Practices for the Use of Technology in High Schools: A Delphi Study

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The Delphi method was used to generate practices regarding the use of technology in high schools. In addition to generating the practices, teacher leaders, administrators, researchers, and policymakers were asked to rate and come to consensus regarding their importance. Consensus was achieved on 32 of the 34 practices and six themes emerged around technology use in high schools: (a) community connection and support, (b) access, (c) research and policy, (d) professional development, (e) curriculum, and (f) school culture.

Although technology has had an enormously positive impact in the business arena, it has only had a small impact on the nation's education system (Pea, 2000). In spite of this, national polls and some education experts believe that technology should be incorporated into our nation's schools (Lemke & Coughlin, 1998; Pea). What is not agreed upon are the practices for effectively integrating technology into schools. While technology is making its way into schools, it has not had the impact as hoped for. Reasons for this lack of progress may include: limited up-to-date hardware and software, limited infrastructure and technical support staff, ineffective integration of technology into curricula, lack of compatibility among computers, and lack of staff development (Whitehead, Jensen, & Boschee, 2003). The speed at which technology is changing and advancing provides an additional challenge to educators as they struggle with the issue of educational technology (Education Week, 1997). The push to make technology available and

integrated into the schools has been coupled with a move toward education reform with an emphasis on accountability and assessment (Means, 1994).

The United States Department of Education and the International Society for Technology in Education (ISTE) produced standards for the use of technology in P-12 curricula. This resulted in the National Educational Technology Standards (NETS) project, whose primary goal was to "enable stakeholders in P-12 education to develop national standards for the educational uses of technology to facilitate school improvement in the United States" (ISTE, 1998, p. 1). Technology, in its many forms, has become a powerful tool to enhance curriculum and instruction. Even though there are a few educators investigating the effective use of technology, some educators lack the support, the resources, or the proper motivation to fully integrate technology into their classrooms (LeBaron & Collier, 2001).

Modern educational technologies have been conceived most frequently as instructional communicators, mediated teachers, and knowledge conveyors (Jonassen & Land, 2000). Much of the research regarding the use of technology in the classroom has shown a positive impact on student achievement (Bangert-Drowns, 1985; Christmann, Badgett, & Lucking, 1997; Jenks & Springer, 2002; Kulik, 1983, 1994, 2003; Kulik & Kulik, 1991; Waxman, Connell, & Gray, 2002; Schacter & Fagnano, 1999). In some instances and under certain conditions, it has been shown that technology helps students learn more, learn faster, become more motivated, and become more connected to the community and the outside world (Kulik, 1994; Lemke & Coughlin, 1998; Schacter & Fagnano, 1999). Although the use of technology in the classroom has been positive, the impact has been minimal (Kulik, 1994; Waxman et al., 2002). The correlation between student achievement and technology in schools has only been demonstrated in a few studies, so people continue to question the numerous calls for the use of computers in the classroom (Pea, 2000; Whitehead et al., 2003).

PURPOSE

According to Layton (as cited in Whitehead et al., 2003), the problem of technology use in schools is that planning efforts have been directed at where schools are now and how to move them forward rather than focusing on where we would like schools to be and then planning based on that vision. In many cases, this means that outdated technology implementations are being used in current learning environments. The purpose of this study was to examine the views of educators regarding the practices for the effective use of technology in high schools. The study sought to create consensus around the most effective practices identified by education experts.

METHODOLOGY

Delphi

The Delphi method earned its name from an Air Force-sponsored defense research study in the early 1950s, called *Project Delphi*. The objective of this original study was to obtain the most reliable consensus of opinions from a group of experts through a series of intensive questionnaires interspersed with controlled opinion feedback (Dalkey & Helmer, 1963). The Delphi methodology was chosen because it generates the maximum level of consensus among experts around a particular issue. This is not to say that the experts will all agree, but rather, the method will effectively expose exactly where there is consensus, and where there is not. "The Delphi method is most appropriate when there is an overarching problem that does not lend itself to precise analytical methods but could benefit, rather, from the subjective insights of experts who, in many cases, represent diverse backgrounds in terms of experience and expertise (Linstone & Turoff, 1975, p. 8)." Additionally, Delphi studies are often employed when it is necessary to involve more individuals than can be physically grouped together for lack of time, proximity, or resources.

Panels

Because multiple stakeholders should be involved in the discussion and research of effective technology use in high schools (Friel, 2001), four participant panels were created based on an examination of education research (LeBaron & Collier, 2001; Lemke & Coughlin, 1998). The four panels were: teacher leaders (panel 1), administrators (panel 2), researchers (panel 3), and policymakers (panel 4). The teacher leader panel (1) included technology coordinators, media specialists, and department heads. The administrator panel (2) was composed of principals, superintendents, and district administrators. The researcher panel (3) included scholars and researchers from universities, nonprofit, private, and government organizations. The policymaker panel (4) was composed of local, state, and national education policymakers.

In an effort to obtain varied points of views, and to have the panels be geographically diverse, a nation-wide search was conducted to solicit participation in the study. Participants were selected based on recommendations from practitioners, researchers, and policymakers. The criteria used for the selection of participants included experience, expertise, and knowledge

about the overarching issue of technology use in high schools. The identification process yielded 187 potential participants.

Research Questions

The Delphi method was used to get educators to identify and come to consensus on the practices for effective use of technology in high schools. The questions posed to the participants were:

1. As you plan for the role of technology in support of teaching and learning in high schools, what do you think are the more important practices and considerations? As you think about your response, please consider the following: parents, students, teachers, policymakers, administrators, and community members.
2. In an effort to provide information about the aforementioned practices and considerations, identify the resources that would be most supportive for you and others.

Data Collection

The Delphi process consisted of three rounds. Round one posed two open-ended questions to the participants in an effort to get them to generate the practices. In round two, participants were asked to rate each of the items generated in round one. Round three consisted of the items where participants were unable to reach consensus in round two. The goal of round three was to determine whether the participants could achieve consensus.

Data Analysis

A content analysis (Berg, 2001) was conducted to determine if there were any themes generated from the practices generated in round one. Survey data was reviewed separately by researchers and placed into broad school-related categories. These broadly defined categories became the themes under which the 34 practices were organized. Data were described using frequency counts, mean scores, and standard deviations. Participant counts represented the number of people who responded to the questions in rounds one, two, and three. In this analysis, only responses from participants

who responded in rounds one and/or round two were considered in round three. A five-point Likert scale was used to rate items in rounds two and three. The Likert scale information was analyzed using mean scores and standard deviations. The standard deviation for each item was used to determine the level of consensus regarding the item's rating among the participants. Determining consensus was based on the size of the standard deviation for an item. Items with a standard deviation greater than 0.40 were judged as not meeting the consensus threshold. This criteria was established in an effort to define consensus as the variability between responses that are less than half the value between the five point ratings on the Likert scale.

RESULTS

Participants

Of the 187 potential participants identified for inclusion in the study, 12 declined, 110 offered no response, and 7 had incorrect e-mail addresses; resulting in a sample size of 58 participants. The teacher leader panel (1) respondents were teachers, coordinators, and curriculum specialists from states that included: Arkansas, Arizona, California, Maine, Massachusetts, Missouri, Texas, Virginia, and Washington. The administrator panel (2) respondents were principals, leaders of educational organizations, and district administrators from the District of Columbia and states that included: Arizona, California, Michigan, New York, Ohio, Texas, Virginia, and Washington. The researcher panel (3) respondents were university professors, and researchers from educational organizations from the District of Columbia and states that included: California, Colorado, Georgia, Illinois, Indiana, Massachusetts, Michigan, Missouri, New York, and Virginia. The policymaker panel (4) respondents were school board members, state and national department of education leaders, and leaders of policy-related educational organizations from the District of Columbia and states that included: California, Illinois, Massachusetts, Nebraska, New Hampshire, Texas, Virginia, and West Virginia.

In round one, 40 participants responded. In round two, 49 participants responded. In round three, only participants who had responded in rounds one and/or two were invited to participate. The purpose of this was to ensure that the research would ultimately reflect the widest range of participant input. Table 1 is the number of participants for each round by panel.

Table 1

Participants by Round and Panel

	Panel 1 Teacher Leaders	Panel 2 Administrators	Panel 3 Researchers	Panel 4 Policymakers	TOTAL
Round 1	8	14	12	7	41
Round 2	10	9	17	13	49
Round 3	6	9	13	13	41

Round One

The round one survey included two questions designed to elicit practices regarding how technology could be effectively used and implemented in high schools. There were a total of 184 practices generated in round one; some of which included multiple suggestions. After all of the practices were analyzed and organized to eliminate redundant ideas and concepts, the total number of distinct practices was 34 (Appendix A):

Round Two

Round two consisted of a survey of the 34 items generated in round one. In round two, participants were asked to rate the 34 items on a five-point Likert scale as follows: 5–absolutely essential, 4–very important, 3–important-, 2–marginally important, or 1–not important. Analysis of the results revealed the overall mean of the means for all 34 items in round two was 4.00, a "very important" overall score on the Likert scale.

Of the 34 practices generated in round one, seven achieved consensus and had a mean of the means greater than or equal to 4.50. These highly rated items represented practices that dealt with:

1. having reliable infrastructure,
2. focusing on learning goals and objectives,
3. providing on-site support,
4. getting support from administrators and policymakers,
5. having access in the classroom,
6. having adequate funding, and
7. providing adequate planning time

Items that had the lowest standard deviation or highest consensus measure were 26, 32, and 24 respectively (Table 2). These items represented agreement across the panels and dealt with issues that included: project based learning, involving teachers in decision making, and involving tech-savvy students in maintenance and support.

Table 2
Round Two Panel Mean Ratings

Item	Panel 1	Panel 2	Panel 3	Panel 4	Mean of the Means	SD*
1	4.73	4.67	4.27	4.42	4.52	0.22
2	4.82	4.78	4.55	4.58	4.68	0.14
3	2.73	3.11	2.91	3.67	3.10	0.41
4	3.55	3.78	4.09	3.92	3.83	0.23
5	3.36	3.67	3.64	3.67	3.58	0.15
6	4.27	4.89	4.55	4.75	4.61	0.27
7	4.64	4.33	4.55	4.5	4.50	0.13
8	3.91	4.44	4.73	4.25	4.33	0.34
9	4.45	4.67	4.36	4.17	4.41	0.21
10	4.55	4.33	4.45	4.58	4.48	0.11
11	4.36	3.89	4.00	3.75	4.00	0.26
12	4.00	4.00	3.36	4.08	3.86	0.34
13	3.18	4.00	3.27	3.58	3.51	0.37
14	4.09	4.22	3.91	4.17	4.10	0.14
15	3.82	4.33	3.64	4.50	4.07	0.41
16	4.82	4.89	4.18	4.50	4.60	0.33
17	3.73	3.56	4.18	3.58	3.76	0.29
18	4.00	4.00	4.36	3.92	4.07	0.20
19	3.82	4.67	4.55	4.33	4.34	0.38
20	3.64	3.44	3.27	3.58	3.48	0.16
21	4.55	4.22	4.45	4.08	4.33	0.21
22	3.91	3.44	3.18	3.58	3.53	0.30
23	4.18	4.67	4.09	4.17	4.28	0.26
24	3.27	3.22	3.36	3.42	3.32	0.09
25	4.27	4.67	4.91	4.67	4.63	0.27
26	3.64	3.56	3.64	3.58	3.60	0.04
27	4.55	4.44	4.36	4.67	4.51	0.13
28	3.27	3.56	3.45	3.42	3.42	0.12
29	3.00	3.67	3.27	3.67	3.40	0.33
30	3.45	3.89	3.82	4.00	3.79	0.24
31	3.09	3.56	3.00	3.33	3.24	0.25
32	4.27	4.33	4.27	4.17	4.26	0.07
33	3.64	4.44	3.55	4.08	3.93	0.41
34	3.91	4.00	3.64	3.92	3.87	0.16
Panel Mean	3.93	4.10	3.94	4.04	4.00	0.08
*SD = standard deviation						

Round Three

Only items 3, 15, and 33 did not achieve consensus, a standard deviation greater than 0.40, and were advanced to round three in an effort to achieve consensus. Results (Table 3) indicated an overall mean of the means rating of 3.48 across the panels on the remaining three items, indicating a rating of "important" on the scale. In round three, consensus was only reached on item 15, "having technology plans that address short term and long term goals."

Table 3
Round Three Panel Mean Ratings

Item	Panel 1 Teacher Leaders	Panel 2 Administrators	Panel 3 Researchers	Panel 4 Policymakers	Mean of the Means	SD*
3	3.14	3.82	2.50	3.14	3.15	0.54
15	4.14	3.64	3.50	4.29	3.89	0.38
33	3.00	3.27	3.33	4.00	3.40	0.42
Panel Mean	3.43	3.58	3.11	3.81	3.48	0.29

The mean of the means for item 15 across all four panels decreased from 4.07 in round two to 3.89 in round three. This was because panels 2, 3, and 4 showed decreases in their mean scores for item 15 while only panel 1 showed an increase in the mean from round two to round three. The standard deviation or consensus measure for item 15 decreased slightly, from 0.41 to 0.38, from round two to round three.

Item 3, "having one computer for each student," showed an increase in both the mean of the means and standard deviation between round two and three. The mean of the means increased slightly from 3.10 in round two to 3.15 in round three, and the standard deviation increased from 0.41 in round two to 0.54 in round three. This was due to the fact that the mean of the means for panels 1 and 2 increased an average of 0.56, while the mean of the means for panels 3 and 4 decreased an average of 0.47.

Item 33, "providing a safe school environment with access to online content that is appropriate and credible," showed a decrease in its mean of the means of 3.93 in round two to 3.40 in round three. All four panels had lower mean scores in round three, with panel 2 having the sharpest decrease of 1.17.

DISCUSSION

The study was successful at identifying and achieving consensus on practices for the use of technology in high schools. Consensus was achieved on 32 of the 34 items. A content analysis was conducted to discover themes that emerged from the practices (Lemke & Coughlin, 1998; Whitehead et al., 2003). Researchers independently reviewed the 34 practices and organized them into broadly defined school-related categories. Once researchers refined the categories and the practices assigned to those categories, the 34 practices generated in round one revealed the following themes:

1. community connection and support,
2. access,
3. research and policy,
4. professional development,
5. curriculum, and
5. school culture.

Community connection and support. Six items (5, 12, 13, 14, 20, and 28) fell under the theme of community connection and support. All of the items in this theme met the standard for consensus by the end of round two. The item with the highest mean of the means in this theme was item 14, "parental support and involvement through effective communication and outreach." Administrators rated item 14 highest, followed by policymakers, teacher leaders, and researchers respectively.

Item 28, "create more opportunities for students to learn about the use of technology outside of the school," had the lowest mean of the means. A participant from the researcher panel (3) stated that it was not feasible, while another commented that high school students were already doing this naturally through "CTCs and learning places, museums, exhibits, and other types of places where the public has access to learning." A participant from the administrator panel (2) commented, "Since students only learn 8% of their technology skills from school (latest Pew report) it seems that we need to provide better opportunities outside school" (Table 4).

Table 4

Community Connection and Support Items

Item	
5	Coordinating with community technology centers and after school programs
12	Getting community buy-in and support for the use of technology in the schools
13	Engaging communities in the development of new kinds of schools, facilities, and places of learning
14	Parental support and involvement though effective communication and outreach
20	Forming partnerships with organizations, universities and businesses
28	Creating more opportunities for students to learn about the use of technology outside of the traditional school setting

Access. Four items (1, 3, 4, and 33) were identified with the theme of access. Items 3 and 33 did not meet the consensus threshold, so they were also part of round three. The mean of the means of the means for the four items in the access theme in round two was 4.01. This "very important" rating indicated that across the four panels, these practices were seen as being very important to the role of technology in support of teaching and learning in high schools. Item 1 had the highest mean of the means in the access theme in round two (4.52), indicating that access to technology in the classroom in order to support teaching and learning was "very important" to all participants (Table 5).

Table 5

Access Items

Item	
1	Having access to technology in the classroom to support teaching and learning
3	Having one computer for each student
4	Having access to technology in the home (students, parents, teachers)
33	Providing a safe school environment with access to online content that is appropriate and credible

Seventeen of the 18 comments regarding item 1 indicated that the participants were in favor of placing technology directly in the classroom where possible. Round two results for items 3 and 33 did not meet the consensus threshold, although the mean of the means for each of these items was

slightly higher than "important" on the scale. Consensus was not reached in round three on items 3 and 33 with the mean of the means of 3.15 and 3.40 respectively, which translates into a slightly lower rating, but still an "important" rating. Between rounds two and three the mean of the means for item 3 dropped from 3.67 (an almost "very important" rating) to 3.14 indicating "important" on the rating scale. Additionally, the standard deviation increased from 0.41 in round two to 0.54 in round three; which suggests an increasing lack of consensus. In round three, the panel means for item 33 were all lower than the panel means in round two. The standard deviation only increased slightly from round two to round three, going from 0.41 to 0.42.

Research and policy. Four items (27, 29, 30, and 31) were identified under the research and policy theme. There was consensus on all items in the research and policy theme in round two; so no items were advanced to round three. The overall mean of the means was 3.74 on these items, indicating that all four panels considered these items slightly more than "important" on the Likert scale. Item 27 had the highest mean of the means, with highest panel mean given by policymakers (panel 4), which may suggest that having adequate funding to implement school technology plans is viewed as the most important item of this category by all panels; especially administrators. Conversely, item 31 had the lowest mean of the means, which may suggest that the panels, did not feel that meeting state and national standards was as important as the other items in this theme (Table 6).

Table 6
Research and Policy Items

Item	
27	Having adequate funding to implement school technology plans
29	Conducting additional research on how technology can be used to increase access to information and resources
30	Conducting additional research on how technology can be used to support student achievement
31	Conducting additional research on how technology can be used to meet state and national standards

Policymakers (panel 4) and administrators (panel 2) had the highest panel means in this theme, 3.65 and 3.64 respectively, but surprisingly researchers (panel 3) had the lowest panel mean (3.32). This suggests that policymakers and administrators placed slightly more importance on research

and policy than did researchers. This may be due to the fact that administrators and policymakers use the results of research to develop policies and procedures which they in turn propose, administer, and enforce.

Professional development. Five items (7, 10, 17, 18, and 19) were aligned with the professional development theme. All items under this theme met the standard for consensus at the end of round two, and were not advanced to round three. The overall mean of the means for the five items in the professional development theme was 4.2, "important" on the rating scale. The mean of the means of item 7 and item 10 had mean scores of 4.50 and 4.48, respectively, which suggests that all participants placed a high value on providing adequate time and skills regarding professional development (Table 7).

Of the five items in the professional development theme, item 17 had the lowest mean rating. While the other items were rated as "very important" by the four panels, item 17 was rated as "important." This may suggest that when discussing issues of professional development, incentives are not viewed as being as important as providing adequate time, focusing on skills, knowledge exchange, and teacher education programs. Item 7 was the highest rated item in this theme and spoke directly to providing more time for planning and preparing for the integration of technology. Viewing the items along with their comments revealed a relationship between items 7, 10, and 18 which may suggest that these items really speak to issues of time and collaboration as it relates to professional development. This relationship suggests that teachers prefer to develop professionally through their peers rather

Table 7
Professional Development Items

Item	
7	Providing adequate time for teachers to plan and prepare for the integration of technology
10	Professional development for teachers and administrators that includes technical skills, effective integration, and assessment issues
17	Providing incentives (computers, planning days, computer peripherals, and reduction of administrative tasks) to teachers to encourage the effective use of technology
18	Creating opportunities for teachers to share knowledge and act as mentors for one another regarding the effective use of technology
19	Requiring colleges and universities to incorporate effective technology practices and methods into their teacher education curriculum and programs

than attending training sessions. One teacher leader who works in the classroom, and supports this type of sharing of best practices said, "We learn best from each other and actually see the lessons in action." A policymaker added, "Teachers cannot succeed in a vacuum. They need to be mentored and become a mentor."

Curriculum. Eight items (8, 15, 21, 22, 23, 25, 26, and 34) made up the curriculum theme. All eight items met the consensus threshold and did not go beyond round two. The overall mean of the means rating for this category was 4.08 ("very important"), with items 8, 15, 21, 23, and 25 having means greater than 4.00.

Items 22, 26, and 34 having the lowest mean of the means of 3.53, 3.60, and 3.87 respectively. Even though items 22, 26, and 34 may not have been rated individually as "very important," the mean rating for the theme is "very important" in the planning of technology use in high schools (Table 8).

School culture. Six items (2, 6, 9, 16, 24, and 32) comprised the school culture theme. All items met the standard for consensus at the end of round two. Participants throughout these six items were very much in agreement about the infrastructure and technology resources to support teaching and learning, rating "very important" on the scale with an overall mean of the means of 4.31. Item 2, "having reliable infrastructure and technology resources to support teaching and learning," had the highest mean of the means, 4.68, a high "very important" mean value. On the other hand, item 24,

Table 8
Curriculum Items

Item	
8	Examining the pedagogy and purpose for implementing the technology
15	Having technology plans that address short term and long term goals
21	Providing students with assignments that are authentic, involve higher order thinking skills, and simulate the use of technology in the workplace
22	Giving school sites greater flexibility to design instruction and technology uses
23	Updating curriculum to meet the needs of students who live in the digital age
25	Focusing technology use on learning goals and objectives rather than the technology itself
26	Utilizing project based learning
34	Using technology to customize instruction to meet students individual achievement levels

"involving technology-savvy students in the infrastructure maintenance and providing technical support to teachers," was the only item that had a mean of the means in the "important" range of the rating scale. In summary, the mean ratings for this theme suggests that participants felt that it was very important to have reliable infrastructure and technology resources, onsite technical support, an atmosphere and culture of excellence and improvement, support from administrators and policymakers, and the involvement of teachers in the decision making processes, but involving tech-savvy students was the least important practice when it came to school culture.

Table 9
School Culture Items

Item	
2	Having reliable infrastructure and technology resources to support teaching and learning
6	Providing on-site technical support to teachers
9	Creating an atmosphere and a culture that promotes excellence and continuous improvement through a shared vision of technology integration with an emphasis on people instead of machines
16	Having administrators and policymakers understand and see the value of technology in education, and hence lend their support
24	Involving technology-savvy students in the infrastructure maintenance and providing technical support to teachers
32	Involving teachers in the planning and decision-making stages of technology implementation

CONCLUSION

From the outset, one might have assumed that achieving consensus on technology practices from a variety of educators might be difficult. In fact, the results of the Delphi study demonstrated strong agreement among all participants: teacher leaders, administrators, researchers, and policymakers. It was clear by the results that, in general, educators agreed upon the practices surrounding the use of technology in high schools. The larger question was why these practices are not or can not be readily implemented. The answer to this question may lie in the examination of the types of practices identified and the perspectives of the participants.

Three out of the five highest-rated items or practices in the study were in the school culture theme. This is significant in that it shows that all participants communicated the notion that a school's culture is a key element in

the effective implementation of technology in schools. Specifically, this relates to the practices involving professional development, access, research and policy, curriculum, and community connection and support. The results of this study suggest that peer-to-peer sharing among teacher leaders is the preferred mode of knowledge acquisition regarding technology use in high schools. Since teacher collaboration is the desired method of knowledge creation and exchange, resources should be allocated to focus on creating channels of communication that facilitate the sharing of knowledge and making technology resources available at the classroom level.

In addition to the themes identified in this research study, clear distinctions existed between panel responses. For example, teacher leaders (panel 1) and researchers (panel 3) tended to rate items similarly, while administrators (panel 2) and policymakers (panel 4) tended to have similar ratings. The mean ratings on items tended to be lower, although not significantly, for teacher leaders and researchers as compared to administrators and policymakers. This was shown by the fact that the mean of the means for the thirty-four items in round two were rated as "important" by teacher leaders and researchers, but as "very important" by administrators and policymakers.

These distinctions among panel mean ratings may suggest different points of view from which panelists are examining the practices of technology use in high schools. Teacher leaders and researchers may have a "micro" perspective when rating a practice because they may be thinking about what happens with each student in each classroom. The lower mean ratings of the practices by teacher leaders and researchers may be that although they view these practices as "important" or "very important," they are also considering the details that may accompany the practice and its implementation. Conversely, administrators and policymakers may have a more "macro" perspective when rating practices since they are most concerned with issues that support, enable, and implement the integration of technology in high school. Administrators and policymakers may view the same practices from a procedural or policy point of view, with an emphasis on the broad issues and concerns.

These varied perspectives may force educators to deal with the issue of practice versus policy in an effort to realize technology's true potential in schools. This may explain why although consensus was achieved on most of the practices for technology implementation in high schools, many of these practices are not effectively implemented or supported. Hopefully teacher leaders, administrators, researchers, and policymakers can begin to work together and take each other's points of view into account as they work to effectively implement technology in our nation's high schools.

Based on the results of this study, recommendations for educators include but are not limited to: focusing technology use on learning goals and objectives, working with other teachers to share knowledge and acquire new skills, providing students with curriculum that integrates technology in authentic and challenging ways. For teachers to be successful, they must be supported by administrators and policymakers. To that end, administrators and policymakers need to find ways to provide teachers with adequate time and funding to plan and prepare for the integration of technology into the classroom, provide teachers with access to reliable technology infrastructure and resources in the classroom to support teaching and learning, and provide teachers with onsite technical support.

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Note

Acknowledgements

APPENDIX

Part A: 34 Practices

1. Having access to technology in the classroom to support teaching and learning
2. Having reliable infrastructure and technology resources to support teaching and learning.
3. Having one computer for each student
4. Having access to technology in the home (students, parents, teachers)
5. Coordinating with community technology centers and after school programs
6. Providing on-site technical support to teachers
7. Providing adequate time for teachers to plan and prepare for the integration of technology
8. Examining the pedagogy and purpose for implementing the technology
9. Creating an atmosphere and a culture that promotes excellence and continuous improvement through a shared vision of technology integration with an emphasis on people instead of machines
10. Professional development for teachers and administrators that includes technical skills, effective integration, and assessment issues
11. Sharing best practices developed through the use and integration of technology
12. Getting community buy-in and support for the use of technology in the schools
13. Engaging communities in the development of new kinds of schools, facilities and places of learning
14. Parental support and involvement though effective communication and outreach
15. Having technology plans that address short term and long term goals
16. Having administrators and policymakers understand and see the value of technology in education; and hence lend their support
17. Providing incentives (computers, planning days, computer peripherals,

and reduction of administrative tasks) to teachers to encourage the effective use of technology

18. Creating opportunities for teachers to share knowledge and act as mentors for one another regarding the effective use of technology
19. Requiring colleges and universities to incorporate effective technology practices and methods into their teacher education curriculum and programs
20. Forming partnerships with organizations, universities and businesses
21. Providing students with assignments that are authentic, involve higher order thinking skills, and simulate the use of technology in the workplace
22. Giving school sites greater flexibility to design instruction and technology uses
23. Updating curriculum to meet the needs of students who live in the digital age
24. Involving technology-savvy students in the infrastructure maintenance and providing technical support to teachers
25. Focusing technology use on learning goals and objectives rather than the technology itself
26. Utilizing project based learning
27. Having adequate funding to implement school technology plans
28. Creating more opportunities for students to learn about the use of technology outside of the traditional school setting
29. Conducting additional research on how technology can be used to increase access to information and resources
30. Conducting additional research on how technology can be used to support student achievement
31. Conducting additional research on how technology can be used to meet state and national standards
32. Involving teachers in the planning and decision-making stages of technology implementation
33. Providing a safe school environment with access to online content that is appropriate and credible
34. Using technology to customize instruction to meet students' individual achievement levels