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Beliefs of District Administrators Regarding Student Technology Use

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The purpose of this study was to determine the beliefs and priorities of district wide leaders regarding technology use. Twenty-three district technology and curriculum leaders representing 83.3% of the districts statewide expressed their priorities and beliefs by responding to a multi-part online survey. In one area of the survey leaders were asked their projections, specifically to project student technology use. The results indicate that across 70% of the items, significant increases were noted when comparing leaders' beliefs about recent student technology use to 2007 estimates of student technology use. This study, which emphasizes comparisons of state data, may serve as a model for other states' examinations of local student technology use.

Keywords: beliefs, district, leaders, technology use

INTRODUCTION

This research study provides information and findings related to technology use and technology integration in public schools on a statewide basis. The purpose of this study is to determine the beliefs and priorities of district wide leaders regarding technology use and integration within Maryland public schools. Specifically, what do these leaders see as current trends in technology use and integration within schools in their district? How do these leaders' beliefs relate to other measures of student technology use?

This research was conducted within the context of the notion, that "technology is not one thing but many things that can be woven into the instructional environment by a teacher to assist the teaching and learning process" (Lawless & Pellegrino, 2004, p. 578) within K-12 schools. The literature supports the finding that technology integration is influenced by the support that comes from a myriad of factors including peers, administration, and the community (Inan & Lowther, 2009; Mumtaz 2000).

Technology use and integration is defined in this study as student use of computing information technology to learn subject area content information, and specific concepts. Throughout this study, technology use is connected to student learning and understanding that can be enhanced through technology use and integration in a variety of methods and processes (Lawless, & Pellegrino, 2004). For example, technology use includes computers, media, and digital devices that afford student opportunities to investigate problems, gather, organize, manipulate, analyze, and report data as well as create reports and projects

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(Lawless, & Pellegrino, 2004). Technology is defined as information technology such as computers, including devices that can be attached to computers, networks (e.g., Internet, local networks), and computer software (Gray, Thomas, & Lewis, 2010). This study seeks greater understanding of leaders' beliefs about K-12 public school student use of technology based on these definitions.

LITERATURE REVIEW

This literature review provides a summary of research related to educational leaders' impacts on student technology use in schools. In addition, recent studies on student technology use are highlighted. The intent is to provide context and relevant findings from prior research related to the keys themes of this study.

To date "…technology integration research has identified several critical variables thought to be important in regard to achieving effective technology integration, such as teacher characteristics, access to technology, support, and so on" (Inan & Lowther, 2009, p. 138).

LEADERS IMPACT ON TECHNOLOGY USE

Dawson and Rakes (2003) completed a study in which they investigated whether technology training received by school principals influenced the integration of technology into classrooms. The results of the study indicated that technology training principals received was statistically significant, indicating that training can influence levels of integration into a school's curricula. The principal is the key facilitator in the effort to infuse technology in a school.

In a summary within their study, Zhao and Frank (2003) note that prior research has resulted in a long and all-inclusive list of factors that may affect the uses of technology in schools. The research of Zhao and Frank (2003) as well as Anthony (2012) provides the larger context and highlights the fact that these variables are often interrelated.

The purpose of a study by Clark (2006) was to examine the views of educators regarding the practices of effective use of technology in high schools. The results indicate that three out of the five highest-rated practices in the study were related to the school culture. This result is significant in that it shows that all participants communicated the importance of a school's culture as a key element in the effective implementation of technology in schools. Clark believes that for teachers to be successful, administrators who represent an integral part of the culture must support them.

A study by Inan and Lowther (2009) collected and analyzed data about student use of technology in 54 schools. Inan and Lowther (2009) indicated that overall support of teachers took the second highest importance within the variables affecting technology integration, while teacher readiness showed the strongest relationship with technology integration. In this study, administrative support is included in this variable of overall teacher support.

Miranda and Russell (2011) completed a secondary analysis of the Massachusetts state technology data set to inform educators about the factors affecting instructional technology use in elementary classrooms. According to the authors, strong predictors of teacher-directed student use of technology included perceived pressure to use technology, principals' use of technology, and principals' technology discretion.

In their research review, Hew and Brush (2007) highlight school leadership can hinder the integration of technology by teachers. They note that leaders' shared vision of learning and teaching, including the role of technology use, can serve as a driving force for

overcoming barriers. They see a vision and plan for technology use as important steps in the process of guiding the use and integration of technology.

These research studies (Clark, 2006; Dawson & Rakes, 2003; Hew & Brush, 2007) indicate that there are a limited number of investigations which examine the relationship between technology integration and school leaders. Based on the research in the field, there are trends that underscore the relationship between leaders' roles and technology use within schools (Anthony, 2012; Clark, 2006; Dawson & Rakes, 2003; Inan & Lowther, 2009; Wizer & McPherson, 2005). Highlighting the need for the current study to focus on the beliefs and priorities of educational leaders regarding student technology use in schools.

STUDENT TECHNOLOGY USE

A recent study by Combs (2010) investigated the use of technology by teachers and students in a large school system. Middle and high school social studies teachers were asked to complete a survey which addressed their use of technology. The study's findings indicate that use of instructional technology in social studies classes is still limited; teachers tend to use the technology for their own uses, such as test development and communication with parents, which is consistent with national data (Combs, 2010).

A federal report by Gray, Thomas, and Lewis (2010) conducted a national teacher survey on schools' use of technology. Estimated prevalence of student use of technology, at least sometimes, ranged between 9% and 69%, depending on task. For example, students use technology to learn or practice basic skills (69%), conduct research (66%), prepare written text (61%), create or use graphics or visual displays (53%), develop and present multimedia presentations (42%), conduct experiments or perform measurements (25%), and use blogs or wikis (9%; Gray, Thomas, & Lewis, 2010). These results are presented to provide examples of the types of technologies used in schools by students. Several of these items relate directly to data collected in this study and are compared in the discussion section.

In summary, the current use of technology in schools appears to vary based on subject area; use in areas of writing and remediation of skills occur most often. The student use of technology in classrooms varies widely from none, or minimal, to frequent (Gray, Thomas, & Lewis, 2010; Smith & Throne, 2007). Overall, it is difficult to determine from a global perspective how often technology is used by students in schools (Smith & Throne, 2007).

Leaders have a substantial impact on technology use by students although research that studies the impact of the leader is incomplete (Clark, 2006; Dawson & Rakes, 2003; Hew & Brush, 2007; Macaulay, 2009; Wizer & McPherson, 2005). This research seeks to add information to the field about how leaders' beliefs relate to other indicators of student technology use.

PURPOSE AND RESEARCH QUESTIONS

The purpose of this study is to determine the beliefs and priorities of district wide leaders regarding technology use and integration within Maryland public schools. The research questions addressed in this study include:

1. How do (baseline) student technology use trends differ from 2004 to 2007 as reported by school-based personnel?
2. How do student technology use trends as reported by school-based personnel in 2007 differ from those reported by district-based administrators in 2012?
3. How do student technology use trends as self-reported by students in 2009 differ from those reported by district-based administrators in 2012?

METHOD

STUDY BACKGROUND

A major focus of this current research process was to survey current educational leaders, including seventy-three district technology and curriculum leaders across Maryland. Participants were requested to express their priorities and beliefs by responding to an online survey. The survey presented respondents with prior data estimates about their districts use of technology by students in schools as a starting point for eliciting the priorities of the leaders. The prior data was derived from statewide inventory survey of technology use in Maryland public schools (Maryland State Department of Education, 2007). Because the current study's data collection efforts (in 2012) presented leaders with existing data from 2007 and 2009 this next section will provide information about these data as it relates to this study.

STATEWIDE SCHOOL INVENTORY (2004 AND 2007) AND STUDENT PROFICIENCY DATA (2009)

School-based educators completed a statewide inventory survey each year called the Maryland Technology Inventory Report (MTIR), created by Maryland State Department of Education (MSDE, 2007). The current study used 2007 data, the last year in which this data is available online, and the data from the first year reported in the current study, 2004. The 2007 report has five sections concerning how teachers and students use technology in the teaching and learning process, which include technology infrastructure, expertise of teachers, technology usage, technology support, and school & district profiles. MTIR survey administrators requested that a knowledgeable educator in each school complete the survey.

The ten items (or areas of technology use) for this study were selected from nineteen student technology use items from the statewide school survey. These ten items were selected if the statewide mean use was over 25% or the item related specifically to items collected in a survey conducted by MSDE in 2009 to examine students' technology proficiency. The focus of this current study included these items: Accommodate for a disability or limitation; Communicate/report information, conclusions; Create graphics or visuals; Develop a more complete understanding of complex material; Gather information/data from a variety of sources; Organize and store information; Plan, draft, proofread, revise and publish written text; Plan, refine, produce multimedia presentations; Remediate for basic skills; and Support via individualized learning or tutoring. (The ten statewide school survey items are also included in Appendix A.) The responses reported throughout this current study about student use of technology indicate that the technology was used every day or almost every. The statewide inventory survey data collected by MSDE in 2004 and 2007 are presented in the results of this study (see Table 1). This is aggregated data from each school in the district, which includes multiple responses from each district. Based on population of the district there is a range of potential schools (and responses) within each district.

The state of Maryland collected data about students' proficiency in using technology in 2009. This data collection occurred in seventh grade classrooms in which students were asked to self-report their technology proficiency. The nine items (or areas of technology use), from the 2009 student proficiency survey, included in this study include: Access [use] class information like grades, notes, podcasts, PowerPoint presentations, etc.; Communicate using text [texting], email, IM, video conferencing or posting blogs or wikis; Conduct research; Conduct virtual experiments or simulations; Create documents, slide

shows, videos, podcasts or web pages for an assignment; Play educational games; Use web tools to create a list of resources to remember and share; Use web tools to create or modify and upload videos, music, audio and animation; and Write or contribute to a blog or wiki. (The nine student proficiency survey items are also included in Appendix B.) The students' proficiency in using technology collected by MSDE in 2009 is presented in the results of this study (see Table 3).

PARTICIPANTS- ONLINE SURVEY OF STATE LEADERS

In the current study, school district technology and curriculum leaders across Maryland were requested (in 2012) to express their priorities and beliefs by responding to an online survey. These public school technology leaders are the primary group upon which this study is focused, because they guide practices within districts and schools throughout the state. The (technology) leaders who responded to the survey include district level administrators who direct, manage and/or supervise in areas such as curriculum, educational or instructional technology, and school library media. In some districts, one person may hold two of these positions and in other districts two people may have joint responsibility for these tasks. The names of the leaders were obtained from lists provided by the Maryland State Department of Education. In addition, school district web sites were consulted to locate recent staff updates in these public school districts. Overall, seventy-three district leaders representing all twenty-four Maryland districts were requested via e-mail to respond to an online survey instrument.

SURVEY INSTRUMENT

The survey instrument contained nineteen items, was divided into two parts, and provided district and state specific student technology use data. (An example of the survey administered to district administrators is included in Appendix C.) The first part of the survey included ten items. These first ten questions asked leaders: "Currently, how often do you estimate that students use various technologies at school?" The leaders were presented with the 2007 data to include each of the ten areas or items for their district. Leaders were then asked to provide estimates of the percentage of technology uses that occur- every day or almost every day.

The second part of the survey instrument contained nine questions in which leaders were presented with statewide student technology proficiency data from student reports of technology proficiency. For example, the survey provided the statewide percentage of students using technology to conduct research (67% in 2009). Then the respondents were asked "Currently, what percentage of students in your district do you estimate proficiently use technology to conduct research?" These nine student technology proficiency items were asked in a similar fashion to this example (see Appendix C).

PROCEDURES

In an effort to create consistency, the current study used previously tested survey items found in these two statewide surveys (MSDE, 2007 & 2009). The wording and content of the ten items from the 2004 and 2007 school surveys are reflected in the first part of the questions in the current survey. The wording and content of the nine items from the 2009 student proficiency survey are reflected in the second part of the questions in the current survey.

The validity of the survey instrument was enhanced by having a group of five educational experts review the items for usability and clarity. Feedback from this pilot

group enhanced the final version of the online survey. The expert review provided feedback and matched item from the two MSDE surveys from 2007 and 2009. In addition, experts provided clarity by adding more current technology use examples. This original survey item – "students' proficiently communicate using text [texting], email, IM, video conferencing or posting blogs or wikis"- was enhanced by the addition of the term texting. Two additions (of this nature) to enhance currency of the survey were inserted within items from the original text.

The validity and credibility of the survey completers is also important to this process, as these educational leaders are knowledgeable about technology use in within their district's schools. The (technology) leaders who responded to the survey include district level administrators who direct, manage and/or supervise in areas such as curriculum, educational (or instructional) technology, and school library media. A substantial portion of the job of these leaders is to regularly observe, assist, and manage a range of school-based technology using teachers in their district including school library media specialists, and educational technologists.

Using items from an existing statewide survey produced by MSDE enhanced content validity. Prior data serves as an anchor to the responses by the education leaders in this study (MSDE, 2007 & 2009). The panel that judged the content items in this study consisted of higher education technology leaders. These four faculty members all have appointments within the Instructional Technology Program in a College of Education and have substantial teaching and research experience in working with school based educators and future teachers.

A limitation of this research is that the sources of the data differ. The data collected in the current study includes the beliefs and priorities of district leaders. The results from 2004 and 2007 represent student use data collected and reported by school-based educators. In 2009 student proficiency data was collected which was self-reported by seventh grade students. Thus, results in some areas should be reviewed in light of this limitation.

RESULTS

Overall in the current study, twenty-three leaders (representing a 31.5% response rate) of the seventy-three possible participants responded by completing at least one of the three parts of the online survey. Twenty of the leaders' responses were complete in all three parts. Across the twenty-four districts statewide, leaders from twenty different districts responded representing an 83.3% district response rate. Three districts had two leaders who responded to the current study. For most analyses, a series of *t*-tests were employed to determine significant increases in educational leaders' views about students' use of technology in schools.

RESEARCH QUESTION 1. TECHNOLOGY USE 2004 AND 2007

As a point of baseline comparison, statewide inventory data for student technology use from 2004 and 2007 were analyzed to determine if significant changes were noted in this historic student use data. The results indicate that for three of the ten items, significant increases were noted in comparing the districts means from 2004 to those in 2007. Increases in student use of technology were noted in all of the ten items (although seven were non-significant). Table 1 presents these t-test comparisons of student use data. The items in which significant increases were noted include: "Accommodate for a disability or limitation"; "Plan, refine, produce multimedia presentations"; and "Support via individualized learning or tutoring". Thus, during a brief 3-year period a significant change is noted in three areas of students' use of technology in schools. The source of the data

from these results in 2004 and 2007 are believed to represent student use data collected as reported by school-based educators.

Table 1. Differences in student technology use*: t*-tests

Mean % scores (standard deviations) reported for 2004 & 2007- everyday or almost everyday use

Item	**2004**	**2007**	**% Difference**	***t***
Accommodate a disability	48.8 (19.4)	57.5 (23.9)	8.7	2.17*
Gather info from sources	50.3 (17.7)	56.2 (21.9)	5.9	1.50
Remediate for basics	47.7 (20.5)	52.5 (23.4)	4.8	1.83
Support individual learning	34.5 (20.8)	43.6 (23.3)	9.1	3.15**
Plan & publish written text	39.3 (16.3)	41.0 (23.9)	1.7	.38
Communicate/report info	24.3 (11.9)	30.9 (21.1)	6.6	1.70
Create graphics or visuals	18.1 (11.0)	22.8 (20.6)	4.7	1.28
Organize and store info	16.8 (9.3)	20.0 (12.3)	3.2	1.33
Plan produce multimedia	8.7 (5.8)	14.9 (13.4)	6.2	2.37*
Develop more understanding	6.3 (4.2)	10.4 (13.0)	4.1	1.54

Note: * =significance at <.05; ** =significance at <.01; *n*= 24 districts; *df*=23
Source: MSDE, Maryland Statewide Inventory Survey, 2004 and 2007

RESEARCH QUESTION 2. TECHNOLOGY USE 2007 AND 2012

In part one of the 2012 survey respondents were asked: "Currently, how often do you estimate that students use various technologies at school?" The leaders were presented with the 2007 data in each of these ten items for their district. The responses reported student use that occurs everyday or almost everyday.

Significant increases in seven of the ten items were noted in comparing the districts' means from 2007 to the leaders' responses in the current study (see Table 2 for these t-test comparisons). The seven items in which significant increases were noted include: "Communicate/ report information, conclusions"; "Create graphics or visuals"; "Develop a more complete understanding of complex material"; "Gather information/data from a variety of sources;" "Organize and store information"; "Plan, draft, proofread, revise and publish written text"; and "Plan, refine, produce multimedia presentations". For all items the means increased in comparing the 2007 data to the responses of the leaders in 2012.

Three items that did not indicate significant changes are: Accommodate for a disability or limitation; Remediate for basic skills; and Support via individualized learning or tutoring. That finding is unexpected as two of these items indicated significant changes from 2004 to 2007.

The sources of the data differ in that the data collected in the current study are the beliefs of district leaders, while the results from 2004 and 2007 represent student use data collected and reported by school-based educators.

A significant increase in student use of technology was noted for these items related to writing and reporting information such as- "Communicate/report information, conclusions"; "Gather information/data from a variety of sources"; "Organize and store information"; and "Plan, draft, proofread, revise and publish written text" in comparing leaders beliefs 2012 to the 2007 data. The districts leaders are now noting a significant increase in area related to the writing process as this differs from the 2004 to 2007 data.

Overall these results indicate that significant increases are noted in over two-thirds of these items. Across these ten items, leaders believe that students are using more technology in schools on a regular basis for all items in 2012 compared with 2007.

Table 2. Differences in leaders' beliefs about student technology use: *t*-tests

Mean % scores (standard deviations) reported for 2007 & 2012- everyday or almost everyday use

Item	**2007**	**2012**	**% Difference**	***t***
Gather info from sources	56.3 (23.3)	67.1 (21.4)	10.8	4.16**
Accommodate a disability	59.6 (25.4)	60.9 (29.2)	1.3	.20
Plan & publish written text	42.1 (25.9)	53.2 (26.2)	11.1	3.77**
Remediate for basics	53.1 (24.5)	55.3 (23.6)	2.2	.35
Organize and store info	20.8 (13.1)	49.9 (25.2)	29.1	6.65**
Support individual learning	44.2 (24.7)	48.4 (24.0)	4.2	.87
Communicate/report info	30.9 (23.0)	44.2 (24.0)	13.3	3.93**
Create graphics or visuals	24.4 (22.2)	33.1 (21.0)	8.7	3.77**
Plan produce multimedia	15.4 (14.5)	27.0 (20.5)	7.6	3.41**
Develop more understanding	11.1 (13.9)	23.7 (20.7)	12.6	4.47**

Note: ** =significance at <.01; *n*= 20 *df*= 19; paired t-test used
Source: MSDE, *Maryland Statewide Inventory Survey*, 24 Districts in 2007; *n*= 21 in 2012

RESEARCH QUESTION 3. TECHNOLOGY USE 2009 AND 2012

In the last section, the survey leaders were presented with 2009 statewide student technology proficiency data. In the current study, leaders were asked to estimate students' technology proficiency in their districts. Due to limited availability of state data, it was not possible to run t-tests to determine differences with these data. Across the nine items, the differences in the means between the statewide data from 2009 and the districts leaders 2012 beliefs about student proficiency varied from -13.3% to 10.2% (as noted in Table 3). For two items the difference between leaders' view about students' proficiency and students' own reports was greater than 10%. The item that indicated a decrease in leaders' beliefs was to "conduct virtual experiments or simulations" (-13.3%). One item showed an increase of over 10% in which students "communicate proficiently using text [texting], email, IM, video conferencing or posting blogs or wikis" (10.2%).

Table 3 Differences in leaders' beliefs and student technology proficiency

Means reported 2009 student proficiency, 2012 leaders' proficiency beliefs, & % difference

Item	**Student Proficiency 2009**	**Leaders' Beliefs 2012**	**% Difference**
Communicate using text, email	65.5	78.8	13.3
Access class information	61.6	67.8	6.2
Play educational games	60.9	65.6	4.7
Create documents	67.8	69.7	1.9
Use web to create lists	59.3	59.1	-.2
Use tools- create video, media	65.3	64.7	-.6
Write via blog, wiki	57.3	55.3	-2.0
Conduct research	67.0	60.0	-7.0
Conduct virtual experiments	62.2	52.0	-10.2

Source: MSDE, Maryland Student Proficiency Data, 2009; *n*= 21 in 2012

DISCUSSION

CURRENT TECHNOLOGY USE

Maryland state school district leaders responded about the current use of technology in each of ten items for their district, which was compared to the equivalent data from 2007. These responses provide a useful picture about how often district leaders believe students are using technology and changes that occurred over a 5-year period ending in 2012. The results indicate that for seven of the ten items, significant increases were noted in comparing the districts' means from 2007 to the responses from the leaders in 2012. Intuitively, these results are predictable, as many educators believe that technology use in schools has grown in recent years.

When compared to the historic data from the statewide inventory survey 2004 to 2007, these results are consistent with growth in student technology use although significant changes are noted in different items. In short-term these data and related results support the notion that there is continual overall growth in student use of technology in schools from 2004 to 2012. An area of commonality over time is demonstrated by an overlap in the top five items reported in student technology use, as four of the five items were consistently noted as used most in the 2004 and 2007, and the 2007 and 2012 results. These four items are: "Accommodate for a disability or limitation"; "Gather information/data from a variety of sources"; "Plan, draft, proofread, revise and publish written text"; and "Remediate for basic skills." These four items can be placed in categories of using technology for accommodations or basic skills and preparation for writing processes and mirror national findings highlighted later in this report (Gray, Thomas & Lewis, 2010).

Across the seven items in which significant results were noted in the 2007 and 2012 only one item – "Plan, refine, produce multimedia presentations" – also indicated a significant change in the prior period (2004 and 2007). When viewing the two intervals from 2004 and 2007, and 2007 and 2012, increases are noted across all ten items on the survey during both intervals. These results are evidence of the on-going increasing student use of technology over time.

The areas of significant growth have shifted over time. Three items that did not indicate significant changes when comparing the 2007 data to the 2012 data collected in this study are: "Accommodate for a disability or limitation;" "Remediate for basic skills;" and "Support via individualized learning or tutoring." That finding is unexpected as these are items upon which many districts are expending resources during recent years. One can speculate that these results could represent a recent view that these are not cutting edge or current technology uses and thus the growth of their use is occurring at a slower pace. These two items – "Accommodate for a disability or limitation;" and "Support via individualized learning or tutoring" – indicated significant growth in the 2004 and 2007 comparison. The new data may indicate limited growth in these areas in recent years and perhaps may reflect a gradual shift in beliefs and/or priorities among school leaders.

Another area in which the findings were unexpected relates to student technology proficiency estimates from 2012 compared to 2009 state data. For two items the difference between leaders' views about students' proficiency and student reports differed by over 10%. The results for one item that indicate a decrease in leaders' estimates of students' proficiency "Conduct virtual experiments or simulations" are unexpected. Why leaders' beliefs in 2012 are reduced or lower compared to students' self-reported proficiency is not possible to explain via these data. It may be that leaders are less confident about students' proficiency in these areas. This skill does require higher-level thinking. Leaders may be indicating here that students are spending less time conducting research of this type and using these thinking skills.

LIMITATIONS OF RESEARCH

This report collected Maryland data thus the ability to generalize these results beyond the state is limited. The respondents represent a majority (over 80%) of the districts within the state of Maryland, suggesting sufficient breadth of coverage across the state. This is tempered, however, by the overall response rate of 30%.

In addition, the respondent population who reported this data varies, from school-based educators in 2004 and 2007, to student self-reports in 2009, and to school district leaders in 2012. Thus, we are limited in our ability to compare results across these varying groups and responders consistently. Plus, there are clear drawbacks inherent to self-reported data. We were limited in our ability to perform additional data analyses on students' technology proficiency (MSDE 2009), as this data was not separated for each district.

NATIONAL TECHNOLOGY USE

The results of this statewide inventory survey can be compared with select data collected on the national level. There are three items that are a consistently reported regarding student technology use on the national level (Gray, Thomas, & Lewis, 2010) and by the State of Maryland (2009). The national data from 2009 indicates that 66% of students sometimes or often conduct research, using technology. This data can be compared to state data from 2009 in which 67% of students use technology to conduct research every day or almost every day. In the current research, leaders believe that 60% of students use technology to conduct research every day or almost every day.

For the other two items, Maryland students use technology more often than national estimates suggest. For example, 57% of students in Maryland use blogs or wikis compared to 9% of students nationally. In addition, 62% of students in Maryland conduct virtual experiments compared to 25% of all U.S. students (Gray, Thomas, & Lewis, 2010). The leaders in Maryland believe that students are conducting experiments at a rate of 52% and using blogs or wikis at a 55% rate. On the surface, these results indicate that students in Maryland are using technology substantially more in select areas, than students nationally. Two reasons may be that Maryland is more progressive in having students use blogs and wikis and participating in virtual field trips. Perhaps, there is greater access to these technologies related to better resource availability.

Four items in the national data (Gray, Thomas, & Lewis, 2010) are compared to 2007 Maryland data. Similar items in the Maryland survey from 2007 found these results (national data is noted in parenthesis): "Create graphics or visuals" at 23% (compare to 53% nationally), "Plan, and publish written text" at 41% (61%); "Plan, refine, produce multimedia presentations" at 12% (42%), and "Remediate for basic skills" at 42% (69%). The leaders' beliefs in 2012, as evidenced in the current study about student technology use in these areas reveals the following outcomes: "Create graphics or visuals" at 33%, "Plan, and publish written text" at 55%, "Plan, refine, produce multimedia presentations" at 27%, and "Remediate for basic skills" at 52%. In most of these cases, the state data indicates substantially lower technology use, possibly in regions where schools are not as progressive in facilitating student use of technology. This study highlights persistent overall trends in increased technology use during the duration of this study. A portion of substantial use differences is evident in comparing data over time. Finally, these trends may be better understood at the local school district level, which is beyond the scope of this study.

TECHNOLOGY USE COMPARISONS

This study, which emphasizes comparisons of state data, may serve as a model for other states' examinations of local student technology use patterns. It can be instructive to compare and analyze state and national data in order to provide policy makers and educators at all levels with useful contextual and comparative information. These data and related information can be used to inform decisions on topics ranging from district and school level resource allocation to professional development for educators. While there are some inherent limitations to employing comparative data, this study highlights some of the potential benefits.

CONCLUSIONS

The results of studies by Inan and Lowther (2009) and Clark (2006) indicated that administrative support, which represents an integral part of the school culture, is an important variable affecting technology use and integration. This argument is supported by these study results for district leaders' on-going impact on school culture. The impact of district leaders' priorities and beliefs may be evident in specific areas of technology use such as information access and the writing process. Future research seeking to determine the relationship between specific student technology uses and leaders' support for such uses is suggested.

A consistent finding in the research literature is that leaders are key facilitators in the effort to have students use technology in schools (Clark, 2006; Dawson & Rakes, 2003; Inan & Lowther, 2009; Macaulay, 2009; Miranda, & Russell, 2011). The results of this study indicate that district leaders see a significant and growing role for technology use by students. These findings are consistent with trends reported by students and school-based educators that also note increasing student technology use. These results regarding leaders' beliefs of increasing student technology use provides promising data based on current conditions and when compared with the views of other educators and students. In the future, it is recommended that researchers investigate the link between leaders' beliefs and support for student technology use.

Finally, a summary of the findings follows. The results indicate that for three of the ten items regarding student technology use, significant increases were noted in comparing the districts means from 2004 to those in 2007. During this 3-year period, increases in student use of technology were noted in all of the ten items. The study results indicate that significant increases are noted in over two-thirds of these leaders' responses items in 2012 compared with 2007. These results highlight the growing importance of student technology use in schools.

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APPENDIX A: Statewide School Inventory (2004 and 2007)

Student Use of Technology for Achievement and Assessment

Results noted as every day or almost every day. Is technology used by students in your school to:

1. Accommodate for a disability or limitation (e.g. using assistive technology devices or software)
2. Communicate/report information, conclusions, or results of investigations (e.g. in word processing documents, e-mail, online discussion areas, multimedia presentations, or on a web site)
3. Create graphics or visuals (e.g. diagrams, pictures, figures)
4. Develop a more complete understanding of complex material or abstract concepts (e.g. through visual models, animations, simulations)
5. Gather information/data from a variety of sources (e.g. via Internet, World Wide Web, Online services, CD-ROM-based reference software)
6. Organize and store information (e.g. creating databases or spreadsheet files)
7. Plan, draft, proofread, revise and publish written text

8. Plan, refine, produce multimedia presentations
9. Remediate for basic skills (e.g. using drill and practice or tutorial software) Irregular basic tool use and drill and practice, integrated learning labs
10. Support individualized learning or tutoring (e.g. using computer or Web-based modules or courses)

APPENDIX B: Student Proficiency Data (2009)

Student technology use for schoolwork and outside of school. Results noted as proficient in these areas:

1. Access class information like grades, notes, podcasts, PowerPoint presentations, etc.
2. Communicate using text, email, IM, video conferencing or posting blogs or wikis.
3. Conduct virtual experiments or simulations.
4. Conduct research
5. Create documents, slide shows, videos, podcasts or web pages for an assignment.
6. Play educational games (including virtual reality).
7. Use web tools to create a list of resources to remember and share
8. Use web tools to create or modify and upload videos, music, audio and animation.
9. Write or contribute to a blog or wiki (my own or someone else's).

APPENDIX C: Current Survey of Maryland State Education Leaders 2012

Part A (uses county specific data which varies for each county):
Please review the 2007 data in these areas from your county and indicate your beliefs about current technology use by students in your county:

1. Gather information/data from a variety of sources.
2007 Results- Every day or almost every day: 50%
Currently, how often do you estimate that students- Gather information/data from a variety of sources-Every day or almost every day: Indicate- %

2. Organize and store information.
2007 Results- Every day or almost every day: 11%
Currently, how often do you estimate that students- Organize and store information-Every day or almost every day: Indicate- %

3. Communicate/report information, conclusions, or results of investigations.
2007 Results- Every day or almost every day: 14%
Currently, how often do you estimate that students- Communicate/report information, conclusions, or results of investigations-Every day or almost every day: Indicate- %

4. Plan, draft, proofread, revise and publish written text.
2007 Results- Every day or almost every day: 21%
Currently, how often do you estimate that students- Plan, draft, proofread, revise and publish written text-Every day or almost every day: Indicate- %

5. Create graphics or visuals.
2007 Results- Every day or almost every day: 14%

Currently, how often do you estimate that students- Create graphics or visuals-Every day or almost every day: Indicate- %

6. Plan, refine, produce multimedia presentations.

2007 Results- Every day or almost every day: 7%

Currently, how often do you estimate that students- Plan, refine, produce multimedia presentations - Every day or almost every day: Indicate- %

7. Develop a more complete understanding of complex material or abstract concepts.

2007 Results- Every day or almost every day: 7%

Currently, how often do you estimate that students- Develop a more complete understanding of complex material or abstract concepts - Every day or almost every day: Indicate- %

8. Support individualized learning or tutoring

2007 Results- Every day or almost every day: 36% A few times per month: 29%

Currently, how often do you estimate that students are- Supported via individualized learning or tutoring- Every day or almost every day: Indicate- %

9 Remediate for basic skills.

2007 Results- Every day or almost every day: 46%

Currently, how often do you estimate that students- Remediate for basic skills- Every day or almost every day: Indicate- %

10 Accommodate for a disability or limitation.

2007 Results- Every day or almost every day: 46%

Currently, how often do you estimate that students are- Accommodated for a disability or limitation- Every day or almost every day: Indicate- %

Part B: Future technology use by students

Please review the 2010 state data in these areas and indicate your beliefs and projections about <u>current and future</u> technology use by grade eight students in your county.

11. Statewide 2010 results indicate that 67% of students proficiently conduct research.

Currently, what percentage of students in your **county** do you estimate proficiently conduct research- %

In five years from now what percentage of students in your **county** will proficiently conduct research- %

12. Statewide 2010 results indicate that 59% of students proficiently use web tools to create a list of resources to remember and share.

Currently, what percentage of students in your **county** do you estimate proficiently use web tools to create a list of resources to remember and share- %

In five years from now what percentage of students in your **county** will proficiently use web tools to create a list of resources to remember and share- %

13. Statewide 2010 results indicate that 66% of students proficiently communicate using text [texting], email, IM, video conferencing or posting blogs or wikis.

Currently, what percentage of students in your **county** do you estimate proficiently communicate using texting, email, IM, video conferencing or posting blogs or wikis- %

In five years from now what percentage of students in your **county** will proficiently communicate using texting, email, IM, video conferencing or posting blogs or wikis- %

14. Statewide 2010 results indicate that 57% of students proficiently write or contribute to a blog or wiki.
    Currently, what percentage of students in your **county** do you estimate proficiently write or contribute to a blog or wiki- %
    In five years from now what percentage of students in your **county** will proficiently write or contribute to a blog or wiki- %

15. Statewide 2010 results indicate that 65% of students proficiently use web tools to create or modify and upload videos, music, audio and animation.
    Currently, what percentage of students in your **county** do you estimate proficiently use web tools to create or modify and upload videos, music, audio and animation- %
    In five years from now what percentage of students in your **county** will proficiently use web tools to create or modify and upload videos, music, audio and animation- %

16. Statewide 2010 results indicate that 68% of students proficiently create documents, slide shows, videos, podcasts or web pages for an assignment.
    Currently, what percentage of students in your **county** do you estimate proficiently create documents, slide shows, videos, podcasts or web pages for an assignment- %
    In five years from now what percentage of students in your **county** will proficiently create documents, slide shows, videos, podcasts or web pages for an assignment- %

17. Statewide 2010 results indicate that 62% of students proficiently conduct virtual experiments or simulations.
    Currently, what percentage of students in your **county** do you estimate proficiently conduct virtual experiments or simulations- %
    In five years from now what percentage of students in your **county** will proficiently conduct virtual experiments or simulations- %

18. Statewide 2010 results indicate that 62% of students proficiently access [use] class information like grades, notes, podcasts, PowerPoint presentations, etc.
    Currently, what percentage of students in your **county** do you estimate proficiently access [use] class information like grades, notes, podcasts, PowerPoint presentations, etc.- %
    In five years from now what percentage of students in your **county** will proficiently access [use] class information like grades, notes, podcasts, PowerPoint presentations, etc.- %

19. Statewide 2010 results indicate that 61% of students proficiently play educational games (including virtual reality).
    Currently, what percentage of students in your **county** do you estimate proficiently play educational games- %
    In five years from now what percentage of students in your **county** will proficiently play educational games- %

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