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**The New Technology Standards for School Administrators: Findings from the First Large-Scale Survey of High School Principals**

David E. Whale

*This study examines the new Technology Standards for School Administrators (TSSA; 2001) and their use by 346 high school principals in Michigan. The survey showed that principals rated themselves highest on enforcement of acceptable use policies and in being advocates for high-quality technology services. The findings suggest the need for professional development for current principals. The findings also have implications for educational administration preparation programs, accrediting agencies, licensing and certification, and the collaborative that developed the standards.*

The importance of technology to high school principals and its impact on pedagogy (see Brooks-Young, 2002; Cooley & Reitz, 1997; Creighton, 2002; McCampbell, 2001; Oberg, Hay, & Henri, 2000) and school management (Geer, 2001; Kajs et al., 1999; LaFee, 2002; MacNeil & Delafield, 1998; Virginia Department of Education, 2002) is greater today than ever before. Educational leaders are challenged by high academic expectations from multiple audiences and a parade of technology advocates who want to leave their imprint on the school setting. School administrators are presumed to be able to weave cutting-edge software applications and computer hardware smoothly into the flow of teaching, learning, and school management.

A reasonable question that school administrators may ask is, "What do I need to be able to do to provide effective technology leadership and maximize its impact on teaching and learning and school operations?" To that end, the Collaborative for Technology Standards for School Administrators (TSSA; 2001) has facilitated the development of a national consensus on what P-12 administrators should know and be able to do to optimize the power of technology.

This study surveyed public secondary school principals in a large Midwestern state about their knowledge of TSSA and the degree to which they currently put into practice the 16 standards. A literature review examines the role and impact of principals' technology competence, the influence of technology in professional development for school leaders and administrator training programs, and related efforts at setting technology standards for administrators. The study design and implementation is then set forth, the results are presented and discussed, and recommendations for future research and limitations of the study are offered.

**Technology Standards for School Administrators (TSSA)**

The TSSA collaborative consists of leading professional educational and technology organizations, including the National Association of Secondary School Principals

(NASSP), National Association of Elementary School Principals, American Association of School Administrators, National School Board Association, North Central Regional Educational Laboratory, the International Society for Technology in Education (ISTE), two state departments of education, two universities, and other interested parties. The collaborative is also supported with expertise and both the dissemination and implementation of the standards by 24 additional participating organizations. Together, these organizations create a partnership with a national in scope and one that, by the authority of its members, wields considerable influence on the population of school administrators in the United States. Because of this collective power, its standards are likely to become integrated with accreditation and certification policies, evaluation of administrators, university educational leadership programs, and professional development. The emergence of this seminal set of standards is timely, as a new crop of administrators will be entering the profession in the next -5 years, when 60% of current principals will retire or leave for other reasons (Peterson, 2002).

The TSSA project ([http://cnets.iste.org/tssa/project\\_summary.html](http://cnets.iste.org/tssa/project_summary.html)) is a well-reasoned approach to a complex subject. Managed by the ISTE, this ongoing enterprise has published role-specific technology leadership tasks for superintendents, principals, and other administrators. The overarching areas are Standards 1-3: leadership and vision; Standards 4-5: learning and teaching; Standards 6-7: productivity and professional practice; Standards 8-10: support, management, and operations; Standards 11-13: assessment and evaluation; and, Standards 14-16: social, legal, and ethical issues. Each topic is then subdivided and stratified with a unique focus for each of the three administrative clusters. The differences in tasks among this triptych reflect the nature of the roles. The standards for principals are focused especially on teachers and ways that the principal can lead instructional staff members to better integrate technology into the curriculum. There is a site-based emphasis on all educational practices as aligned to district goals and policies. Finally, school management issues are stressed, such as the need to master software that keeps track of student grades, attendance, and schedules.

The principal-specific tasks may be viewed at <http://cnets.iste.org/tssa/printtaskprofile.html>. Table 1 lists the 16 standards representing the tasks done by principals who effectively lead technology in their schools.

**Table 1. Principals' Responses to Technology Standards for School Administrators**

Standard	n	Percentages				
		SA	A	N	D	SD
1. I participate in an inclusive district process through which stakeholders formulate a shared vision that clearly defines expectations for technology use	345	16	57	14	12	1
2. I develop a collaborative, technology-rich school improvement plan, grounded in research and aligned with the district strategic plan	346	9	57	19	13	1
3. I promote highly effective practices in technology integration among faculty and other staff	346	19	69	8	4	0
4. I assist teachers in using technology to access, analyze, and interpret student performance data, and in using results to appropriately design, assess, and modify student instruction	345	9	53	21	16	1
5. I collaboratively design, implement, support, and participate in professional development for all instructional staff that institutionalizes effective integration of technology for improved student learning	344	16	62	13	9	1
6. I use current technology-based management systems to access and maintain personnel and student records	345	39	52	6	3	0
7. I use a variety of media and formats, including telecommunications and the school website, to communicate, interact, and collaborate with peers, experts, and other education stakeholders	343	21	61	13	5	1
8. I provide campus-wide staff development for sharing work and resources across commonly used formats and platforms	345	10	51	26	14	0
9. I allocate campus discretionary funds and other resources to advance implementation of the technology plan	343	18	51	20	10	2
10. I advocate for adequate, timely, and high-quality technology support services	345	37	61	2	0	0
11. I promote and model the use of technology to access, analyze, and interpret campus data to focus efforts for improving student learning and productivity	345	15	63	17	5	1
12. I implement evaluation procedures for teachers that assess individual growth toward established technology standards and guide professional development planning	341	7	43	30	19	2
13. I include effectiveness of technology use in the learning and teaching process as one criterion in assessing performance of instructional staff	344	8	50	24	17	2
14. I secure and allocate technology resources to enable teachers to better meet the needs of all learners in the school	338	12	69	13	4	1
15. I adhere to and enforce among staff and students the district's acceptable use policy and other policies and procedures related to security, copyright, and technology use	338	50	47	2	0	0
16. I participate in the development of facility plans that support and focus on health and environmentally safe practices related to the use of technology	339	18	57	18	6	1

Note. Percentages do not always add up to 100 because of rounding.

SA = Strongly Agree, A = Agree, N = Neither Agree nor Disagree, D = Disagree, SD = Strongly Disagree

## Review of Related Literature

There is considerable research regarding the integration of technology into the teaching and learning practices of a school--defined by Brooks-Young (2002) as an instructional program in which student outcomes are the focus and technology use is woven through the curriculum--and the role of the principal in leading technology aspects of the school's mission. Much of this is axiological knowledge written by schoolhouse administrators on the front lines. There are other studies that suggest technology standards and needs for administrators, but these studies age rapidly. Given the advancing sophistication of technology and administrators' needs in this area, research more than 3 years old is of limited value. The shift in recent times has been to a more philosophical and leadership position using technology, while not entirely neglecting the formerly emphasized hands-on and personal productivity skills for administrators. Overall, there appears to be little current research about principals' knowledge and use of TSSA.

## Impact of Principals' Technology Skills on the Teaching and Learning Environment

Principals play a critical role modeling and implementing the technology mission of their schools. Cooley and Reitz (1997) stated that, "the building principal remains the crucial linchpin to adoption and use of technology" (p. 4). When principals do these

tasks well, higher student achievement can result (Sellers, 2002). The role of the principal in steeping the school in appropriate technology can be referred to as e-leadership. Mills (2001) argued that e-leadership:

Requires leaders to identify those who are expert in the new technology and support them, even stepping out of the way if necessary--and let new people point the direction giving them initiative--and to build an organizational framework (positions and culture) in which the new can displace the old. (p. v)

High school principals manage, analyze, and report ever-increasing amounts of student, school, and academic performance data. Bailey (2002) stated, "leadership's challenge to successfully integrate technology with many levels of education goals and standards might be seen as analogous to a conductor with an orchestra" (p. 4). These challenges include widely publicized state-mandated standardized tests, uniform data reporting procedures, and turning raw data into performance-enhancing learning strategies.

Principals must be the leaders in ensuring that technology actually impacts the teaching and learning process. The research of Hope, Kelley, and Guyden (2000) found that "school administrators are indispensable in the process of transforming schools through technology" (p. 369). However, according to Thomas (1999) "school administrators do not appear to be prepared for their emerging role in technology, and their lack of understanding and resources sometimes creates barriers to change and improvement" (p. 3). Thomas also found that "a strong link between educational technology and school leadership is necessary to support improvements in education" (p. 6). Part of this may be due to a relative lack of attention by policymakers to administrators as compared to teachers and technology. The role of administrators has been much less prominent than that of teachers in conversations about effective use of information and communication technology in schools (McCampbell, 2001).

#### Other Technology Standards Models

A handful of organizations have proposed technology standards for administrators or incorporated them into broader schema, and there are studies that examine the technology needs and competencies of administrators. The National Council for Accreditation of Teacher Education (NCATE), has approved a set of educational leadership standards ([http://www.npbea.org/ELCC/ELCCStandards%20\\_5-02.pdf](http://www.npbea.org/ELCC/ELCCStandards%20_5-02.pdf)) prepared for the National Policy Board for Educational Administration (NPBEA) by the Educational Leadership Constituent Council (ELCC; 2002). Specifically, Standard 2.2 states, "candidates demonstrate the ability to use and promote technology and information systems to enrich curriculum and instruction, to monitor instructional practices and provide staff the assistance needed for improvement." Standard 3.3 requires, "candidates apply and assess current technologies for school management, business procedures, and scheduling."

The Southern Regional Education Board (SREB) offers technology standards for administrators, as discussed by Hope, Kelly, and Guyden (2000) and Thomas (1999). SREB requires that the administrator:

- Understand the elements and characteristics of long-range planning for the use of current emerging technology--infrastructure, budgeting, staff development, technical support, personnel, and upgrades;
- Demonstrate the ability to analyze and react to technology issues, concepts, and proposals--community and corporate pressures;
- Possess a "big picture" vision of technology in education and schools--reform movement, competency-based education, standards, time allocation;
- Use technology to efficiently communicate with stakeholders--voice mail, e-mail, newsletter;
- Use technology to collect and analyze data and other information to improve decision making and other management functions--student academic achievement tests, gather data on variables not previously gathered, access to global information;
- Understand how current and available technologies can be effectively integrated into all aspects of the teaching and learning process--application of software and connectivity to each instructional area, access to research information, multi-media presentations;
- Understand the legal and ethical issues related to technology licensing and usage--purchasing agreements, safety and security issues; and,
- Use technology appropriately to fulfill the role of coordinator and communicator of school programs and activities--manage the school enterprise efficiently, present information effectively to stakeholders, improve decision making and consultation processes.

The Interstate School Leaders Licensure Consortium (ISLLC) calls for the administrator to facilitate processes and engage in activities ensuring that technologies are used in teaching and learning and that there is effective use of technology to manage school operations. : The ISLLC Standards for School Leaders, adopted by the Consortium in 1996, is currently used in part or in whole in 35 states.

While not specific to principals, Flowers and Algozzine (2000) provided a rigorous, reliable, and valid comprehensive guide to what educators should be able to do. It includes nine domains: basic computer operation skills; set-up, maintenance, and troubleshooting of equipment; word processing; spreadsheets; databases; networking; telecommunication; media communication; and social, legal, and ethical issues.

Finally, NPBEA's 21 Domains of Principal Performance is a set of standards of special importance to principals. These domains reflect ISLLC standards and are divided into four groups: functional, programmatic, interpersonal, and contextual. Skrla, Erlandson, Reed, and Wilson (2001) described these domains and how they impact principal recruitment, selection, and training. The 21 domains--leadership, information collection, problem analysis, judgment, organizational oversight,

motivating others, interpersonal sensitivity, and oral and nonverbal expression, to name a few-- do not include a separate technology domain. This omission may reflect the importance of technology integration into many of the categories. Overall, the NPBEA domains are of primary importance to aspiring and practicing principals.

While standards in education may be ubiquitous, Creighton (2002) cautioned that (a) standards often divert attention and focus back toward hardware and software and basic skills and competencies, and (b) standards have a tendency to draw planners and organizers toward goals and objectives that are not pertinent to their unique or individual educational setting. The technical milieu in which principals operate, however, makes some set of benchmarks against which they can be measured imperative.

### **Professional Development Issues**

Lifelong learning is a requirement for principals. Professional development offers administrators ways to keep current in their field, maintain certification, and network with other administrators. However, professional development can be a complicated issue fraught with structural problems, such as having no logical connection to preparation programs and current needs in the field. The technology professional development requirements of school administrators have received less attention (Cooley & Reitz, 1997; Hope, Kelly, & Kinard, 1999) than other areas in the leadership arena. At times, professional development opportunities remain independent and loosely linked (Peterson, 2002) to university preparation programs with little attention to coordinated, long-term learning. Structured professional development is not the primary method of learning new technologies for principals. Ritchie (1996) noted that most administrators get their technology experience through self-instruction, vendors, school personnel, consultants, or external courses.

Kelley and Peterson (2000) recommended that professional development be career staged, with specialized training for aspiring, new, and experienced principals, something that is not often actualized. "If educational leaders continue to demonstrate developmental lags in their knowledge and technology competence, the expected benefits of innovative technology practices will likely be unrealized" (Testerman, Flowers, & Algozzine, 2002, p. 60).

Peterson (2002) stated that professional development should address "the needs of well-trained school leaders who have completed existing programs but who want to deepen their skills in a specific area" (p. 231). Structures and opportunities suggested by Peterson included study groups; advanced seminars; reading and discussion groups; presentation by current thinkers or expert practitioners; attendance at national academies or conferences; and opportunities to become coaches, facilitators, or trainers themselves. All of these areas lend themselves to technology training in the form of professional development for administrators.

The No Child Left Behind Act includes a section, "Title II-Preparing, Training, and Recruiting High-Quality Teachers and Principals," that allocates funding for technology-related professional development of principals in Sections II-A and II-A-5-2151(B). The "Enhancing Education Through Technology" portion of the program requires applicants to spend at least 25% of their technology funds on professional development, including that for principals (NCLB, 2002). The technology needs of principals will remain a vital part of their ongoing education. Politicians and educational leaders have deemed this added-value training a necessity for reform and accountability.

### **School Administrator Preparation Programs**

Although all states require school leaders to take courses in leadership and management, few require or expect administrators to be technologically competent (Ritchie & Rodriguez, 1997). Public school administrators and higher education instructors need to collaborate to provide principals with relevant technology education and training (Kajs et al., 1999). Little research has been done documenting the technology competence of school leaders (Testerman, Flowers, & Algozzine, 2002), and there has been limited analysis of preparation programs to determine how they meet these needs (Hill & Somers, 1996).

Testerman, Flowers, and Algozzine (2002) showed principals had the lowest reported basic computer skills when compared with assistant principals, central office administrators, and graduate students preparing to become administrators. While there may be reasonable explanations for this situation beyond abilities and interest, such as demands on time and access to experts to help them, it is equally likely that principals will benefit by achieving standards-based technology competencies. Hope, Kelley, and Guyden (2000) proposed that administrator preparation programs prepare future leaders to: (a) understand technology terminology; (b) be knowledgeable about the power, features, and capabilities of technology; (c) understand technology's role in schools; (d) act as role models and encourage technology use; (e) provide problem solving and technical assistance; and (f) act as change agents that facilitate technology's integration into teaching and learning.

Geer (2001) identified eight topics for aspiring school leaders: instructional leadership and technology; school finance; teachers and technology; managing information; technology resources and tools; communicating with technology; computer facilities; and ethical and legal issues relating to technology. This content again reflects an underpinning that girds a technology course for administrators, with two areas that should be emphasized: 1) development of an understanding of how technology can enhance instruction and learning; and 2) utilization of technology to improve the efficiency and effectiveness of managing the school community (MacNeil & Delafield, 1998).

Overall, there is increasing awareness for the need to integrate technology for school leaders into administrator preparation programs. It is likely that technology

requirements in leadership programs will become more robust and common as researches continue to study the issue and universities offer appropriate content for such courses. A review of the literature suggests that the categories chosen for inclusion in the TSSA document--leadership and vision; learning and teaching; productivity and professional practice; support, management, and operations; and, assessment and evaluation--are appropriate and justified.

## **The Study**

The Collaborative for Technology Standards for School Administrators adopted TSSA in November 2001. Guidelines were issued for three groups of school administrators, including principals. In the year following the adoption of these standards, there has been little research into how much site-based administrators actually know of and use these standards. Because of the power and influence of the sponsoring organization there are career implications for principals, their preparation, and the types of professional development they receive. This study examined the knowledge and use of TSSA by secondary principals in a Midwestern state.

## **Population and Context**

All 605 regular public high school principals in Michigan comprised the studied target population. There are a small number of charter schools, private schools, and schools with religious affiliations in the state, but, because of the specialized nature of most of these institutions, they were not included. The state enjoys relative prosperity and well-funded schools. Technology is a key part of the educational success of students and state government-sponsored programs offer advice and services in this area. The state is one of the 10 largest in the nation. Most of the 553 school districts have maintained steady student enrollment, although a number of suburban schools continue to grow while some rural and urban districts are losing students. The total K-12 public school student population in 2002-03 in Michigan is approximately 1,679,000.

## **Methodology**

### **Instrumentation**

A self-administered survey tool (<http://www.davidwhale.us/survey.doc>) was developed and mailed to high school principals to gauge their awareness and use of TSSA. Names and addresses of principals were obtained from the 2003 Michigan Education Directory. Respondents were first asked for some demographic information, and then the 16 specific TSSA content areas were addressed. A standard five-point Likert scale was used and respondents indicated the degree to which they agreed with each of the 16 statements. Years of experience as a school administrator, student enrollment at the school, and previous technology training constituted the background questions. A self-addressed stamped envelope was included with the materials to facilitate their return.

The survey was four pages in length and was accompanied by a cover letter. It was administered in December 2002. Recipients learned the purpose and importance of the survey, the benefits of participation, how their responses would be used, that responses are confidential and anonymous, and the sponsor of the survey in the cover letter. A web-based survey was considered but rejected because of an anticipated lower response rate.

The survey tool was pre-tested and reviewed by 21 current school administrators and other professionals for clarity, purpose, and content. The administrators included principals, assistant principals, and athletic directors with characteristics similar to the target population. Two statisticians, the Institutional Review Board of a university, the executive director from the TSSA Collaborative, and two professors of educational administration formed the other review group.

Several changes were made based on the feedback from practicing administrators and professionals in the field. The cover letter was rewritten to clarify the purpose and importance of the survey. An additional background question was added to address technology training received by the principal. A standard five-point Likert scale was adopted for responses. The return procedure was more fully conveyed, and a requested deadline was added.

### **Data analysis**

Responses by principals to the 16 standards were compiled and a frequency table (Table 1) was prepared representing the Likert scale selections. Each standard had five possible responses ranging from 1, "strongly agree" to 5, "strongly disagree." The background information was tallied for years on the job, previous technology training, awareness of TSSA, and school enrollment. The frequency table is first interpreted without consideration of the demographics of the respondents. The data were then analyzed using one-way ANOVA tests to determine where principals, professional development providers and policymakers, the TSSA Collaborative, and administrator training programs may want to concentrate their efforts, based on the relationships between the standards and characteristics of the respondents. Construct validity was assessed with a factor analysis. The extraction method used was a principal components factor analysis with a varimax rotation. It was performed on data based on 346 usable responses.

### **Limitations**

At the time of the study, TSSA was less than a year old. It will take time for it to be built into administrator training programs, professional development opportunities, and day-to-day use by principals. The research was conducted in only one state and the results may or may not be similar to findings in other states. The results may be generalizable only to high school principals, the focus of the study; middle school and elementary school principals may have different levels of response to the standards. There may have been avoidance by some potential respondents to return the survey because of feelings of inadequacy regarding technology, despite assurances of

confidentiality, anonymity, and the need for a broad range of responses. Neither the gender of respondents nor their age was requested or examined in this research.

## **Findings**

Of the 605 surveys that were distributed, 346 (57.2%) were returned. The frequency of responses for the 16 standards is presented in Table 1. A one-way ANOVA test for years of experience, size of school, and previous technology training of principals matched with the 16 TSSA standards is available at <http://www.davidwhale.us/anova.htm>. The raw data set from this study can be found at <http://www.davidwhale.us/data.xls>. The factor analysis is found at <http://www.davidwhale.us/factor.htm>.

In terms of length of service, the largest group of respondents (41%) has been in the profession 3 to 10 years. The next largest group (35%) has 11 to 20 years of experience. The rest have tenures of less than 3 years (10%) or over 20 years (14%). Two-thirds of the principals report having participated in some type of course, seminar, professional development, or other activity specifically on technology for administrators. School enrollment ranges were: less than 500 students (41%), 500-1,000 (28%), and more than 1,000 (31%). Approximately one-third of the principals (109) expressed a knowledge of TSSA and the remainder were either unsure or had not heard of it.

The strongest level of agreement, with a mean score of 1.53 on the five-point Likert scale, was on Standard 15, "I adhere to and enforce among staff and students the district's acceptable use policy and other policies and procedures related to security, copyright, and technology use." The standard that had the lowest level of support was Standard 12, "I implement evaluation procedures for teachers that assess individual growth toward established technology standards and guide professional development planning," with an average response of 2.67. The greatest variance of responses among the 16 standards was for Standard 9, "I allocate campus discretionary funds and other resources to advance implementation of the technology plan," with a standard deviation of .92, and a mean score of 2.28. The tightest cluster of responses was to Standard 10, with a standard deviation of .56, "I am an advocate for adequate, timely, and high-quality technology support services" with a mean of 1.66.

The data were analyzed using one-way ANOVA tests to find significant differences between the four independent variables and the 16 standards. For the three independent variables that had more than two possible responses, a post hoc comparison using the Tukey method revealed specific sources of significant differences. Starting with years of experience, there was no significant difference between length of tenure and responses to any of the 16 standards.

The second variable, the technology background of the principals, found five areas of significant difference: Standard 5 ( $p = .043$ ), "I collaboratively design, implement, support, and participate in professional development for all instructional staff that

institutionalizes effective integration of technology for improved student learning"; Standard 8 ( $p = .001$ ), "I provide campus-wide staff development for sharing work and resources across commonly used formats and platforms"; Standard 9 ( $p = .013$ ), "I allocate campus discretionary funds and other resources to advance implementation of the technology plan"; Standard 11 ( $p = .034$ ), "I promote and model the use of technology to access, analyze, and interpret campus data to focus efforts for improving student learning and productivity"; and, Standard 14 ( $p = .012$ ), "I secure and allocate technology resources to enable teachers to better meet the needs of all learners on campus." In all cases, principals who reported some type of training in technology had significantly stronger levels of agreement response rates. In the other 11 standards, there were no significant differences. In summary, principals with technology training stated a higher level of agreement on Standards 5, 8, 9, 11, and 14.

The enrollment of the school had little impact on the results. There were only two standards with a significant difference, Standard 7, "I use a variety of media and formats, including telecommunications and the school website, to communicate, interact, and collaborate with peers, experts, and other education stakeholders;" and Standard 10, "I am an advocate for adequate, timely, and high-quality technology support services." In Standard 7, principals in larger schools reported using technology to communicate with stakeholders significantly more than did principals in smaller schools. In Standard 10," principals of larger schools expressed significantly higher agreement than did their counterparts in mediumsized schools.

Finally, knowledge of TSSA was a significant factor in the responses for all 16 standards. In every case, principals who stated an awareness of TSSA responded with significantly stronger levels of agreement than did those who were unsure or had not heard of TSSA.

The factor analysis partially validated the constructs--leadership and vision; learning and teaching; productivity and professional practice; support, management, and operations; and assessment and evaluation--and how they were organized in the TSSA document. Four groups emerged from the analysis with an Eigen value over 1 and which together explained 68% of the variance. Standards 4, 11, 12, and 13 fit together and validate the construct assessment and evaluation standards. Standards 1, 2, 3, and 14 form a leadership core. Standards 5, 7, 8, and 9 create a group related to the professional development of staff members and personal productivity. The remaining standards, 6, 10, 15, and 16, relate to policy and records management.

### **Implications and Conclusions**

A literature review confirmed the appropriateness of the TSSA document, and the subsequent survey of public high school principals leads to specific recommendations. The findings suggest programmatic, policy, and other professional implications for high school principals, the TSSA Collaborative, administrator

preparation programs, policymakers and accrediting agencies, and professional development providers.

*Principals.* Principals with technology training are stronger leaders in this realm than their counterparts who have not had such preparation. This suggests that an effective strategy for school leaders who want to improve their leadership is to enroll in some type of technology program for administrators, whether through a university course or by professional development. Principals of smaller schools may want to increase their efforts at using technology as a communication tool with stakeholders. Principals need to be cognizant of TSSA and yet most of them are not. Continued efforts at becoming more familiar with TSSA and its components are in order. In every instance, principals who were aware of TSSA had significantly stronger levels of agreement with the standards than did principals who had not heard of them.

*TSSA Collaborative.* Only about one-third of the respondents are aware of the TSSA. Further dissemination of the standards through the efforts of the Collaborative, journals, accrediting agencies, graduate leadership programs, and professional development is needed. The Collaborative may choose to use these findings to encourage certification agencies, accrediting bodies, and state departments of education to incorporate TSSA into their policies and procedures. Finally, the Collaborative may want to reconsider the groupings in the standards based on the factor analysis.

*Administrator preparation programs.* Almost one-third (31.5%) of the respondents have never taken a technology course or workshop for administrators. Few educational administration programs include a separate course for educational technology for school leaders. As the importance of technology skills and leadership abilities continues to increase, universities should be at the forefront in preparing leaders for new school realities, including technology proficiency. TSSA rubrics should be incorporated into the repertoire of future leaders via a stand-alone technology course at the graduate level.

*Policymakers and accrediting agencies.* State departments of education, school boards, and legislators should avail themselves to TSSA, reference them, and build them into licensing, certification, and evaluation of administrators. The collective expertise and authority of the agencies that created TSSA make it a logical choice to include in professional requirements and evaluations. Standards-setting groups such as the ELCC and NPBEA may want to reference TSSA as they consider educational leadership criteria.

*Professional development providers.* Responses to Standard 12, "Implement evaluation procedures for teachers that assess individual growth toward established technology standards and guide professional development planning," and Standard 13, "Include effectiveness of technology use in the learning and teaching process as one criterion in assessing performance of instructional staff," indicate a specific opportunity for professional development providers: demonstrating ways principals

can include technology use and its mastery by teachers into the evaluation process. A second focus for these providers is helping principals assist their teachers in using technology to analyze and interpret student performance data (Standard 4) to improve student performance.

The data suggest several areas that future investigators may want to examine:

- Administer the survey to middle school and elementary school principals to gauge their level of awareness and skills related to that of their high school counterparts. New emphases in professional development or administrator training may emerge.
- Conduct a survey of faculty members in a school and analyze and compare responses with how the principal assesses her or his own abilities and knowledge using a linear regression model.
- Delve further into the aspect of principals apparently not using technology as a criterion for teacher evaluation. Contract limitations, perceived or real, are likely part of the reason, but there may be other factors as well.

The single most effective action principals can take to advance the teaching, learning, and management of their schools appears to be obtaining specialized training in technology for administrators. As a group, principals consider themselves to be strong advocates of technology in their schools. They also strongly agree that they enforce appropriate computer use and other technology policies on their campuses.

Although respondents were not asked to provide any written comments, several did. Two comments that came up frequently regarded budget (securing and allocating technology resources) and teacher evaluation issues. Principals stated that their hands were tied by teacher contracts that did not allow them to use technology abilities as a criterion in evaluating teachers. They also said that budget issues were often decided above the building level, and, because of this, their involvement was limited in securing and allocating technology resources. A related comment was that some principals experienced a lack of resources to even purchase technology, let alone integrate it into teaching and learning processes. Some principals cited their reliance on a technology director to perform and implement some of the standards, to a degree "washing their hands" of technology matters.

Overall, the TSSA model should contribute to systemic improvement in teaching, learning, and school management by administrators. As stakeholders become more familiar with TSSA and its many possible avenues of positive impact, it likely will become a cornerstone of 21st century schools.

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*David E. Whale is an associate professor in the Educational Administration and  
Community Leadership Department of Central Michigan University. Correspondence  
concerning this article may be sent to [whale1de@cmich.edu](mailto:whale1de@cmich.edu).*

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