, Houghton, Sah, and Carroll (1992) investigated the differences in achievement between three different types of instruction. The researchers compared achievement among an interactive video session, a linear video session, and a nonvideo
session. Statistically significant differences were found between the video session and the other two sessions on student achievement. The researchers concluded that video had a positive effect on student achievement.

Another area in the literature in which the positive effects of technology in learning have been noted is the affective domain. A number of researchers (Cotton, 1992; Rowe, 1993; Sivin-Kachala & Bialo, 1996) found a positive relationship between educational technology and the development of positive attitudes and improved self-esteem. The development of these traits influence learning in schools. Cotton (1992) found in schools that had integrated technology into the classroom a higher level of self-efficacy, better attendance, fewer behavioral problems, and more time on task. Sivin-Kachala and Bialo (1996) found that the technology-rich environment made learning more student centered. The researchers also found more cooperative learning and higher student/teacher interactions. Each of these led to improved student performance.

Kulik (1994) summarized a large number of meta-analyses from the 1980s. In the 97 studies reviewed, the analysis investigated effect sizes based on five different uses of media for instruction. The uses included tutoring, managing, simulation, enrichment, and programming. The researcher observed that students learned more in courses involving computer-based instruction. He also noted students who used technological support acquired information at a more rapid rate. Kulik argued that this type of instruction, which employed advanced technology, yielded marked improvement and was effective in improving student achievement. The studies reviewed in the meta-analyses targeted elementary, middle, and high school students in math, science, language arts, and social studies. The overall effect size for the tutoring group was moderate at 0.36. The effect
size for the other groups was 0.14 or below.

Kulik also conducted a meta-analysis of 12 meta-studies based on 546 individual studies (Table 5). The researcher reported average effect sizes ranging from 0.25 to 0.57. This equated to a 10- to 22-percentile gain over the control group, which performed at the 50th percentile. In addition, Kulik reported that students learned more in less time, and that they liked their classes more. The results had positive effects in every area. Table 4 depicts how achievement varied with educational level. At the elementary school level, the effect sizes were greater, 0.37 to 0.40 (14- and 16-percentile gain), while at the secondary and college levels, the effect sizes were smaller, 0.25 and 0.29, respectively.

Learning with visual representations is also especially important for difficult concepts that frequently need additional clarification (Wetzel, Radtke, & Stern, 1994). The Wetzel et al. study indicated a general learning benefit compared to using only audio. The study focused on how the material was delivered, simultaneous or sequential, and when audio narration should precede the video images.

Johnson, Cox, and Watson (1994) conducted the ImpacT study with 2,300 students from 87 classrooms in primary and secondary schools in England and Wales. The study evaluated teachers’ practices, schools’ policies, and resources related to student achievement. This national research project used multiple quasi-experimental designs and then computed an overall effect size from 24 separate studies. Johnson et al. determined that high levels of instructional technology improved academic achievement in the four content areas of math, science, geography, and English. The results showed that there were small but statistically significant academic achievement effect sizes for those with high computer use. These effects ranged from a low of 0.08 in English to a
Table 5
*Kulik's Findings from Twelve Meta-analyses*

<table>
<thead>
<tr>
<th>Meta-analysis</th>
<th>Instructional level</th>
<th>Number of studies analyzed</th>
<th>Average effect size</th>
<th>Percentile gain over control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangert-Drowns, J. Kulik, &amp; C. Kulik (1985)</td>
<td>Secondary</td>
<td>51</td>
<td>.25</td>
<td>10</td>
</tr>
<tr>
<td>Burns &amp; Bozeman (1981)</td>
<td>Elementary and secondary school</td>
<td>44</td>
<td>.36</td>
<td>14</td>
</tr>
<tr>
<td>Cohen &amp; Dacanay (1991)</td>
<td>Health professions education</td>
<td>38</td>
<td>.46</td>
<td>18</td>
</tr>
<tr>
<td>Fletcher (1990)</td>
<td>Higher education and adult training</td>
<td>28</td>
<td>.50</td>
<td>19</td>
</tr>
<tr>
<td>Hartley (1978)</td>
<td>Elementary and secondary math</td>
<td>33</td>
<td>.41</td>
<td>16</td>
</tr>
<tr>
<td>C. Kulik &amp; J. Kulik (1986)</td>
<td>College</td>
<td>119</td>
<td>.29</td>
<td>11</td>
</tr>
<tr>
<td>C. Kulik &amp; J. Kulik, &amp; Shwalb (1986)</td>
<td>Adult education</td>
<td>30</td>
<td>.38</td>
<td>15</td>
</tr>
<tr>
<td>J. Kulik, C. Kulik, &amp; Bangert-Drowns (1985)</td>
<td>Elementary</td>
<td>44</td>
<td>.40</td>
<td>16</td>
</tr>
<tr>
<td>Niemiec &amp; Walbert (1985)</td>
<td>Elementary</td>
<td>48</td>
<td>.37</td>
<td>14</td>
</tr>
<tr>
<td>Roblyer (1988)</td>
<td>Elementary to adult education</td>
<td>82</td>
<td>.31</td>
<td>12</td>
</tr>
<tr>
<td>Schmidt, Weinstein, Niemiec, &amp; Walberg (1985)</td>
<td>Special education</td>
<td>18</td>
<td>.57</td>
<td>22</td>
</tr>
<tr>
<td>Willett, Yamashita, &amp; Anderson (1983)</td>
<td>Precollege science</td>
<td>11</td>
<td>.22</td>
<td>9</td>
</tr>
</tbody>
</table>

Source Information: Kulik (1994)

High of 0.31 in mathematics. The two other content areas of geography and science had small but significant effect sizes of 0.25 and 0.21, respectively.

Large, Beheshti, Breuleux, and Renaud (1995) studied 71 sixth-grade students to determine the effect of multimedia on children's learning and achievement. The sample
was composed of approximately equal numbers of males and females. The researchers had students view text that included animation on how to find direction. The researchers found that both recall and the following of procedural steps were statistically significantly higher in the group viewing the video. The differences were significant at $F(3,67) = 6.020, p \leq .001$.

Fletcher-Flinn and Gravatt (1995) examined 120 individual studies that reviewed the effect of a number of variables related to educational level, course content, duration, and student characteristics. The mean effect size was 0.24 for 1987–1992. In these studies, no significant differences were found in effect size between the different educational levels, as has been previously noted by Kulik. Also noted in the results was that effect size did not differ with computer-assisted instruction (CAI) type. There were differences, though, in achievement depending on the course subject. The highest gains were in mathematics, with a 0.32 effect size. The lowest gains were in reading and writing. The researchers' results are summarized in Table 6.

Researchers have noted that specific demographic and subject groups can be positively influenced by the use of media. Studies, such as those by Green (1995), noted that classroom teachers can help language minority students comprehend subjects by practicing, as the Intercultural Development Research Association (IDRA) suggested, using filmstrips, video, and audio cassettes in conjunction with approved texts.

Roberts, Cowen, and MacDonald (1996) reviewed film and text versions of the short story “The Soap-Box Derby.” The researchers found that the video version of the story provided students with better recall compared to students who experienced only the text versions of the story. The researchers also noted that the video led to better recall of
secondary information. The study supported higher achievement by students with video compared to text versions only.

Mann and Shafer (1997) studied five New York counties and found that in schools with high levels of instructional technology and teacher training an average of 7.5% more high school students took and passed the state college preparatory exam in math. In English, the average was 8.8% more students taking the exam. The researchers also noted that 42% of the variation in math scores and 12% of the variation in English scores could be explained by the addition of technology in the school.

Another study in chemistry conducted by Harwood and McMahon (1997) included 450 students in Grades 9 through 12 across 18 classrooms in a metropolitan area on the East Coast. This study reviewed not only academic achievement but also students' attitudes in chemistry for students using a structured chemistry video series. Four instruments were used to assess results: the High School Studies Test (a 40-minute norm referenced standardized test), the High School Chemistry Student Opinion Survey (Heikkinen, 1973) (a 20-question Likert-scaled attitude survey), microunit quizzes created by the researchers, and the Test of Logical Thinking (TOLT) (a 20-minute paper-and-pen assessment). The results of the repeated analysis of variance measures proved a statistically significant difference in the comprehensive achievement of the students using the video series at $p \leq .01$.

Christmann, Badgett, and Lucking (1997) analyzed student achievement during a 12-year period (1984 to 1995) of secondary students across multiple academic areas with and without computers in the instructional environment. The researchers found an effect
Table 6
Mean Effect Sizes and Percentile Gains for Nine Study Feature Variables and Other Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number of studies</th>
<th>Effect size</th>
<th>Percentile gain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Study feature variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preschool/Kindergarten</td>
<td>6</td>
<td>.55</td>
<td>21</td>
</tr>
<tr>
<td>Elementary (Grades 1-6)</td>
<td>27</td>
<td>.26</td>
<td>10</td>
</tr>
<tr>
<td>Secondary (Grades 7-12)</td>
<td>20</td>
<td>.20</td>
<td>8</td>
</tr>
<tr>
<td>Tertiary (college/university)</td>
<td>48</td>
<td>.20</td>
<td>8</td>
</tr>
<tr>
<td>Special education</td>
<td>10</td>
<td>.32</td>
<td>13</td>
</tr>
<tr>
<td>Adult training</td>
<td>9</td>
<td>.22</td>
<td>9</td>
</tr>
<tr>
<td>Course content</td>
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<tr>
<td>Mathematics</td>
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<td>Reading/writing</td>
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<td>.12</td>
<td>5</td>
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<td>Science/medicine</td>
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<td>9</td>
</tr>
<tr>
<td>Year</td>
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<td></td>
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<td>1987</td>
<td>17</td>
<td>.06</td>
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<td>1988</td>
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<td>1990</td>
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<td>CAI type</td>
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<tr>
<td>Drill and practice/tutorial</td>
<td>46</td>
<td>.23</td>
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<tr>
<td>Simulation/thinking activities</td>
<td>25</td>
<td>.25</td>
<td>10</td>
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<td>Word processing</td>
<td>24</td>
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<td>Duration</td>
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<td>Less or equal to 4 weeks</td>
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<tr>
<td>Greater than 4 weeks</td>
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<td>.27</td>
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<td>Same teacher</td>
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<td>.23</td>
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<tr>
<td>Different teacher</td>
<td>36</td>
<td>.30</td>
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<td>Not categorized</td>
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<td>.21</td>
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<td>Subject assignment</td>
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<td>Random</td>
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<td>Nonrandom</td>
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<td>10</td>
</tr>
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<td>Repeated-measurements</td>
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<td>.16</td>
<td>6</td>
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<tr>
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<td>.34</td>
<td>13</td>
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<td><strong>II. Other Variables</strong></td>
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<td>Retention</td>
<td>13</td>
<td>.08</td>
<td>3</td>
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<tr>
<td>Attitudes</td>
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<td>Computers</td>
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<td>.07</td>
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<td>Instruction method</td>
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<td>Instruction topic</td>
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<td>Ability</td>
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<td>High</td>
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<td>Gender</td>
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<tr>
<td>Paper version of CAI</td>
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<td>.43</td>
<td>17</td>
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</tbody>
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Source Information: Fletcher-Flinn & Gravatt (1995)
size of 0.19. The students who used the instructional aids had higher achievement than 57% of the students not using the aids. This finding supported Fletch-Flinn and Gravatt’s (1995) reported effect size of 0.20 for studies at the secondary school level from 1987 to 1992 (Table 6).

Other researchers have also identified a number of benefits of educational technology. Wild (1998) noted that the use of multimedia allowed a range of resources such as text, film, sound, graphics, and photographs to be combined effectively into one learning event. The researcher outlined areas of teaching and learning that would be enhanced through the use of technology, such as the PV product. These areas included the following: (a) pedagogy (altering the relationship between teacher and pupil so the teacher becomes more of a facilitator learning with the class), (b) learning environment (helping learning by supporting pupils with learning differences), (c) learning processes (encouraging enquiry-based learning), (d) cognitive modeling (helping pupils relate separate items of knowledge to a broader context), (e) social contexts (modeling and enquiry-based learning creating discussions on related topics), (f) new activities (resources supporting a wide variety of new activities and learning experiences), and (g) child-centered learning (helping pupils work independently or within a group).

The National Center for Research on Literature Teaching and Learning’s project, the Multimedia and Literature Teaching and Learning Project, reviewed attributes of multimedia and developed multimedia applications for literature at the elementary and secondary school levels. Swan and Meskill (1997) found that electronic media “support unique and important forms of meaning making that need to be included into a necessarily broadening view of literature study” (p. 56).
Liao (1998) conducted a meta-analysis comparing achievement of students taught by traditional instructional delivery and students who were taught with hypermedia (including video). The results showed positive influences of the hypermedia method. Liao noted, however, that earlier research (e.g., Bain et al., 1992; Barnes, 1994; Chen, 1993) comparing the effect of increased levels of video support on instruction conflicted with studies by Azevedo, Shaw, and Bret (1995), Barker (1988), and Hess (1994). In the former studies, the researchers concluded that video support yielded positive benefits while in the latter studies the researchers concluded that no such benefits accrued from video support.

Reeves (1998) reviewed the effectiveness of technology and media as tools for educators to aid in the development of higher-order thinking skills. The researcher noted that teachers had to make significant changes in their delivery and management of classroom activities when using media. Teacher-required changes were also noted as a potential hindrance to implementation. Reeves suggested that a constructivist learning environment is most effective in achieving success and positive student achievement. The researcher noted that students learned “from” media and technology and “with” media and technology. Investigators also examined how the media were used. Was there teacher-directed instruction, teacher-centered instruction with media used as a supplement, or total delivered instruction by media? Reeves noted that in this meta-analysis the effectiveness declined as the grade level increased. The effect size for elementary schools was 0.47. In secondary schools, this was reduced to 0.04, and further reduced to 0.03 for colleges and universities. The researcher concluded that media were effective means for conveying instructional content in the classroom.
Wenglinsky (1998) used the National Assessment of Educational Progress (NAEP) data sets to analyze multiple variables and their impact on NAEP math achievement in the fourth and eighth grades. The study consisted of a national sample of 6,277 fourth graders and 7,146 eighth graders. The researcher found that technology use positively affected student achievement. The researcher also noted that other factors, such as teacher preparation, access, and types of use, also affected achievement.

Researchers Chang, Honey, Light, Moeller, and Ross (1998) examined the effects of computer technologies and student achievement in the Union City, New Jersey, school district during a 10-year period. Over the period of the study, between 69 and 135 students participated in the study. Eighth-grade Early Warning Test (EWT) scores improved 53% in reading, 30% in math, and 40% in writing during a 5-year period. Over a 3-year period, ninth-grade EWT scores were 10% higher in reading, 4% higher in mathematics, and 7% higher in writing. The scores were compared to a control group. Chang et al. also found positive results with 10th-grade students on the High School Proficiency Test (HSPT), on which there was an 11% increase in reading and a 14% increase in writing scores over a 2-year period. At the elementary grade levels, the researchers found that first-grade reading scores improved 45% while fourth-grade scores increased by 25%. In mathematics, first-grade achievement scores increased 18%, and fourth-grade scores were 15% higher. The writing scores increased 34% for first graders and 14% for fourth graders during the 1989–1997 time frame. The researchers also called for increases in technology budgets because of the results found in this study.

Clarkson, Dunbar, and Toomey (1999) found that educational technology played an important role in the area of engaging students in the learning process. The researchers
noted that these skills help produce literacy in students. This literacy leads to improved student achievement.

Pisapia et al. (1999) reported on a 3-year initiative regarding effects of computer technologies on a large metropolitan school district of more than 44,000 students. Thirty-four elementary schools participated. The report covered third and sixth grades using the Literacy Testing Program (LTP) and the Cognitive Abilities Test (CogAT). The study investigated before and after affects of computer technologies. Analysis of covariance (ANCOVA) results showed statistically significant differences in verbal, quantitative, reading, math, and writing scores of the students exposed to the technologies at the $p \leq .000$ level.

Herron, Cole, and Corrie (1999) investigated the use of video to teach culture for university students studying Russian. A pretest was administered, and a posttest was given at the end of the semester. Videos were reviewed on multiple occasions during the semester. Also, postvideo viewing tests were given after each video was reviewed. Students gave written feedback on their perceptions of how well they learned from the videos. Repeated ANOVAs were conducted. The researcher noted positive results in cultural knowledge after the students viewed selected specific videos. The posttest scores were statistically higher than the pretest scores at a level of $p \leq .001$.

The U.S. Department of Education funded a research study conducted by Yekovich, Yekovich, and Nagy-Rados (1999) that evaluated the Technology-Rich Authentic Learning Environment (TRALE) project’s impact on students in urban elementary schools in the District of Columbia. The TRALE project was designed to be a framework for the creation of meaningful instruction using technology as a tool in
activities. The researchers found that despite expectations there would be no difference in students’ achievement on standardized test scores for at least 3 years, students’ scores increased significantly in the first year. The vocabulary gain equated to 0.83 years as measured by grade equivalent scores compared to a control group of 0.24. In math, the gains were even more significant, equating to 0.9 years. The study found that language scores increased 0.7 years compared to the control group of 0.07. The study also found that teachers who had high technology implementation in the classroom had average Normal Curve Equivalent (NCE) point gains of 10.9 compared to teachers with low rates of technology implementation of only 1.1 NCE point gains.

Meskill, Mossop and Bates (1999) highlighted the use of electronic media in the classroom to facilitate language and literacy development for English-as-a-Second-Language (ESL) learners. The data for this case study of two ESL classes were derived from extended observations. The researcher found that media helped integrate concrete examples visually, which resulted in greater ability to think and communicate in the target language.

Other literature reviews also suggested that computer technologies had a positive effect on academic achievement. Most of the effect sizes ranged from 0.10 to 0.40. Rarely were strong relationships noted. Christmann and Badgett (1999) found a very small effect size for chemistry (0.08) and biology (0.04). The researchers, however, noted a strong effect size for general science at 0.70. Cavanaugh (1999) found that math had an effect size of 0.76. Cavanaugh also found an effect size for science of 0.07, in contrast to the effect size found by Christmann and Badgett of 0.19. These types of differences may depend on the specific types of media and technology resources being studied.
Soe, Koki, and Chang (2000) conducted a meta-analysis of 17 studies of K-12 students to review the effects of CAI on students reading achievement. The researcher found an effect size of 0.13 for reading achievement. These results also indicated a positive effect on reading achievement with a significance level of $p \leq 0.000$.

A study by White, Easton, and Anderson (2000) examined the use of video by learners in a multimedia language course. In the study, researchers asked students to assess how the learning sources (video, audio, textbook, workbook, and study guide) contributed to the development of language skills. The figures in Table 7 reveal that students used video to acquire listening skills and speaking skills. The researchers found that video was effective in the development of listening and speaking skills, including pronunciation. The researchers also reported that students outlined the advantages of video as high enjoyment and low anxiety. The students described positive language learning and a positive orientation to the course. White et al. noted that “[t]he video replicates situations that the foreign language classroom cannot produce” (p. 174).


Schreibman, Whalen, and Stahmer (2000) investigated the use of video in children with autism. The researchers used a process of video priming, a means to teach
events and possible outcomes to the special needs students, to reduce disruptive behavior. Behaviors addressed included whining, crying, screaming, aggression, pulling, and verbal resistance. Since a number of special needs students are mainstreamed in regular classrooms, the results go beyond the effect on the autistic students. The researchers had students view short videos of specific transitions that the autistic students’ parents had noted indicated repeated behavioral problems. The researchers found that in a few short weeks after viewing the specific situations again and again, the students’ disruptive behavior declined. The researchers found that the implementation of the video priming procedures led to a reduction and in some cases a complete elimination of the disruptive behavior.

Other researchers have studied the impact of multimedia in the classroom for specific subject areas. Xin and Reith (2001) found positive effects for vocabulary and reading comprehension with video use for special needs students in the fourth, fifth, and sixth grades. The researchers conducted pretests, posttests, and follow-up tests. Data analysis from this experiment revealed that video-assisted vocabulary instruction positively impacted student achievement. Specifically, students randomly assigned to the video group had higher word acquisition scores than students who were not in the group. The post hoc one-way analysis of variance (ANOVA) was significant for the video group at $F(1,74) = 4.50, p = .037$. This occurred in one school at each campus over a 6-week period.

Spielvogel et al. (2001) conducted a study of nine locations using information gathered from IBM’s Reinventing Education initiative. The study focused on education reforms that used computer technologies. The study used qualitative and quantitative
methods. The researchers noted that:

Unlike many education reform initiatives, the solutions that directly address
student learning through the provision of new or improved forms of instruction
have had significant positive impact on student achievement in grades 7 through
11 in mathematics, language arts, social studies and science and on the
development of early reading skills. (p. 1)

Wu, Krajcik, and Soloway (2001) conducted a study of 71 11th-grade chemistry
students at a public high school in the Midwest over a 6-week period. The researchers
studied the use of a visualization tool to reinforce learning concepts in chemistry. The
study included 36 males and 35 females. There was a mix of ethnic backgrounds,
socioeconomic status as well as academic abilities. The tools used in this study allowed
students to build molecular models and view different models at the same time. The data
were analyzed using a software program that allowed the researchers to code, analyze,
and display data in real time based on students’ usage. The results of the pretest vs.
posttest paired two-sample $t$ test indicated that students’ understanding of chemical
representations improvement was statistically significant at $p \leq .001$. The effect size was
2.68, indicating that the posttest scores were more than 2.5 standard deviations higher
than the pretest scores.

Blok, Oostdam, Otter, and Overmaat (2002) studied the effectiveness of computer
assisted instruction (CAI) programs with beginning readers. The researchers reviewed 42
studies and found the effect size was 0.19. These findings were similar to the Kulik
(1994) study that also found small but positive effects. The researchers found that if the
results were limited to English-speaking countries, the overall effect size grew to
Waxman, Connell, and Gray (2002) conducted a meta-analysis of 20 quantitative studies to review the effects of teaching and learning with technology on student performance. The study included more than 4,400 students. The researchers calculated 138 effect sizes from the 20 studies. The mean of the study-weighted effect sizes averaging across all outcomes was 0.30 ($p < .05$), with a 95% confidence interval. This indicated a small-to-medium strength correlation.

In rural Virginia, Boster, Meyer, Roberto, and Inge (2002) conducted a study to examine video streaming over the Internet and the possible connections to improved student performance. The experimental group that used in-class educational videos outperformed the control group by an average of 12.6% in third- and eighth-grade science and social study scores. This study produced a weighted average effect size of $r = 0.29$ and was statistically significant. The product evaluated in the Boster et al. research included video clips so that teachers might specifically target learning of key concepts. The product had videos aligned to the specific state standards that were tested on state assessment tests. The product used in the Boster et al. study is a subset of the PV product being researched in this study.

Boster et al. (2004) repeated video streaming research with 2,134 sixth- and eighth-grade students from Los Angeles area middle schools. These results showed a statistically significant improvement for the experimental group of 3% to 5% over the control group. The sixth-grade students performed 4.7% better than the nonvideo streaming group. A similar result was noted in the eighth-grade group where the video
streaming group performed 2.2% better than the nonvideo group. Both results were statistically significant and were noted across schools and teachers.

Beglau (2005) discussed how media improved scores for fourth-grade students on a state standardized test in Missouri, the Missouri Assessment Program (MAP). Changes in the students’ achievement were credited to the enhanced Missouri’s Instructional Networked Teaching Strategies (eMINTS) that used technology to improve student performance. The differences in average scores ranged from 7.6 points higher in communication arts to 19.6 points in mathematics. In communication arts, the Cohen’s $d$ effect size was 0.37 and was 0.37 for Hedge’s $g$. The calculated effect size for mathematics was 0.55 for Cohen’s $d$ and 0.55 for Hedge’s $g$. The research also pointed to media’s ability to narrow the Black-White achievement gap.

Tienken and Wilson (2007) reviewed the impact of computer-assisted instruction (CAI) on seventh-grade students’ mathematics achievement in 4 middle school classrooms in a school in central New Jersey. The researchers found that CAI had a positive, small effect on the students’ learning of basic mathematics skills. The Cohen’s $d$ calculation resulted in an effect size of $d = 0.12$.

So and Kong (2007) also examined how teachers used multimedia in the classroom. The study investigated the use of a multimedia package to help students understand the movement of the Earth. The researchers investigated two different approaches to inquiry learning. So and Kong also noted that different pedagogical methods used affected the level of achievement. A comparison of pretest and posttest results found significant improvements in two classes of 10–12 year olds studied. A paired $t$ test was conducted to measure changes in achievement. Transforming mean
differences to standardized progression scores through statistical conversion shows a percentile gain. In Class A, the effect size was 21.1% and was 39.9% in Class B. The researchers stated that teacher development tools are needed to observe the greatest increase in achievement. Another factor was to determine if teachers had been trained in the use of the multimedia.

James-Shuler (2008) conducted a nonexperimental study analyzing differences in outcomes on the New Jersey Assessment of Skills and knowledge (NJASK) state-mandated test based on the influence of the Student Achievement in Reading and Writing (STAR-W) grant program. The researcher studied language arts literacy for students in Grades 3 through 5 in the Hackensack Public school district in New Jersey. James-Shuler found that the student achievement of fourth graders was higher for participants in the program than nonparticipants. The results, however, were not statistically significant.

While some would tout digital curriculum supplements as universally beneficial (e.g., Matranga, 2007), Clark (1994) stated that media do not influence learning, only the content of the materials causes learning. Clark (1983) stated, “The best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes change in nutrition” (p. 445).

St. Clair (1999) reported negative results on academic achievement and the use of computer technologies in the classroom. The program was implemented in six Detroit public schools in the 1997–1998 school year. The Michigan Educational Assessment Program (MEAP) was the tool used for determining levels of student achievement. A total of 655 students and 22 teachers participated in the study. Both a summative and a
formative assessment were conducted. The summative assessment was designed to
determine if students in the treatment group would score higher on the MEAP than
students in the control group. The analysis of the data indicated that the program resulted
in an average normal curve equivalent (NCE) loss of 3.11 points for seventh-grade
students on the reading portion of the exam. Similarly, students in the program had an
average loss of 12.79 NCE points on the science portion of the exam.

Johnson (2000) also questioned results of studies indicating positive achievement
results. The researcher used multiple regression analyses to analyze the effects of
computer technologies and other variables on student achievement. Johnson used the
1998 National Assessment of Educational Progress (NAEP) database on reading to
analyze the influence on academic achievement in reading. Johnson's findings established
that on the NAEP reading test, in fourth and eighth grades, the variable for computer
instruction was not statistically significant, indicating no effect on the academic
achievement of students. The researcher also noted that the results of other studies were
questionable because they overlooked the instructor's capabilities.

Also on the other side of the debate are researchers who support the findings of
Mayer, Heiser, and Lonn (2001) who indicated that learners can be “overloaded” by
multisensory input that may lead to a decrease in learning. Mayer (2001) also observed
that the methods used in instructional programs, not the delivery method, influence
learning.

Tienken and Maher (2008) researched differences in student achievement on a
state standard test for students in eighth-grade mathematics. The study of 121 students
from a population of 284 focused on the effect of CAI on achievement. The researchers
found that there was no statistically significant improvement in student achievement scores based on the CAI intervention for this group. Using the Glass (1976) formula, the effect size calculation was 1.53 and favored the control group in the 25th quartile.

**Theoretical Framework**

The use of classroom multimedia has had a diverse history in terms of theoretical underpinnings. Select theories emphasize factors internal to the learner, while other theories highlight external factors as the critical variables influencing knowledge acquisition.

One theory regarding learning as a function of multimedia usage is grounded in the active learner operating in a constructivist environment. The learner uses the environment, both video and traditional instruction, and integrates this information with existing knowledge to create learning. For learning to take place, the learner must process and incorporate information into his or her own cognitive process where the information can then become a part of what Vygotsky (1978) named the zone of proximal development.

Schiller (1999) concluded that “[t]he use of computers in schools for teaching and learning is best served by a constructivist approach to teaching and learning” (p. 5). Some researchers also highlight relationships between internal and external cognitive environments to examine how learning takes place.

Pea (1990) and Perkins (1990) discussed how external stimulus in the environment can complement internal cognitive processes. The researchers noted that these interactions between the external environment and the individual have learning
effects that last well beyond the interaction.

Theories also discuss how media-connected learners, with limited prior knowledge, better connect with concepts that otherwise are difficult because of this limited prior knowledge. Greeno (1989) researched how such knowledge between the individual and the environment is processed based on prior knowledge.

Researchers have also noted that there must be a cognitive effort by the learner for visual literacy to take place. Salomon (1983, 1984) noted that in addition to visual literacy there must be visual attention, effort put forth, and active processing for learning to take place. Solomon and Perkins (1989) also noted the necessity for active processing. Hansen (2006) found that some learners reduce their cognitive efforts if the material is familiar or believed to be understood. If a learner is already familiar with the material, the effect could be reduced processing and therefore no learning.

Baggett (1989) concluded that information received by the learner visually and verbally is actually processed differently in an individual's memory. The researcher concluded that visual aspects, such as size, shape, and color, make the association more memorable, thus positively impacting learning. This is also supported by research studies (Baggett & Ehrenfuecht, 1982, 1983; Hayes & Kelly, 1984; Pezdek & Hartman, 1983) that noted that the combination of audio and visual information resulted in more recall than visual-only or audio-only presentations.

Baddeley (1986) created a working memory model that consisted of three components: central executive, visuospatial sketchpad, and phonological loop (see Figure 4). According to this model, there are two locations for storage: the phonological loop and the visuo-spatial sketchpad. The phonological loop is important in language
comprehension, reading, and vocabulary. The visuo-spatial location is used for visual and spatial coding. The central executive is the command center that coordinates the retrieval of information for further processing. The multimedia format for presentation of instructional materials works to populate the visuo-spatial sketchpad and phonological loop. Enhanced learning occurs as processing takes place in the central executive center.

**Figure 4.** Baddeley's working memory model.

Mayer (2001) called learning from both words and pictures multimedia learning. Mayer's theory assumed that successful multimedia learning depended on the ability of a person to select words and pictures from multimedia, organize, and integrate with prior knowledge stored in long-term memory. The researcher based his theory on the workings of the human mind and on what multimedia instruction should have to be effective in learning. His theory used the work of Baddeley (1986, 1992, 1998) on working memory, and Paivio (1986) and Clark and Paivio (1991) on dual channel coding. Figure 5 gives an overview of how this process works. Words and pictures enter through the ears and eyes. The learner must be attentive and select the words and images for further processing. Next, the selected words and pictures must be organized into different knowledge
structures, which Mayer called verbal models and pictorial models. These two models must then be integrated with each other by building connections between the verbal and pictorial models using prior knowledge. Mayer called this process integrating.

Organizing, processing, and integrating do not necessarily occur in a linear manner, but randomly. Once integrated, the learning is stored in long-term memory for future use. The visual/pictorial channel processes animations, while the auditory/verbal channel processes narrations.

![Diagram of Cognitive Theory of Multimedia Learning](image)

*Figure 5. Cognitive theory of multimedia learning (Mayer, 2001).*

Mayer's theoretical model is based on three assumptions: a) the dual channel assumption, b) the limited capacity assumption, and c) the active learning assumption. The dual channel assumption is that humans have separate channels for processing sounds and images. The limited capacity assumption is that people are limited in the amount of information that can be processed by a channel at one time. The active processing assumption is that people must be actively engaged to make meaning of the inputs and create mental models. Active learning requires selecting relevant material,
organizing the material, and integrating the material into prior knowledge structures.

Mayer found that the effect of properly using the model led to what the researcher called "the promise of multimedia learning" where "students can learn more deeply from well-designed multimedia messages consisting of words and pictures than from more traditional modes of communication involving words alone" (p. 125).

Sweller (1994) also researched a limitation similar to Mayer's, cognitive load theory (CLT). CLT assumes a limited working memory connected to an unlimited long-term memory. The researcher noted that a user has three possible types of cognitive load: (a) intrinsic cognitive load (this is load caused by the structure and complexity of the material being used), (b) germane cognitive load (this is the load used by the learner's effort to comprehend and process the information), and (c) extraneous cognitive load (this load is overhead that does not contribute to an understanding of the material, for example, sorting necessary information from extraneous information). Because these three cognitive loads are being processed, less working memory is available to process content. This provides limited working memory.

The theoretical aspects of dual channel learning and memory, when coupled with the multichannel presentation in a multimedia presentation, form the basis for the study of possible relationships in this research. Given the inherent multichannel presentation of multimedia materials, what (if any) relationship exists between multimedia presentation and student learning as measured by student achievement on the TAKS test? A majority of the researchers cited identified the need for additional studies not only to clarify conflicting research but also to examine current findings relative to variance in student learning styles and methodological differences in instructional presentation. This research
project with PV will in part fulfill the need for additional quantitative research. Figure 6 depicts the theoretical framework for this study.

Summary of Chapter 2 and Description of Chapter 3

Chapter 2 reviewed research and literature concerning the use of media in the classroom, how the instruction was used, the effectiveness of video, and its effect on student learning and student achievement.

In chapter 3, the researcher details the design, methodology, and specific procedures used to collect and analyze the data collected in this study.
Limited Capacity
Multimedia Presentations
Images
Words
Limited Capacity
Organizing Pictures and Images
Organizing Words and Sounds
Organizing and integrating dual channels
INCREASED LEARNING

Figure 6. Theoretical framework for Power Videos study.
Chapter 3: Design and Methodology

Introduction

This research study was a nonexperimental, correlational evaluative study designed to determine what relationships existed between the use of a DCS-owned program, PV, and student achievement. DCS provided the PV program to all independent schools in Dallas County, Texas. The researcher analyzed data to assist administrators in prioritizing investments. The purpose of this study was to obtain valid and reliable information to allow school administrators to make informed decisions for data management, student achievement, and budget requirements. Administrators needed data to assist in prioritizing programs that continue to receive funding because of the scarce financial resources available. A primary concern was to determine if monies are best spent in select PV products subject areas that have a positive statistical correlation to student achievement, or if resources are better used to support other products. The results of this study provided essential data for DCS leadership to make more informed decisions.

This study provides data to determine what relationships existed between the use of PV in a sample of elementary classrooms of schools located in Dallas County, Texas, and student achievement as measured by the Texas Assessment of Knowledge and Skills (TAKS) test.

Data for PV usage were collected from standard reports generated by DCS and available on the DCS Web site. All documents existed in the public domain, and none contained data identifying individual students. Sampling from the population of 373
schools continued until 61 campuses had been identified that met the criteria regarding exclusion of specialty schools, SES, LEP, and class size.

As recognized by Johnson (2001), "Nonexperimental quantitative research is an important area for research for educators because there are so many important but non-manipulative variables needing further study in the field of education" (p. 3). The purpose of this study was to obtain valid and reliable information to make informed decisions for data management, student achievement, and budget requirements. This information was used as one factor to assist administrators in prioritizing budget funds to best affect student achievement.

Research Design

Researchers have discussed distinctions between causal-comparative research and correlational research to determine appropriate research methods for the question or problem being stated. "Correlational research involves collecting data in order to determine whether, and to what degree, a relationship exists between two or more quantifiable variables" (Gay & Airasian, 2000, p. 321). The use of correlational analysis advances the intent of this research, namely to determine what relationships exist between the use of PV and student achievement, and the power of these relationships, but not to determine or imply any cause-and-effect relationships.

Charles (1998) argued that causal-comparative research "strongly suggests cause and effect" (p. 305) while correlational research "examines the possible existence of causation" (p. 260). Charles's position is not universally accepted. Johnson (2001) presented a compelling argument that "the two terms [causal-comparative and
correlational] ultimately suggest a false dichotomy as they are presented in popular educational research texts" (p. 11).

This correlation analysis enhances the ability of DCS management and school board members to reach better informed conclusions regarding expenditures of public monies. The analysis and use of the correlation coefficient squared ($r^2$) enable decision makers to understand better the extent to which PV contribute to helping a campus’s students meet TAKS standards. Unlike many multivariate correlational studies that are designed to generate a prediction equation, this study uses a design that matches the data obtained with the decisions that must be made. Stated another way, information produced by this study should better position DCS executive staff to make decisions regarding fiscal matters associated with PV than a prediction formula.

Research Questions

Question 1. What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in reading?

Question 2. What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in math?

Question 3. What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in science?

Question 4. What were the relationships (if any) between teachers’ usage of the
DCS PV product on a campus and the performance of students on that campus on the TAKS test in all tests?

Hypothesis

The null hypothesis underlying this nonexperimental quantitative study is $H_0 = \mu = 0$, indicating that the results are due to chance such that there is no patterned influence of the use of PV in the classroom on student achievement. If the null hypothesis is proved, no statistically significant correlation exists between the use of PV and student achievement. The alternative hypothesis is $H_A = \mu \neq 0$, indicating that the results are not due to chance. Regardless of the outcome, the information obtained is used as one factor in the determination of tax dollars to be spent on the program.

Research Methods

The researcher collected data regarding TAKS performance to determine student achievement from the TEA Web site. Data for PV usage were collected from the DCS Web site from standard reports. All documents existed in the public domain, and none contained information identifying individual students; therefore, the researcher received approval to collect data via an exemption from the Institutional Review Board (Appendix B). K–6 schools were randomly selected by a random number generator from the population of 373 schools and included in the study. Specialty schools—such as gifted and talented magnet schools and dedicated disciplinary/juvenile justice centers if identified in the random selection process—were excluded from the study, and the next identified school replaced the specialty school in the final sample.
Variable one in each correlation was the extent of use of the PV product, which, as indicated earlier, is defined as the percentage of the total teacher population on a campus that had either downloaded and/or streamed a DCS Power Video product during the 2006–2007 school year. Variable two was the percentage of students meeting TAKS requirements in reading, math, science, and all-tests areas. Pearson $r$ values were generated for the following comparisons: Power Video usage vs. elementary TAKS scores—reading, Power Video usage vs. elementary TAKS scores—math, Power Video usage vs. elementary TAKS scores—science, and Power Video usage vs. elementary TAKS scores—all tests.

The Pearson $r$ values were analyzed to test the significance ($p \leq 0.05$) of each value to determine how the relationships identified differed from what would be expected in the general population. All statistical analyses were completed using the SPSS software, with SPSS programmed to evaluate the Pearson $r$ value using a two-tailed test.

The $r^2$ value was used to inform decision makers how much of the variance between aggregate TAKS scores on the campuses sampled might be explained by the extent of usage of the Power Video product.

Discussion of Controls

Some controls needed to be used to address rival explanations for correlation values found to be significant ($p \leq 0.05$). "It is essential that we understand that what is always important when attempting to make causal attributions is the elimination of plausible rival explanations" (Johnson, 2001, p. 5). Johnson noted that plausible rival explanations can be reduced by using correlational research.
In nonexperimental quantitative research, it is seldom possible to control for all rival explanations for causal attributions via the manipulation of the variables. Therefore, there must be clear definition of the parameters of the variables to narrow the possible rival explanations.

In correlational research, confounding variables can produce results that may skew research data. Possible confounding variables (e.g., by delimitations) must be addressed by controls imposed by the researcher. Some of the often-researched variables shown to relate to students' achievement are SES, language proficiency such as English Language Learners (ELL), or LEP, and class size. Mitchell and Mitchell (1999) noted that demographic variables, such as student poverty and language spoken, impacted student achievement. Finn and Achilles (1999) reported that the Student Teacher Achievement Ratio (STAR) experiment found that students in small size classes ($n = 13-17$ students) in early grades consistently showed substantial academic gains over their randomly assigned counterparts in regular-size classes ($n = 22-25$ students).

In the present study, the variables of SES, language factors, and class size, if uncontrolled, could provide rival explanations for any positive findings. Therefore, the following controls were used to address the following key areas.

*Socioeconomic status (SES).* Existing research has established a positive relationship between SES and achievement. Chall (1996) analyzed data from the NAEP reading results and Scholastic Aptitude Test (SAT) scores over time and found large differences between higher and lower SES children. In a study from the Second International Mathematics Study (SIMS), Payne and Biddle (1999) found that the United States would have ranked only above Nigeria and Swaziland if all high-poverty schools
were included in the study. Indeed, the U.S. Department of Education, in *The Longitudinal Evaluation of School Change and Performance (LESCP) in Title I Schools* (2001), found that individual and school poverty had negative effects on student achievement. The report noted that students in schools with the highest percentages of poor students performed worse on both reading and mathematics tests. To minimize the issue of SES in the present research, the researcher included only those campuses where the percentage of economically disadvantaged students fell within ± one (1) standard deviation of the State of Texas mean for economically disadvantaged students in major urban areas as reported in the AEIS database. Texas defines economically disadvantaged students as those who are (a) eligible for free meals, (b) eligible for reduced meals, (c) students from families with annual incomes at or below the official poverty line, (d) students eligible for Temporary Assistance to Needy Families (TANF) or other public assistance, (e) students who receive a Pell Grant or comparable state program of need-based financial assistance, (f) students eligible for programs assisted under Title II of the Job Training Partnership Act (JTPA), and (g) students eligible for benefits under the Food Stamp Act of 1977.

*Language factors.* The State of Texas defines a student of LEP in the Texas Education Code (TEC) Chapter 29.052 to mean “a student whose primary language is other than English and whose English skills are such that the student has difficulty performing ordinary class work in English.” Haney (2000) noted significant impacts on the Texas Assessment of Academic Skills (TAAS), a precursor of the current state test (TAKS), for Hispanic students. Haney concluded that the TAAS test had discriminatory impacts on Hispanic students. In 2002, the TEA conducted a longitudinal cohort study
that reported evidence of a gap in performance between LEP and non-LEP students in meeting the exit-level testing requirements. Current information available on the performance of LEP students in Texas schools was found on the statewide AEIS report, indicating LEP student performance on the TAKS test was among the lowest of eight reported disaggregated student groups (TEA, 2006). According to Canale (1981), English language proficiency is an important contributor to the differences in academic achievement between Hispanic-language speakers and native English-language-speaking students. To address the issue of LEP, this researcher included only those campuses where ≥50% of students were proficient in English as identified in the State of Texas AEIS reports.

Class size. The State of Texas provides guidelines regarding pupil-teacher ratio (PTR). These are defined in TEC Chapter 25.111, which states that “each school district must employ a sufficient number of teachers certified under Subchapter B, Chapter 21, to maintain an average ratio of not less than one teacher for each 20 students in average daily attendance.” While the State of Texas has promulgated guidelines regarding PTR, the state has not developed guidelines regarding class size. In this study, the researcher used only class size information, not PTR. Research has indicated that class size has an impact on student achievement. For example, Finn and Achilles (1999), in the STAR experiment, noted that small class size ($n = 13–17$ students) affects student achievement. Also, Achilles and Finn (2000) noted that students who were in smaller classes in the early grades for sufficient duration, each day every day, assigned randomly to cohorts, realized lasting academic and social benefits. Muennig and Woolf (2007) noted that investments to address underlying conditions, such as class size, could lead to cost
savings and lasting social benefits. Only those campuses where average class size was within ± one standard deviation of the average class size for elementary schools in major urban areas, as determined using the AEIS reports, were included in the study.

**Step-by-Step Procedures**

The following steps were followed in the study:

*Step 1: Identification of campuses for inclusion in study.* A random number table was produced from an Internet-based random integer generator programmed to provide a sequence of random numbers, sampling between 1 and 373, a range defining the alpha listing of all potential elementary schools served by DCS. The number generator produced numbers within a range unique to the identifiers of all Dallas County elementary schools. As schools were identified, unless excluded as a specialty school or as stipulated by a specific delimitation, such as SES, class size, or LEP, the campus was considered as having been selected for the study. Sixty-one elementary (K–6) campuses were identified in this manner for the study.

*Step 2: Collection of data regarding 2006–2007 TAKS scores.* The Texas Education Agency (TEA) Web site was accessed, and campus TAKS data regarding the percentage of students meeting TAKS requirements in the specified areas were obtained from the AEIS reports. Percentile scores were converted to normal curve equivalents (NCE), i.e., interval data, before data analysis.

*Step 3: Collection of data regarding 2006–2007 PV usage.* The DCS PV Web site was accessed, and campus data regarding the percentage of teachers using PV products obtained.
Step 4: Correlation analysis. Individual correlation coefficients were generated in the four areas specified using the SPSS software. Scatter plots were produced to assist in data interpretation. Pearson $r$ values were tested for significance using the SPSS software and two-tailed test.

Step 5: Generation of $r^2$ values. Pearson $r$ values were squared to yield information regarding the extent to which variation in the campus TAKS scores can be attributed to the use of PV on the campuses.

Step 6: Discussion. All data generated in the study were reviewed, and conclusions were drawn regarding the relationship between PV products and the ability of elementary students to meet TAKS standards in the areas of reading, math, science, and all tests. Inferences were drawn, and implications for decision makers were discussed.

Step 7: Results compared. Results of the present analysis were compared to prior work as reported in chapter 2 as a basis for conclusions.

Summary of Chapter 3 and Description of Chapter 4

Chapter 3 described the research design and the methods for data collection and analysis. The chapter gave a detailed step-by-step process for this study.

Chapter 4 provides a detailed statistical analysis of the data collected in this study. The chapter also summarizes the findings.
Chapter 4: Data Analysis

In this study, the researcher analyzed data to assist administrators in prioritizing investments. The purpose of this study was to obtain valid and reliable information to allow school administrators to make informed decisions for data management, student achievement, and budget requirements. With the scarce financial resources available, administrators need data to assist in prioritizing programs that continue to receive funding. A key concern was to determine if monies are best targeted to select PV products subject areas that have a positive statistical correlation to student achievement, or if resources are better used to support other products. The results of this study provided essential data for DCS leadership to make clearer decisions.

This study provides data to determine what relationships existed between the use of PV in a sample of elementary classrooms of schools located in Dallas County, Texas, and student achievement as measured by the TAKS test. The 61 schools included in the study were selected on a random basis. After selection, campus information was obtained from the TEA Web site. The information contained not only test scores but also information about class size, demographics, and SES. Appendix E provides an example of the information available to the researcher for analysis.

The data were analyzed using SPSS 16.0 software. The quantitative findings of the study were derived from a correlational analysis of the percentage of teachers on a campus using PV and the achievement of that campus on the state-mandated TAKS test. Variable one in each correlation was the extent of use of the PV product. Variable two was the percentage of students meeting TAKS requirements in the reading, math, science, and all-tests areas.
The analysis was conducted using Pearson's $r$ as a descriptor of the degree of linear association between the two variables. Pearson's $r$ ranges in value from -1 to +1. When it is near zero, there is little correlation, but as it approaches -1, a strong negative relationship exists. As Pearson's $r$ approaches +1, a strong positive relationship exists between the variables. Cohen (1988, 1992) gave a rule of thumb regarding interpreting the magnitude of the relationships: small = 0.1, medium = 0.3, and large = 0.5 or greater.

**Research Question 1**

What were the relationships (if any) between teachers' usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in reading?

The first correlation analysis computed was the percentage usage of PV and the achievement on the reading section of the TAKS test. As noted in Table 8, the Pearson correlation was 0.258, which was statistically significant at the $p \leq 0.044$ level. This indicates that in the area of achievement on the reading portion of the TAKS test, a small-to-medium relationship exists.

Inspection of the scatter plot (Figure 7) indicates that the Pearson $r$ value generated by a comparison of PV usage and reading TAKS scores indicates a small-to-medium correlation. Calculating the coefficient of determination (the $r^2$ value) indicates that approximately 6.7% of the variance between student aggregate TAKS reading scores could be explained by the extent of usage of the PV product.
Table 8
*Power Video Usage vs. Elementary TAKS Scores—Reading*

<table>
<thead>
<tr>
<th></th>
<th>PV usage</th>
<th>Reading NCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PV usage</strong></td>
<td>Pearson correlation</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.044</td>
</tr>
<tr>
<td>Sum of squares and cross-products</td>
<td>3.37E4</td>
<td>3255.867</td>
</tr>
<tr>
<td>Covariance</td>
<td>563.033</td>
<td>54.264</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>61</td>
<td>61</td>
</tr>
</tbody>
</table>

| **Reading NCE**   | Pearson correlation | .258 | 1 |
| Sig. (2-tailed)   | .044               |
| Sum of squares and cross-products | 3.25E3 | 4698.689 |
| Covariance        | 54.264             | 78.311 |
| **N**             | 61                 | 61    |

*Correlation is significant at the 0.05 level (2-tailed).*
Research Question 2

What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in math?

The second correlation analysis computed was the percentage usage of PV and the achievement on the math section of the TAKS test. As noted in Table 9, the Pearson correlation was 0.301, which was statistically significant at the $p \leq 0.019$ level. This
indicates that in the area of achievement on the reading portion of the TAKS test, a medium relationship exists.

The scatter plot (Figure 8) shows that the Pearson $r$ value generated by comparison of PV usage and math TAKS scores indicates a medium correlation. Calculating the $r^2$ value indicates that approximately 9.1% of the variance between student aggregate TAKS math scores could be explained by the extent of usage of the Power Video product.

Table 9
**Power Video Usage vs. Elementary TAKS Scores—Math Correlations**

<table>
<thead>
<tr>
<th></th>
<th>PV usage</th>
<th>Math NCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PV usage</strong></td>
<td>Pearson correlation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sum of squares and cross-products</td>
<td>3.378E4</td>
</tr>
<tr>
<td></td>
<td>Covariance</td>
<td>563.033</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>61</td>
</tr>
<tr>
<td><strong>Math NCE</strong></td>
<td>Pearson correlation</td>
<td>.301*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.019</td>
</tr>
<tr>
<td></td>
<td>Sum of squares and cross-products</td>
<td>4.209E3</td>
</tr>
<tr>
<td></td>
<td>Covariance</td>
<td>70.149</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>61</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
Figure 8. Scatter plot of Power Video usage vs. elementary TAKS scores—Math.

Research Question 3

What were the relationships (if any) between teachers' usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in science?

The third correlation analysis computed was the percentage usage of PV and the achievement on the science section of the TAKS test. As noted in Table 10, the Pearson correlation was 0.185, which was not statistically significant at the $p \leq 0.05$ level. This
indicates that in the area of achievement on the science portion of the TAKS test, no measurable relationship exists.

A review of the Figure 9 scatter plot for PV usage versus science scores supported the conclusion that outliers had no real impact on the Pearson $r$ value. Schools with only limited PV usage (less than 25%) produced some of the highest scores on the science portion of the TAKS test. Alternately, schools with "mid-to-high range" PV usage produced midrange TAKS scores. Finally, schools with no appreciable PV usage yielded exceptionally low TAKS pass rates.

Table 10
*Power Video Usage vs. Elementary TAKS Scores—Science*

<table>
<thead>
<tr>
<th></th>
<th>PV usage</th>
<th>Science NCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PV usage</strong></td>
<td>Pearson correlation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>.185</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.153</td>
<td></td>
</tr>
<tr>
<td>Sum of squares and cross-products</td>
<td>3.378E4</td>
<td>2972.311</td>
</tr>
<tr>
<td>Covariance</td>
<td>563.033</td>
<td>49.539</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>61</td>
<td>61</td>
</tr>
</tbody>
</table>

|                  | Pearson correlation |                   |
|                  | .185                | 1                |
| Sig. (2-tailed)  | .153                |                 |
| Sum of squares and cross-products | 2.972E3 | 7630.590 |
| Covariance       | 49.539              | 127.177         |
| **N**            | 61                   | 61               |
Figure 9. Scatter plot of Power Video usage vs. elementary TAKS scores—Science.

Research Question 4

What were the relationships (if any) between teachers' usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in all tests?

The fourth correlation analysis computed was the percentage usage of PV and the achievement on the all-tests section of the TAKS test. As noted in Table 11, the Pearson correlation was 0.298, which was statistically significant at the $p \leq 0.019$ level. This
indicates that in the area of achievement on the all-tests portion of the TAKS test, a medium relationship exists.

The scatter plot (Figure 10) shows that the Pearson $r$ value generated by comparison of PV usage and all-tests TAKS scores indicates a medium correlation. Calculating the $r^2$ value indicates that approximately 8.9% of the variance between the student aggregate TAKS all-tests scores could be explained by the extent of usage of the PV product.

Table 11
*Power Video Usage vs. Elementary TAKS Scores—All Tests*

<table>
<thead>
<tr>
<th></th>
<th>PV usage</th>
<th>All Test NCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PV usage</td>
<td>Pearson correlation</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sum of squares and cross-products</td>
<td>3.378E4</td>
</tr>
<tr>
<td></td>
<td>Covariance</td>
<td>563.033</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>61</td>
</tr>
<tr>
<td>All Test NCE</td>
<td>Pearson correlation</td>
<td>.298*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sum of squares and cross-products</td>
<td>4.181E3</td>
</tr>
<tr>
<td></td>
<td>Covariance</td>
<td>69.677</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>61</td>
</tr>
</tbody>
</table>

*. Correlation is significant at the 0.05 level (2-tailed).

In that the all-tests comparison represents an aggregate of reading, math, and science, the Pearson $r$ value being significant is not unexpected since the reading and math scores
indicated statistical significance.

Figure 10. Scatter plot of Power Video usage vs. elementary TAKS scores—All tests.

Summary of Results

The hypothesis of this nonexperimental quantitative study was stated as $H_0 = \mu = 0$, indicating that the results are due to chance such that there is no patterned influence of the use of PV in the classroom on student achievement. The null hypothesis was rejected
in the reading, math, and all-tests areas. Statistically significant correlations existed between the use of PV and student achievement in the reading, math, and all-tests areas of the TAKS test.

The null hypothesis was proved in the area of science on the TAKS tests. No statistically significant correlations exist between the use of PV and student achievement on the science portion of the TAKS test.

**Summary of Chapter 4 and Description of Chapter 5**

Chapter 4 provided a detailed statistical analysis of the data collected in this study. The chapter also summarized the findings.

Chapter 5 includes the summary of findings from the data analysis in chapter 4. This chapter also includes conclusions relating to the findings of the study. Chapter 5 concludes with recommendations for practices and policies and future research regarding the use of media in the classroom.
Chapter 5:

Summary of Findings, Conclusions, Discussion, and Recommendations

Introduction and Research Questions

The primary purpose of this study was to provide data to inform the leadership how to best allocate scarce financial resources. The study provided data to assist decision makers to determine if PV products, or specific subject areas, have a positive statistical correlation to student achievement as measured by the TAKS test. Sixty-one schools were randomly selected for inclusion in the study.

The study was a nonexperimental, correlational evaluative study designed to determine what relationships existed between the use of a DCS-owned program, PV, and student achievement.

Possible confounding variables were addressed by controls imposed by the researcher. The researcher set specific controls for SES, LEP, and class size. Additionally, because of the number and extent of controls put in place, the researcher released a control if 70% of the population was excluded in order to reach the sample size. In this study, SES reached the sample size exclusion control and was released.

Controls for LEP and class size remained in the study.

Pearson $r$ values were used to test the significance ($p \leq 0.05$) of each value. These determined if any relationships identified differed from what would be expected in the general population. SPSS software was used to complete all statistical analyses. SPSS was programmed to evaluate the Pearson $r$ value using a two-tailed test. The study had a single hypothesis with multiple research questions. The four research questions asked
were as follows: What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in reading? What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in math? What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in science? What were the relationships (if any) between teachers’ usage of the DCS PV product on a campus and the performance of students on that campus on the TAKS test in all tests?

Summary of Findings

This study supported the alternative hypothesis that relationships existed between the use of Power Videos in the classroom and student achievement in specific subject areas. In one subject area, the hypothesis was not rejected.

The first correlation analysis computed was the percentage usage of PV and the achievement on the reading section of the TAKS test. This correlation was statistically significant at the \( p \leq 0.044 \) level. In the area of achievement on the reading portion of the TAKS test, a small-to-medium relationship existed.

The second correlation analysis computed was the percentage usage of PV and the achievement on the math section of the TAKS test. This correlation was statistically significant at the \( p \leq 0.019 \) level. In the area of achievement on the math portion of the TAKS test, a medium relationship existed.

The third correlation analysis computed was the percentage usage of PV and the
achievement on the science section of the TAKS test. This correlation was not statistically significant at the $p \leq 0.05$ level. In the area of achievement on the science portion of the TAKS test, no measurable relationship existed. The null hypothesis was proved in the science portion of the test.

The fourth correlation analysis computed was the percentage usage of PV and the achievement on the all tests section of the TAKS test. This correlation was statistically significant at the $p \leq 0.019$ level. In the area of achievement where all students passed each section of the TAKS test, a medium relationship existed.

The results indicated that there are relationships between the use of PV in the classroom and student achievement in math, reading, and all-tests areas. The results also indicated there are no significant relationships in the area of science student achievement and the use of PV.

**Conclusions and Discussion**

The majority of the studies cited in the research, theory, and literature review found that there are small-to-moderate gains in overall student achievement when computer technologies, including media, are used in the classroom. Clearly, the impact of media, and specifically the PV product, upon academic achievement is an extremely complex relationship. Multiple variables are involved in determining student achievement and success. Some of these variables provide additional opportunities to craft future studies to add to the research base. Factors such as teaching philosophy, teacher knowledge and skills, the curriculum, and student social factors are a few variables that can be expanded to better understand the effects of media upon student achievement. As
this study suggested, media may be more suitable for some content areas than others in affecting student achievement.

Implications from this study suggest media had a positive relationship as a factor in the achievement of students in specific subject areas. Based on this finding, there are other implications for policymakers at the local and state levels. Administrators must use data for this and other studies to balance the cost-benefit of technology tools such as PV.

The study achieved the purpose for which it was intended. This study provided additional information to use with other data to determine what investments should be made in the PV product. This data provided specific information about possible subject areas to prioritize the investment of video materials. With the study highlighting the areas of reading and math, the administration can now focus on further improving the library in those areas.

The investment in the PV product is not simply an investment in digitizing and linking to the state TEKS standards. A factor in the investment equation is the infrastructure used for PV, and used for other Internet access, such as the DCS Online Continuing Education program; therefore, fiscal decisions are not one-dimensional but rather multifaceted and complex. DCS currently spends more than $1,000,000 a year in infrastructure to support the product.

With the enormous potential of the Internet comes great opportunity, but also great challenges. One of the greatest challenges is not what or how many tools the Internet can provide but how to effectively use the resources in the classroom. Lepani (1997) predicted that the Internet and tools from technology would transform education and the classroom. The researcher stated that the classrooms would become “hi-touch/hi-
tech local hubs of the network of lifetime learning services” (p. 12). As noted in this study, numerous researchers indicated that this issue must be a policy consideration.

These results also highlight the opportunity for some additional recommendations to even further clarify the use of PV in the classroom. These clarifications also will further research on the effect of media usage on student achievement.

**Recommendations**

One public policy consideration involves balancing how much, when, and how tools, such as PV, should be implemented. A major concern is how to ensure educators are technically and professionally prepared for this challenge. This factor, as the literature suggested, is tied to the professional development of teachers. Multiple researchers reviewed in this study (Wenglinsky, Reeves, and others) noted that implementation by the teacher was a factor in attaining positive results. Collis et al. (1996) summarized this need in an international study of student and teachers:

Teachers are the main gatekeepers in allowing educational innovations to diffuse into the classrooms. Therefore one of the key factors for effecting an integration . . . is adequate training of teachers in the handling and managing these new tools in their daily practices. (p. 31)

Public policy must address this issue in the next administration. Technology Counts (1999) pointed to the fact that after two decades of integrating technology into the classroom, teachers did not feel prepared to use the tools in meaningful ways. A significant investment has been made in providing professional development to teachers and campuses in using PV. During the year, DCS staff members conduct on-site staff
development throughout the county for best use of the product. A thorough review of the
training and practices used should be completed to ensure the training is meeting the
needs of the educators.

One recommendation for DCS to implement on a local level is to survey how
closely teachers using the PV product approximate a best practices approach to product
usage. This also addresses this study’s discussion as noted by Collis et al. (1996) that
mandates a requirement for adequate professional development for educators to
effectively integrate these tools into the classroom setting. Users, upon entering the PV
Web site, have access to links on the site detailing using video in the classroom and
recommended practices for classroom media. This detailed information provides tools for
educators to ensure a quality learning experience and a well-integrated use of media in
the classroom. The areas associated with the survey would include the following: (a)
Ensure that the video is included as a part of the lesson and clearly identify the intent of
using that specific video. (b) Determine the educational value of the video. Does the
video provide for learning in the cognitive domain as well as the affective domain? (c)
Preview the tape. For this item, a survey question would determine if the user in fact
previewed the tape or simply thought it looked good and presented it to the class without
previewing it first. (d) Prepare the students for the tape by including lead-in activities
such as reviewing key concepts or key vocabulary terms. Previewing activities such as
distributing focus questions could also be determined. (e) Ensure that the physical
environment is conducive to learning. For this item, the survey could question if the
lights were left on so that the students were alert and could take notes. (f) Segment the
viewing. As an important concept was introduced, did the teacher stop the video to point
out important information? (g) After the viewing, did the teacher discuss the video with
the students? The survey could determine if the teacher used the video to practice critical
thinking. (i) Integrate the concepts into other activities planned in the curriculum.

Another tool on the Dallas County School’s Web site that addresses this policy
issue is recommended practices for use of media in the classroom. A second
recommendation is to ensure all teachers are trained with this tool. This tool highlights 14
different considerations when using video:

Intent. For the teaching tools to be used effectively, the teacher should choose a
video that complements or expands on a specific teaching objective. A video can be used
to help engage learners. The video can also expand learning by using two or more forms
of presentation. The video also reaches the strong auditory and visual learners.

Educational value. Educational videos are important as a tool in the development
of intellectual skills, abilities, and thinking skills in the cognitive domain. Students’
feelings, attitudes, values, and emotions in the affective domain are also promoted.

Preview media. Preview each video item before showing to a class.

Build schemata. Use Bloom’s taxonomy of knowledge, comprehension,
application, analysis, synthesis, and evaluation to build the background.

Note specific items. Select specific items from the video for the students to pay
particular attention.

Emphasize skills. Review listening skills and listening behavior. Give examples to
students on how to listen to gain information from the video. Have students retell specific
parts of the video.

Importance of visual literacy. Jean Lee (1998) noted, “In Mind and Media
(Harvard University Press, 1984), Patricia Greenfield pleads that visual literacy must become as important as print literacy, and that teachers must develop special programs to turn children from passive into active consumers of visual materials."

**Literature as basis for videos.** Rothlein and Meinbach (1991) noted:

Our literature incorporates all that we are and all that we hope to be. It includes the knowledge of ages past and present and dares us to imagine the future. Literature is the perfect vehicle for making connections as we strive to understand our world and our place in it. Literature can help bridge the gap between classroom lessons and reality, adding additional perspective to the curriculum and giving dimension to concepts and themes being taught. Literature, no matter what the genre, easily adapts to any theme being taught. A thematic approach is one in which a variety of materials, activities, and content areas all combine to teach a specific concept, idea, or theme. A thematic approach offers a multi-disciplinary as well as an interdisciplinary approach to learning.

**Multicultural education.** Herrera (1996) stated that “incorporating a multicultural perspective into the existing curriculum can be achieved best through the use of literature. Through literature, students are able to reflect not only on their own culture, but on the cultures of other ethnic groups” (p. 23). Community resources, videotapes, and other visual materials can be used to familiarize students with ethnic customs, languages, music, and dress.

**Teaching the English language.** The use of videos in the classroom is also an excellent means for reinforcing difficult concepts, especially for limited English learners. Video can be used as a means to experience the language in the context of the culture.
This meaningful expression of the language is seen in real contexts and becomes the basis for language learning.

*Comprehension strategies.* Comprehension strategies should also be used to bring meaning to the video: (a) develop literal meaning by recognizing details and sequential order, (b) develop global meaning by analyzing and discussing what was seen and identifying the main idea, (c) develop inferential meaning via strategies that determine cause and effect, predicting the outcomes, and drawing conclusions, and (d) evaluate the video.

*Follow-up.* Follow-up with questions that relate to the teaching objectives.

*Cue video before class.* Ensure that if only using clips of the video that the clips are cued and ready to start.

*Keep records.* Include in the lesson plans titles and segments of the videos that are to be used with each unit.

A survey could determine if users integrated these practices into the use of the product. Once the survey has been developed, future researchers could design a study to determine if teachers actually followed these recommendations and if maintaining fidelity to best practices yielded more favorable outcomes, i.e., determine if those additions provide stronger correlations.

Also, a study could be repeated at the high school level to determine if the results changed based on different grade levels. The current study analyzed only data associated with elementary schools. Some of the research reviewed noted that sample size effects were higher in elementary grades than in secondary and high schools. This would be an
additional tool for administrators to further scrutinize spending and potentially prioritize spending in the grade levels and subjects with the higher correlational relationships.

Specific teacher demographics, such as years of teaching experience, master teacher status, and educational level achieved, could be used in a new study to determine if the results are different for different teacher demographics.

The effect of media to motivate students is another area of possible research. A relationship existed between higher uses of PV and student achievement. Is there also a relationship between use of PV and increased student motivation? A survey of teacher and student perceived engagement could add to the existing research base.

Future studies could also include a qualitative survey of specific subject areas for teachers to provide data regarding how the media is integrated into the general curriculum and into a teacher's specific classroom. Tools for this qualitative survey are available from the Institute for the Integration of Technology into Teaching and Learning in Denton, Texas.

A number of the research studies reviewed also focused on the classroom pedagogy and learning environment for successful use of technology tools in the classroom. Roschelle and Pea (1990) found that traditional classrooms often do not provide the structure or resources for learning, but technology can effectively enable learning. Additionally, studies could be created to include a comparison of identified constructivist classrooms and traditional classroom to determine if significant differences exist.

This year, Dallas County Schools implemented mandatory training requirements for anyone requesting access to PV. A study could be conducted in 2–3 years after
implementation of the mandatory training requirements to determine if the results would differ.

Also, this study could be repeated in the science area by including an analysis of all science titles used by teachers. This could help establish if the lack of usage of science titles may be an additional factor in the finding of this study that no correlations existed in the area of science.

Each of these future studies would add to the existing research and help further define possible relationships between the use of media in the classroom and the effect on student achievement.
References


of interactive video for teaching social problem-solving to early adolescents.


DeMartino, D. J. (2001). Use of video mediated instruction in teaching American Heart Association emergency cardiac care training courses. In Proceedings of ED-


Herrera, S. (1996). Multicultural education: Meeting the needs of ethnic minority


Koechel, L. (1970). *Effects of the use of two visual methods in teaching college chemistry*


Payne, K., & Biddle, B. (1999). Poor school funding, child poverty, and mathematics


SPSS for Windows, Rel. 16.0.0 2007. Chicago: SPSS Inc.


Power Videos is a copyrighted product produced by Dallas County Schools. The library has more than 10,300 titles available from multiple sources, including Disney, National Geographic, Weston Woods, Visual Learning, and many more. A collection of audio titles including textbooks on audio for special needs students is also available from the Reading and Radio Resource. Users may search by subject, keyword, title, or grade level. Videos are correlated to the Texas Essential Knowledge and Skills (TEKS) Standards. Most videos are divided into short clips for ease of use.
Appendix B: IRB Forms

Human Participant Protections Education for Research Teams

Completion Certificate

This is to certify that

Rick Sorrells

has completed the Human Participants Protection Education for Research Teams online course, sponsored by the National Institutes of Health (NIH), on August 8, 2006.

This course included the following:

- key historical events and current issues that impact guidelines and legislation on human participant protection in research.
- ethical principles and guidelines that should assist in resolving the ethical issues inherent in conducting research with human participants.
- the use of key ethical principles and federal regulations to protect human participants at various stages in the research process.
- a description of guidelines for the protection of special populations in research.
- a definition of informed consent and components necessary for valid consent.
- a description of the role of the IRB in the research process.
- the roles, responsibilities, and interactions of federal agencies, institutions, and researchers in conducting research with human participants.

National Institutes of Health

http://www.nih.gov
IRB Non Review Certification

STUDENT: Nicki Farrell

Title of Dissertation: Relationships Between Student Achievement and Use of PowerVideos Digital Educational Videos

I certify, by my signature below, that the above indicated study does not require IRB review as a result of a lack of involvement with human subjects (see OHRP flow chart) and as indicated by any or all of the following (check all that apply).

1. Historical research
2. Public data base
3. *Proprietary data base
4. Freedom of Information
5. Right to know – sunshine law

Student signature: Nicki Farrell
Advisor approval: MM Gadelha 3/3/05

Reviewed by:
Marty Finklestein - Higher Ed
Daniel Gutmore - K - 12

• Proprietary data that does not identify individuals
Appendix C: Campuses Randomly Selected for Inclusion in the Study

Albert Johnson
Alexander
Blanton
Bonham
Casa View
Centerville
Club Hill
Colin Powell
CountryPlacee
Cowart
Daniels
Degolyer
Dickinson
Donald
E. Martinez
Ervin
Frank
Freeman
Freeman CFB
Galloway
Garner
Gooch
Good
Gray
Handley
HB Gonzalez
Heather Glen
Hernandez
Hill
John N Bryan
Johnson GP
Kent
Lakewood
Landry
Marshall
McCoy
Miller
Moreno
Oran Roberts
Peabody
Peeler
Preston Hollow
R. E. Lee
Rayburn
Reilly
Runyon
S S Conner
Sally Moore
Sam Houston
Sanger
Seguin
Thompson
Thornton
Tosch
Townley
U. Lee
Umphrey Lee
Weaver
Webster
Winnetka
Zavala
### Educational Download Log:

**5/5/2008 to 5/6/2008**

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2006-07 Academic Excellence Indicator System

District Name: DALLAS ISD
Campus Name: JOHN F PEELER EL
Campus #: 057905192
2007 Accountability Rating: Academically Acceptable

Gold Performance Acknowledgments:
Attendance (2005-06)

Comparable Improvement: Reading/ELA
### Appendix E: AEIS Sample Report

**TEXAS EDUCATION AGENCY**  
Academic Excellence Indicator System  
2006-07 Campus Performance  
Section I - Page 1  
Total Students: 467  
Grades Span: K-8 - K-5  
School Type: Elementary

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| **TAKS Mat 2007 Standard**  
Grade 5 (English) First Administration Only |       |         |       |        |                 |          |       |                |                 |      |        |           |          |     |
| Reading    | 2007  | 83%     | 77%   | 85%   | 72%             | 74%       | 80%   |                 |                 | 62%  | 76%    |           | 72%      | 68% |
| 2006       | 90%   | 70%     | 85%   | 81%   |                 | 80%       | 85%   |                 |                 | 63%  | 75%    |           | 82%      | 76% |
| Mathematics| 2007  | 83%     | 73%   | 86%   | 77%             | 50%       | 62%   |                 |                 | 50%  | 63%    |           | 51%      | 54% |
| 2006       | 84%   | 70%     | 85%   | 85%   |                 | 63%       | 72%   |                 |                 | 50%  | 64%    |           | 60%      | 64% |
| All Tests  | 2007  | 78%     | 64%   | 71%   | 48%             | 45%       | 55%   |                 |                 | 42%  | 57%    |           | 45%      | 41% |
| 2006       | 79%   | 65%     | 75%   | 79%   |                 | 61%       | 71%   |                 |                 | 50%  | 66%    |           | 74%      | 71% |
| **TAKS Mat 2007 Standard**  
Grade 6 (English) |       |         |       |        |                 |          |       |                |                 |      |        |           |          |     |
| Reading    | 2007  | 84%     | 79%   | 76%   | 67%             | 55%       | 71%   |                 |                 | 71%  | 59%    |           | 68%      | 42% |
| 2006       | 84%   | 79%     | 73%   | 63%   |                 | 54%       | 54%   |                 |                 | 65%  | 58%    |           | 56%      | 39% |
| Mathematics| 2007  | 84%     | 78%   | 81%   | 77%             | 72%       | 72%   |                 |                 | 73%  | 70%    |           | 74%      | 73% |
| 2006       | 85%   | 78%     | 73%   | 72%   |                 | 58%       | 70%   |                 |                 | 73%  | 72%    |           | 74%      | 73% |
| Writing    | 2007  | 91%     | 87%   | 92%   | 85%             | 84%       | 85%   |                 |                 | 84%  | 85%    |           | 84%      | 58% |
| 2006       | 92%   | 85%     | 93%   | 92%   |                 | 90%       | 90%   |                 |                 | 90%  | 90%    |           | 90%      | 90% |
| All Tests  | 2007  | 75%     | 61%   | 67%   | 57%             | 58%       | 64%   |                 |                 | 64%  | 64%    |           | 64%      | 17% |
| 2006       | 74%   | 58%     | 64%   | 58%   |                 | 36%       | 52%   |                 |                 | 52%  | 52%    |           | 52%      | 17% |

| **TAKS Mat 2007 Standard**  
Grade 6 (English) First Administration Only |       |         |       |        |                 |          |       |                |                 |      |        |           |          |     |
| Reading    | 2007  | 83%     | 62%   | 72%   | 70%             | 70%       | 63%   |                 |                 | 63%  | 63%    |           | 63%      | 60% |
| 2006       | 84%   | 62%     | 71%   | 63%   |                 | 63%       | 63%   |                 |                 | 61%  | 64%    |           | 61%      | 60% |
| Mathematics| 2007  | 85%     | 75%   | 82%   | 68%             | 68%       | 68%   |                 |                 | 70%  | 59%    |           | 68%      | 60% |
| 2006       | 85%   | 73%     | 78%   | 81%   |                 | 89%       | 69%   |                 |                 | 70%  | 79%    |           | 70%      | 90% |
| Science    | 2007  | 78%     | 62%   | 68%   | 53%             | 53%       | 53%   |                 |                 | 72%  | 54%    |           | 52%      | 54% |
| 2006       | 76%   | 62%     | 64%   | 51%   |                 | 73%       | 73%   |                 |                 | 73%  | 71%    |           | 73%      | 80% |
| All Tests  | 2007  | 69%     | 51%   | 66%   | 44%             | 44%       | 44%   |                 |                 | 44%  | 44%    |           | 44%      | 14% |
| 2006       | 66%   | 49%     | 53%   | 51%   |                 | 66%       | 66%   |                 |                 | 66%  | 66%    |           | 66%      | 64% |

| **TAKS Mat 2007 Standard**  
Grade 6 (English) |       |         |       |        |                 |          |       |                |                 |      |        |           |          |     |
| Reading    | 2007  | 92%     | 87%   | 92%   | 92%             | 92%       | 92%   |                 |                 | 92%  | 92%    |           | 92%      | 82% |
| 2006       | 92%   | 90%     | 90%   | 90%   |                 | 90%       | 90%   |                 |                 | 90%  | 90%    |           | 90%      | 90% |
| Mathematics| 2007  | 90%     | 77%   | 87%   | 87%             | 87%       | 87%   |                 |                 | 91%  | 91%    |           | 91%      | 67% |
| 2006       | 81%   | 70%     | 81%   | 81%   |                 | 81%       | 81%   |                 |                 | 81%  | 81%    |           | 81%      | 67% |
| All Tests  | 2007  | 78%     | 66%   | 82%   | 82%             | 82%       | 82%   |                 |                 | 82%  | 82%    |           | 82%      | 50% |
| 2006       | 76%   | 75%     | 81%   | 81%   |                 | 81%       | 81%   |                 |                 | 81%  | 81%    |           | 81%      | 50% |
## Appendix E: AEIS Sample Report

### Texas Education Agency

#### 2006-07 Campus Performance

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<td>62%</td>
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<td>81%</td>
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</table>

**TAKS Profile Performance (Sum of All Grades Tested, EXCLUDING TAKS-I)**

| Reading/ELA | 2007 | 30% | 19% | 20% | 24% | 24% | 17% | 20% | 1% | 24% |
| | 2006 | 27% | 16% | 20% | 14% | 13% | 10% | 18% | 1% | 21% |
| Mathematics | 2007 | 25% | 17% | 20% | 23% | 23% | 19% | 20% | 1% | 24% |
| | 2006 | 23% | 17% | 20% | 23% | 23% | 19% | 20% | 1% | 24% |
| Writing | 2007 | 30% | 20% | 19% | 24% | 24% | 17% | 20% | 1% | 24% |
| | 2006 | 27% | 16% | 20% | 14% | 13% | 10% | 18% | 1% | 21% |
| Science | 2007 | 19% | 11% | 26% | 22% | 22% | 17% | 20% | 1% | 24% |
| | 2006 | 16% | 9% | 14% | 14% | 14% | 10% | 18% | 1% | 21% |
| All Tests | 2007 | 13% | 7% | 8% | 11% | 11% | 7% | 10% | 1% | 24% |
| | 2006 | 11% | 6% | 8% | 7% | 7% | 6% | 10% | 1% | 24% |
### Appendix E AEIS sample report

**TEXAS EDUCATION AGENCY**

**Academic Excellence Indicator System**

**2006-07 Campus Performance**

**Section I - Page 2**

**Total Students:** 467

**Grade Span:** KE - 12

**School Type:** Elementary

<table>
<thead>
<tr>
<th>Indicator</th>
<th>State</th>
<th>District</th>
<th>Campus Group</th>
<th>Campus</th>
<th>African American</th>
<th>Hispanic</th>
<th>White</th>
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<td>&gt; 99%</td>
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<tr>
<td></td>
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<td>91%</td>
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<td>99%</td>
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**SBA I Exams** (Sum of All Grades Tested)

**Reading/ELA**

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</table>

**Mathematics**

|        | 2007 | 90% | 84% | > 99%| 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% |
|--------|------|-----|-----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|        | 2006 | 85% | 83% | 93% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% |

**Writing**

|        | 2007 | 79% | 70% | 87% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% |
|--------|------|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|        | 2006 | 68% | 69% | 89% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% |

**All Tests**

|        | 2007 | 82% | 72% | 85% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% | 9% |
|--------|------|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|        | 2006 | 74% | 67% | 84% | 86%| 86%| 86%| 86%| 86%| 86%| 86%| 86%| 86%| 86%| 86%| 86%| 86%| 86%|
### Appendix E  AEIS sample report

#### District Name: DALLAS ISD  
Campus Name: JOHN H FEHNER EL  
Campus # : 057905192  

#### Texas Education Agency  
Academic Excellence Indicator System  
2006-07 Campus Performance  

#### Table: 2007 TAKS/TAKS-Y/HDAA XI/TAKS-Alt Participation  
(Grades 3-11)

<table>
<thead>
<tr>
<th>Indicators:</th>
<th>State</th>
<th>District</th>
<th>Campus Group</th>
<th>Campus</th>
<th>African American</th>
<th>Hispanic</th>
<th>White</th>
<th>Native American</th>
<th>Pacific Is</th>
<th>Male</th>
<th>Female</th>
<th>Special Ed</th>
<th>Exam Dereg</th>
<th>LEF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested</td>
<td>97.7%</td>
<td>95.4%</td>
<td>98.8%</td>
<td>98.3%</td>
<td>98.3%</td>
<td>0</td>
<td>0</td>
<td>100.0%</td>
<td>96.1%</td>
<td>180.0%</td>
<td>99.2%</td>
<td>94.4%</td>
<td>111.8%</td>
<td>81.6%</td>
</tr>
</tbody>
</table>

#### By Program

| TAKS (1 or more) | 91.3% | 90.4% | 92.3% | 97.4% | 97.4% | 0 | 97.4% | 0 | - | 98.3% | 96.1% | 93.2% | 96.1% | 98.2% | 99.2% | 94.4% |
|-------|-------|-------|-------|-------|-------|---|-------|---|---|-------|-------|-------|-------|-------|-------|-------|-------|
| Not on TAKS | 6.7% | 6.9% | 5.8% | 0.6% | 0.6% | 0 | 0.6% | 0 | 0 | 0.8% | 0.8% | 7.7% | 0.8% | 0% | 0% | 1.4% |
| TAKS-Y Only | 0.3% | 0.1% | 0.0% | 0.0% | 0.0% | 0 | 0.0% | 0 | 0 | 0.1% | 0.1% | 6.6% | 0.1% | 0% | 0% | 0% |
| HDAA XI Only | 4.8% | 4.7% | 3.7% | 0.4% | 0.4% | 0 | 0.4% | 0 | 0 | 0.8% | 0.8% | 7.7% | 0.8% | 0% | 0% | 1.4% |
| TAKS-Alt Only | 0.4% | 0.4% | 0.0% | 0.0% | 0.0% | 0 | 0.0% | 0 | 0 | 0.1% | 0.1% | 6.6% | 0.1% | 0% | 0% | 0% |
| Combination | 1.4% | 1.4% | 1.6% | 0.0% | 0.0% | 0 | 0.0% | 0 | 0 | 0.1% | 0.1% | 6.6% | 0.1% | 0% | 0% | 0% |

#### By Root States

<table>
<thead>
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<th>Female</th>
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</tr>
</tbody>
</table>

#### Total Count

| Total Count | 3,001,657 | 102,138 | 275 | 266 | 1 | 264 | 0 | 140 | 126 | 19 | 247 | 48 |

#### Section I - Page 4  
Total Students: 467  
Grade Span: K-6  
School Type: Elementary
Appendix E  AEIS sample report

Texas Education Agency
Academic Performance Indicator System
2006-07 Campus Performance

District Name: DALLAS ISD
Campus Name: JOHN Q FELDER EL
Campus #: 85705192

Section I - Page 5

Total Students: 467
Grade Span: K-06
School Type: Elementary

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<td>Percent of Failers Passing TAKS</td>
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<tr>
<td>2006</td>
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<tr>
<td>2006</td>
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</tbody>
</table>

Student Success Initiative

Grade 1 Reading (English and Spanish)

| Students Requiring Accelerated Instruction |       |          |        |                  |          |       |                 |                  |      |        |            |      |       |     |
|-------------------------------------------|-------|----------|--------|------------------|----------|-------|-----------------|                  |      |        |            |      |       |     |
| 2007                                      | 12%   | 34%      | 18%    | 25%              | 25%      | 25%   | 25%            |                  |      |        |            |      |       |     |
| 2006                                      | 13%   | 21%      | 15%    | 24%              | 25%      | 25%   | 25%            |                  |      |        |            |      |       |     |
| TAKS Cumulative Not Standard (First and Second Administrations) |       |          |        |                  |          |       |                 |                  |      |        |            |      |       |     |
| 2007                                      | 94%   | 85%      | 95%    | 43%              |          | 43%   | 43%            |                  |      |        |            |      |       |     |
| 2006                                      | 94%   | 88%      | 91%    | 39%              |          | 39%   | 39%            |                  |      |        |            |      |       |     |
| TAKS Failers Promoted by Grade Placement Committee |       |          |        |                  |          |       |                 |                  |      |        |            |      |       |     |
| 2006                                      | 48.4% | 59.6%    | 50.0%  | 28.0%            | 28.0%    | 28.0% | 28.0%          |                  |      |        |            |      |       |     |
| TAKS Not Standard/HDAA IX Not AND Expectations (Failed in Previous Year) |       |          |        |                  |          |       |                 |                  |      |        |            |      |       |     |
| Promoted to Grade 4 2007                  | 23%   | 23%      | 17%    |                  |          | 17%   | 17%            |                  |      |        |            |      |       |     |
| 2006                                      | 24%   | 21%      | 17%    |                  |          | 17%   | 17%            |                  |      |        |            |      |       |     |
| Retained in Grade 3 2007                  | 42%   | 71%      | 59%    |                  |          | 59%   | 59%            |                  |      |        |            |      |       |     |
| 2006                                      | 86%   | 80%      | 83%    |                  |          | 83%   | 83%            |                  |      |        |            |      |       |     |
Appendix E  AEIS sample report

<table>
<thead>
<tr>
<th>Indicators</th>
<th>State</th>
<th>District</th>
<th>Campus Group</th>
<th>Campus</th>
<th>African American</th>
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<td>96.7%</td>
<td>97.3%</td>
</tr>
</tbody>
</table>

*9:* Indicates that the data for this item were statistically improbable, or were reported outside a reasonable range.

*0:* Indicates results are masked due to small numbers to protect student confidentiality.

1:* Indicates zero observations reported for this group.

"n/a" indicates data reporting is not applicable for this group.
### Class Size Information

(derived from teacher responsibility records.)

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<tr>
<th>Class Size Averages by Grade and Subject:</th>
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<th>Campus Group</th>
<th>District</th>
<th>State</th>
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<tr>
<td><strong>Secondary:</strong></td>
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<tr>
<td>English/Language Arts</td>
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<tr>
<td>Foreign Languages</td>
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<td>22.3</td>
<td>17.8</td>
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</tr>
<tr>
<td>Sciences</td>
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<td>18.3</td>
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<tr>
<td><strong>Social Studies</strong></td>
<td>-</td>
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<td>17.1</td>
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</table>
### Actual Operating Expenditures Information

<table>
<thead>
<tr>
<th></th>
<th>General Fund</th>
<th>Per Student</th>
<th>All Funds</th>
<th>Per Student</th>
<th>All Funds</th>
<th>Per Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>By Function:</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Total Operating Expenditures</td>
<td>$2,614,185</td>
<td>100.0%</td>
<td>$6,792</td>
<td>100.0%</td>
<td>$6,596</td>
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<tr>
<td>Instructional (31,91)</td>
<td>$2,063,767</td>
<td>78.1%</td>
<td>$1,122</td>
<td>78.1%</td>
<td>$1,084</td>
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<tr>
<td>Instructional - Related Services (12,13)</td>
<td>$299,955</td>
<td>11.4%</td>
<td>$122</td>
<td>11.4%</td>
<td>$122</td>
<td>11.4%</td>
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<tr>
<td>Instructional Leadership (21)</td>
<td>$173,075</td>
<td>6.7%</td>
<td>$82</td>
<td>6.7%</td>
<td>$82</td>
<td>6.7%</td>
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<tr>
<td>School Leadership (22)</td>
<td>$237,138</td>
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<td>$108</td>
<td>9.1%</td>
<td>$108</td>
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<tr>
<td>Support Services - Student (31,22,23)</td>
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<td>$18</td>
<td>2.2%</td>
<td>$18</td>
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<tr>
<td>Other Campus Costs (32,36,38,53)</td>
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<td>$52</td>
<td>5.1%</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Campus Group</th>
<th>General Fund</th>
<th>Per Student</th>
<th>All Funds</th>
<th>Per Student</th>
<th>All Funds</th>
<th>Per Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>By Program:</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Total Operating Expenditures</td>
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<tr>
<td>Bilingual/ESL Education (25)</td>
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<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
<td></td>
</tr>
<tr>
<td>Career &amp; Technology Education (22)</td>
<td>$90,327</td>
<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
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<tr>
<td>Accelerated Education (24, 20)</td>
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<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
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</tr>
<tr>
<td>Gifted &amp; Talented Education (21)</td>
<td>$90,327</td>
<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
<td></td>
</tr>
<tr>
<td>Special Education (23)</td>
<td>$90,327</td>
<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
<td></td>
</tr>
<tr>
<td>Other (36, 38, 53)</td>
<td>$90,327</td>
<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
<td>$42</td>
<td>3.4%</td>
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</tbody>
</table>

### Program Information

<table>
<thead>
<tr>
<th></th>
<th>Campus</th>
<th>Count</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Student Enrollment by Program:</td>
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</tr>
<tr>
<td>Bilingual/ESL Education</td>
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<td>43.1%</td>
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</tr>
<tr>
<td>Career &amp; Technology Education</td>
<td>0</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>Gifted &amp; Talented Education</td>
<td>75</td>
<td>10.9%</td>
<td></td>
</tr>
<tr>
<td>Special Education</td>
<td>75</td>
<td>10.9%</td>
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</tbody>
</table>

### Teachers by Program (population served)

<table>
<thead>
<tr>
<th></th>
<th>Campus</th>
<th>Count</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Bilingual/ESL Education</td>
<td>15.7</td>
<td>45.1%</td>
<td></td>
</tr>
<tr>
<td>Career &amp; Technology Education</td>
<td>0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Special Education</td>
<td>2.0</td>
<td>5.9%</td>
<td></td>
</tr>
</tbody>
</table>

---

*"Y" indicates that the data for this item were statistically improbable, or were reported outside a reasonable range.*

*"Y" indicates that results are masked due to small numbers to protect student confidentiality.*

*"W/A" indicates that data reporting is not applicable for this group.*