LEADERSHIP AND EFFECTIVE INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY FOR THE AGE OF RESTRUCTURING

Dr Joseph Sebastian Thekedam[1]

***Abstract*:** *Principals who effectively lead information and communication technology integration within their colleges typically perform well in leadership and management, vision and goal setting, student learning, teaching, professional development and training, operations and infrastructure support, and assessment and evaluation. Technology leadership supports effective instructional practices through a combination of interpersonal skills, knowledge of a variety of current technology applications, and the vision to anticipate future technology-based solutions for education. The potential benefits of good technology leadership can include improved academic achievement by students, improved student attendance and reduced attrition, better vocational preparation of students, more efficient administrative operations, and reduced teacher/staff burnout and turnover.*

The main objectives of this study are to investigate principals' technology leadership practices in their respective colleges and the methods and strategies principals use to lead technology integration into the educational environment. This empirical study attempts to investigate the technology leadership of principals by using the seven primary dimensions of principals' technology leadership: i) vision and leadership; ii) learning and teaching; iii) productivity and professional practice; iv) support, management, and operations ; v) assessment and evaluation; vi) responsible decision making related to social, legal, and ethical issues and vii) interpersonal and communication skills. Qualitative as well as quantitative data were collected by means of semi-structured interviews and questionnaires that were administered to teachers and principals of professional colleges. The findings show that interpersonal and communication skills are important antecedents to principals' overall effective technology leadership. The technology standards and technology competencies of the principal as a technology leader have a significant influence on the quality and effectiveness of the technology programme in an educational institution. This study reveals that technology integration as an instructional strategy needs to be learned in the wider context of changing pedagogy and paradigms of thought about technology use in education.

Keywords: Technology Leadership, Technology Integration, Technology Vision

[1] St. Berchmans' College, Changanacherry P.O. Kottayam District, Kerala State,

Pin Code: 686 101, jsthekkedam@yahoo.com.

1. INTRODUCTION

Changes in college environments are inevitable to keep abreast with the demands of the 21st century. Principals play a vital role in colleges in leading college reform, implementing innovations and making improvements. It is their responsibility to adopt appropriate changes that ensure an effective integrated education system. For fundamental changes to take place, it is essential that principals have a clear purpose linked to a sustainable vision for the college. Since the principal's leadership and management influence the teaching and learning in the college, they should have a pertinent understanding of what actions and strategies to take, and which leadership and management style to apply to have a positive influence on teachers' information and communication technology integration into their teaching and students' learning practices. An effective principal can enable the teachers to perform at their best and create an environment where teachers are willing to bring about appropriate change in order to ensure that effective teaching and learning takes place.

The technology standards and technology competencies of the principal as a technology leader have a significant influence on the quality and effectiveness of the technology programme in an educational institution. For college principals to provide effective leadership in their colleges, they must possess knowledge and understanding of the issues and capabilities of technology. They must also be able to use technology appropriately in the fulfillment of their roles of coordinator and communicator of college programmes and activities. Students benefit from technology if the college environment is technology-rich and if the staff and principal have a shared vision of how and why technology is integrated into educational environment. As a cornerstone to promote the innovative use of information and communication technology in their colleges the principals should encourage teachers to use information and communication technology in their instructional practices. Principals as the leaders in their colleges should not underestimate the impact of integrating information and communication technology into teaching and learning. They should implement effective strategies to ensure that their colleges are equipped with appropriate information and communication technology infrastructure for teaching and learning. Principals themselves should use information and communication technology and attend training opportunities and be competent about every aspect of information and communication technology integration. Principals should display sincerity and confidence, and demonstrate excellent communication skills to motivate the teachers and students.

Principals' actions determine the attitude of teachers towards information and communication technology integration, as well as teachers' commitment. A way that a principal can provide and sustain supportive contexts for teachers is through teacher professional development as it influences teachers' confidence levels, their inclination toward trying out new innovative ideas, as well as their attitude towards the teaching profession and creative classroom practices. Teacher professional development creates a supportive environment and principals should encourage and create teacher professional development opportunities where teachers can continuously share their expertise, success, frustrations and knowledge with one another. Although teachers should assume responsibility for their own development, principals should assist teachers by providing the necessary time, resources, support and encouragement to enable them to work towards their professional development and achieving the colleges' goals. Principals have significant responsibilities of initiating, organizing, planning and implementing teachers' professional development in their colleges, especially through creating in-house training opportunities. It is important that principals should support and encourage teacher professional development activities that will enable teachers to engage in innovative practices by making use of information and communication technology in their teaching and learning. It therefore remains a challenge for principals to provide teacher professional development opportunities for individual teachers, and to positively influence teachers' thinking and beliefs about the importance of information and communication technology integration into their teaching and learning practices.

2. TECHNOLOGY LEADERSHIP STANDARDS/DIMENSIONS

Principal's technological leadership practices are more important than a principal's individual competency level with technology. For effective technology leadership and for a comprehensive and appropriate use of technology in colleges the following standards are essential for college principles:

2.1. ***Leadership and Vision*** - Principals inspire a shared vision for comprehensive integration of technology and foster an environment and culture conducive to the realization of that vision.

The following performance indicators for the standard (Leadership and Vision) promote the establishment of a vision for technology and the leadership practices that encourage staff members and students to use that technology:

a) Principals facilitate the shared development by all stakeholders of a vision for technology use and widely communicate that vision,
b) Principals maintain an inclusive and cohesive process to develop, implement, and monitor a dynamic, long range, and systemic technology plan to achieve the vision,
c) Principals foster and nurture a culture of responsible risk taking and advocate policies promoting continuous innovation with technology,
d) Principals use data in making leadership decisions,
e) Principals advocate for research-based effective practices in the use of technology (Brooks-Young, 2002).

2.2. ***Learning and Teaching*** - Principals ensure that curricular design, instructional strategies, and learning environments integrate appropriate technologies to maximize learning and teaching.

The five performance indicators under this standard help principal better understand how to examine and evaluate current instructional technology use and then provide support to teachers as they strive to improve their instructional practice. The performance indicators for this standard are:

a) Identify, use, evaluate, and promote appropriate technologies to enhance and support instruction and standards-based curriculum leading to high levels of student achievement,
b) Facilitate and support collaborative technology-enriched learning environments conducive to innovation for improved learning,
c) Provide for learner-centered environments that use technology to meet the individual and diverse needs of learners,
d) Facilitate the use of technologies to support and enhance instructional methods that develop higher-order thinking, decision-making, and problem solving skills,
e) Provide for and ensure that faculty and staff take advantage of quality professional learning opportunities for improved learning and teaching with technology.

The first four performance indicators relate to the integration of technology into the curriculum.

The last indicator emphasizes the importance of professional development for teachers. Teachers will have to be provided time to change, training to make the change, and support to encourage change. Two technology leadership tasks for principals concerning the ***Learning and Teaching*** standard are:

i) Assist teachers in using technology to access, analyze, and interpret student performance data, and in using the results to appropriately design, access, and modify student instruction, and

ii) Collaboratively design, implement, support, and participate in professional development for all instructional staff that institutionalizes effective integration of technology for improved student learning.

Performance indicators for this standard refer to the support role of the principal as he or she provides encouragement and understanding as teachers begin to incorporate technology into their instructional practices and as they learn to use technology as a part of their classrooms.

2.3. ***Productivity and Professional Practice*** - Principals apply technology to enhance their professional practice and to increase their own productivity and that of others.

One of the best ways to support change is to model it personally. This standard identifies the importance of the principal modeling the use of technology in personal and professional roles.

The five performance indicators are:

a) Model the routine, intentional, and effective use of technology,
b) Employ technology for communication and collaboration among colleagues, staff, parents, students, and the larger community,
c) Create and participate in learning communities that stimulate, nurture and support faculty and staff in using technology for improved productivity,
d) Engage in sustained, job related professional learning using technology resources,
e) Maintain awareness of emerging technologies and their potential uses in education,
f) Use technology to advance organizational improvement.

The performance indicators of this standard relate directly to the principals ability and inclination to use technology. Principals need to use technology effectively to make positive changes in productivity for themselves and those they lead. Two technology leadership tasks for principals in this standard are:

i) Use current technology-based management systems to access and maintain personnel and student records,
ii) Use a variety of media and formats, including telecommunications and the college website, to communicate, interact, and collaborate with peers, experts, and other education stakeholders.

2.4. ***Support, Management, and Operations*** - Principals ensure the integration of technology to support productive systems for learning and administration.

The performance indicators for this standard examine areas vital to the ongoing success of technology for the college – the acquisition, maintenance, and replacement of technological infrastructure. The five performance indicators are:

a) Develop, implement, and monitor policies and guidelines to ensure the compatibility of technologies,
b) Implement and use integrated technology-based management and operations systems,
c) Allocate financial and human resources to ensure complete and sustained implementation of the technology plan,
d) Integrate strategic plans, technology plans, and other improvement plans and policies to align efforts and leverage resources,
e) Implement procedures to drive continuous improvements of technology systems and to support technology replacement cycles.

2.5. ***Assessment and Evaluation*** - Principals use technology to plan and implement comprehensive evaluation systems of effective assessment and evaluation.

The four performance indicators for principals are:

a) Use multiple methods to assess and evaluate appropriate uses of technology resources for learning, communication, and productivity,
b) Use technology to collect and analyze data, interpret results, and communicate findings to improve instructional practice and student learning,
c) Assess staff knowledge, skills, and performance in using technology and use results to facilitate quality professional development and to inform personnel decisions,
d) Use technology to assess, evaluate, and manage administrative and operational systems.

The principal's specific technology leadership tasks are:

i) Promote and model the use of technology to access, analyze, and interpret campus data to focus efforts for improving student learning and productivity,
ii) Implement evaluation procedures for teachers that assess individual growth toward established technology standards and guide professional development planning,
iii) Include effectiveness of technology use in the learning and teaching process as one criterion in assessing performance of instructional staff.

As campus leaders of technology principals need to set into place evaluation procedures that ultimately improve student performance. The progress of the students must be monitored and used to make improvements. Principals are charged with leading this effort to analyze student performance data and make it useful. Principals should also include a technology component in their evaluation of teachers. Because teachers will be at various stages of technology competency individual technology improvement plans need to be developed. These individual plans then would drive the teachers' choice of technology professional development.

2.6. ***Social, Legal, and Ethical Issues*** - Principals must understand the social, legal, and ethical issues related to technology and model responsible decision making related to these issues.

Principals should pay careful attention to the performance indicators for this standard. Because of the long-range risks associated with not paying attention to these areas, this is the most important standard for Principals to understand and address as individuals. The following five performance indicators for this standard are sated with potential hazards:

a) Promote and enforce privacy, security, and online safety related to the use of technology.
b) Identify, communicate, model, and enforce social, legal, and ethical practices to promote responsible use of technology.
c) Ensure equity of access to technology resources that enable and empower all learners and educators.
d) Promote and enforce environmentally safe and healthy practices in the use of technology.
e) Participate in the development of policies that clearly enforce copyright law and assign ownership of intellectual property.

These indicators cover equality of access; social, legal, and ethical issues; safety and security of online use; and potentially harmful environmental issues. The specific tasks facing principals are:

- Secure and allocate technology resources to enable teachers to better meet the needs of all learners on campus,
- Adhere to and enforce among staff and students the acceptable use policy and procedures related to security, copyright, and technology use,
- Participate in the development of facility plans that support and focus on health and environmentally safe practices related to the use of technology.

Principals must ensure that technology is up to date and available to all students, regardless of race, sex, or academic standing.

2.7. **Interpersonal and Communication Skills -** Principals must be able to get along with teachers and staff members as they begin to integrate new learning technologies.

A principal can be an effective leader without technological expertise; however, without interpersonal and communication skills, principals cannot be effective technology leaders. Technology leadership requires refined interpersonal and communication abilities, as well as technological competency. The three performance indicators are:

a) Interact and communicate well with teachers, staff members and students as they begin to integrate new learning technologies.

b) Demonstrates an understanding of technology needs and concerns of faculty, staff and Students
c) Maintains positive relationships with faculty, staff and students in regard to technology
d) Encourages college personnel to utilize information sources about technology for professional development
e) Model the use of technology to increase the efficiency of their colleges and improve communication and collaboration within the educational community.
f) Communicates effectively with faculty, staff, and students about technology

3. OBJECTIVES OF THE STUDY

With relatively few studies specifically addressing evaluation of principals' technology leadership, this area necessitates future exploration so that current and future leaders can be prepared to deal more effectively with technology and to successfully implement technology policy. The main objective of this study is to empirically investigate principals' technology leadership practices in their respective colleges. The supplementary objectives of the study are:

- To analyze the methods and strategies do principals use to integrate technology into the educational environment.
- To probe how principals develop and spread effective Information and Communication Technology practice in the teaching environment through teacher professional development.
- To investigate the principals' contributions to the successful and sustainable implementation of information and communication technology in education in their institutions.
- To examine the practical problems faced by principals while executing technology leadership in their colleges.

4. REVIEW OF THE LITERATURE

This review provides a summary of the literature that is relevant to the educational leadership needed to facilitate the integration of technology into the teaching and learning process. Few studies have been done to explore the methods and strategies that college principals use to lead technology integration in their colleges where technology is viewed as an instructional strategy and part of larger college reform efforts. Wilmore and Betz in their

research study pointed out that "information technology will only be successfully implemented in an educational institution if the principal actively supports it, learns as well, provides adequate professional development and supports his/her staff in the process of change" (Wimore & Betz, 2000, p. 15). Diane Yee, in her research on principals, leadership and technology integration found that the educational institutions that integrated information and communication technology in the most constructive way were those where the principals shared an unwavering vision that information and communication technology had the potential to improve student learning (Yee, 2000, p. 291). Similar to Yee's research, Schiller's findings highlight the key role that the principal must play not only in supporting technology, but also facilitating change and intervention strategies in the teaching and learning process (Schiller, 2003). Hughes and Zachariah investigated the relationship between effective administrative leadership styles and the use of technology and they found that it is the teacher's pedagogy that needs to change and that the leaders needed to align the changes into productive future directions. (Hughes & Zachariah, 2001). Kearsley and Lynch noted in their study that the technology is a powerful tool that supports educational institutional reform and facilitates student learning. The potential benefits of good leadership can include improved academic achievement by students, improved student attendance and reduced attrition, better vocational preparation of students, more efficient administrative operations, and reduced teacher/staff burnout and turnover. (Kearsley & Lynch, 1994).

5. THEORETICAL FRAMEWORK

Drawing from the empirical literature on principals' leadership in general and specifically their effectiveness as technology leaders, seven primary dimensions of principals' technology leadership will be examined and serve as the conceptual framework for this study: i) vision and leadership; ii) learning and teaching; iii) productivity and professional practice; iv) support, management, and operations ; v) assessment and evaluation; vi) responsible decision making related to social, legal, and ethical issues and vii) interpersonal and communication skills. The aforementioned seven dimensions are chosen because they are the principals' core tasks in dealing with teaching and learning as well as administrative operations with technology in their colleges.

6. METHODOLOGY

A mixed-method approach of both quantitative and qualitative methodology is used for this study. The quantitative methodology consists of the surveys sent to principals and teachers.

The qualitative methodology includes the researcher's use of in-depth interviewing as a second source of data collection and analysis. This explorative study investigates the methods and strategies that principals use for technology integration as they relate technology use as a tool of instructional strategy. It also investigates what changes occur as a result of technology integration and how these changes may be connected to college reform efforts.

6.1. Sampling Methods

The population for this study was all the teachers and principals of the Professional Colleges in Karnataka, Tamilnadu and Kerala State. Participants were selected after the pilot study, and a questionnaire was sent to each teacher along with a cover letter explaining the purpose of the study and providing needed information to properly complete the questionnaire. Teachers were asked to evaluate their principal's role in leading and facilitating technology use in their colleges. To encourage the return rate, follow up thank you postcards and personal contacts were made until a satisfactory percentage of participants completed the questionnaire. All surveys were collected anonymously unless the survey responded voluntarily offered his/her contact information. All presentation of data from survey responses and interviews use numbers or pseudonyms so as to not reveal the identity of any participant. Although the nature of the research questions could impact on a principal's job performance, the researcher will maintain participant anonymity and confidentiality at all times. The participants are informed of the research objectives, data collection methods and data collection devices.

500 questionnaires were sent randomly to selected teachers of the professional colleges in the States of Karnataka, Tamilnadu and Kerala. Of the 500 survey forms mailed, 292 were returned. The response rate was 58.4 percent, normal for such research. Of these 292, only four survey forms were deemed unusable because the respondents answered incompletely. Two hundred and eighty eight or 57.6 percent of these survey forms were analyzed for this study. Data from some of the respondents were missing for some of the study questions, which accounts for discrepancies in total number of responses from one item to the next.

6.2. Design of the Instrument

To explore technology leadership, the researcher used the *Professional College Principals' Technology Leadership Questionnaire.* The survey instrument is a two-part questionnaire designed to collect data on factors associated with the role of principals as leaders

of technology on their respective campuses. Part one of the instrument is designed to measure the technology leadership, technology standards and accompanying performance indicators of college principals. Part one asks seventy five questions using the Likert scale (5-point scales). Part two of the survey instrument is designed to collect demographic data of the respondents, including gender, educational level, age and number of years of teaching experience etc. Based on the preliminary analysis, the seven leadership dimensions showed consistency across the individual groups of assessment responses. The alpha coefficients (shown in parentheses) were calculated for each scale: i) vision and leadership (0.934); ii) learning and teaching (0.916); iii) productivity and professional practice (0.952); iv) support, management, and operations (0.941); v) assessment and evaluation (0.955); vi) responsible decision making related to social, legal, and ethical issues (0.937) and vii) interpersonal and communication skills (0.928).

6.3. Data Analysis

For data analysis, the Statistical Package for the Social Sciences (SPSS version 11.5) software was chosen. Both descriptive and inferential statistics were calculated on all quantitative data. Descriptive statistics were used to manage the data in the form of frequencies, proportions, percentages, means, and standard deviations.

7. FINDINGS

Of those teachers who responded to the demographic information on the instrument, respondent gender consisted of 193 (67.01%) males and 95 (32.99%) females; respondent age ranged from 28 to 60 years. Years of teaching experience varied, with 156 (54.17%) with less than 10 years, 94 (32.64%) with 10-20 years, and 38 (13.19%) with more than 20 years. One hundred and ninety four respondents (67.36%) held basic degree (minimum requirements) to teach in the professional colleges and ninety four respondents (32.64%) held a research degree or higher qualification.

Part one of the survey document contained seventy five questions and each of the Standards was measured using the responses to only those questions identified to measure that particular standard. The range of possible mean scores on the Likert scale responses on this instrument is 1.00 to 5.00. The following table presents the results of the survey instrument:

Table: 1 *Mean score of the Leadership Standards*

Standards/ Dimensions	Mean	Standard Deviation	Variance
Leadership and Vision	**3.0833**	**1.64221**	**2.697**
Learning and Teaching	**2.9514**	**1.72431**	**2.973**
Productivity and Professional Practice	**2.9618**	**1.80454**	**3.256**
Support, Management, and Operations	**2.8125**	**1.73293**	**3.003**
Assessment and Evaluation	**2.9653**	**1.63972**	**2.689**
Social, Legal, and Ethical Issues	**2.0590**	**1.32254**	**1.749**
Interpersonal and Communication Skills	**3.1250**	**1.65437**	**2.737**
Valid N (list wise): 288			

Participant's highest mean score (3.1250) was for the standard: *Interpersonal and Communication Skills*. The lowest mean score (2.0590**)** was for the standard: *Social, Legal, and Ethical Issues.* The largest amount for variance occurred in the mean scores for the standard: *Productivity and Professional Practice*.

Arithmetic mean scores were also tabulated for each performance indicator. The following Table displays a short description of the performance indicator, the questions measuring that indicator and the combined mean scores for all study participants.

Table: 2 *Mean Scores by Performance Indicator*

1. Leadership and Vision		
Performance Indicator	Questions	Combined Mean
a) Shared Vision	21, 35, 57	3.127
b) Technology Plan Process	6, 14	3.043
c) Innovation	19, 25	2.836
d) Use of Data to Make Decisions	7, 13, 58	3.129
e) Research-based Technology Practices	17, 50	3.281

2. Learning and Teaching		
Performance Indicator	Questions	Combined Mean
a) Use Technology for Instruction	22,70	3.311
b) Support Innovative Uses of Technology	60, 3	2.746
c) Provide Learner Centered Tech Environment	5,49	2.968
d) Support Tech for Higher-Order Thinking	31, 48, 59	1.994
e) Provide for Professional Development	71, 55	3.738

3. Productivity and Professional Practice		
Performance Indicator	Questions	Combined Mean
a) Model Technology Use	26, 51	3.397
b) Use Technology for Communication	12, 46	3.112
c) Create/Participate in Tech Learning Communities	31, 61	3.426
d) Engage in Professional Development	4, 72	2.192
e) Aware of New Technologies	16, 47	2.241
f) Use Tech for Organizational Improvement	45, 62	3.403

4. Support, Management, and Operations		
Performance Indicator	Questions	Combined Mean
a) Guidelines for Tech Compatibility	27, 44	2.946
b) Use of Technology Management Programs	15,52	3.527
c) Allocate Resources for Technology	36, 63	3.224
d) Integration of Tech Plan with Other Plans	18, 73	1.694
e) Implementation of Continuous Improvement	24, 43	2.672

5. Assessment and Evaluation		
Performance Indicator	Questions	Combined Mean
a) Assessment of Tech Resources	32, 64	2.469
b) Use of Tech to Analyze Data	11, 74	3.632
c) Assessment of Staff Competency	2, 69	3.174
d) Assessment of Administrative Systems	34, 53	2.586

6. Social, Legal, and Ethical Issues		
Performance Indicator	Questions	Combined Mean
a) Equity of Access	20, 68	2.163
b) Social, Legal, and Ethical Practices	37, 41	1.713
c) Privacy, Security, and Safety Practices	28, 54	2.834
d) Environmentally Safe and Healthy Practices	40, 56	2.108
e) Policies that Enforce Copyright	9, 65	1.477

7. Interpersonal and Communication Skills		
Performance Indicator	Questions	Combined Mean
a) Interact and Communicate	23, 38	3.361
b) Demonstrates an understanding of needs and concerns	8, 67	2.849
c) Maintains Positive Relationships	29, 42	3.085
d) Encourages Professional Development	1, 75	3.117
e) Improve Communication and Collaboration	33, 39	3.004
f) Communicates Effectively	10, 66	3.334

Fourteen of the performance indicator mean scores were higher than 3.00. Performance indicator (2 e), which asked participants "whether their principals provide for and ensure the faculty to take advantage of quality professional learning opportunities for improved learning and teaching with technology", received the highest combined mean score (3.738). The lowest score (1.477), and the only combined mean score less than 1.5, was performance indicator (6 e) dealing with "Policies that Enforce Copyright".

The method of in-depth interview was used to corroborate the survey data and provide more comprehensive, in-depth and detailed data collection from the principal's perspective in regards to the major research questions. Ten respondents were chosen for in-depth interviews. Each participant was asked thirty six questions following a specific interview protocol. The principals presented multiple perspectives when discussing technology use and integration strategies. No matter what the perspective, principals all share three common themes, (1) modeling technology use, (2) promoting technology use through baby steps and (3) creating

technology trainers. Within these themes additional details and strategies are presented. When specifically asked about methods and strategies for technology integration, principals were able to more explicitly state what they were doing. Seven topics emerged: (1) providing more teachers training, (2) using technology to model expected teacher use, (3) obtaining additional software and hardware, (4) monitoring technology use, (5) creating more time for discussion about technology use, (6) planning with teachers to integrate technology, and finally, (7) using methods to shift paradigms. Three themes emerge to answer the question: "What changes result from technology integration?" They all stem from an increase in the use of technology as an instructional tool. This increase requires (1) changes in the education environment, (2) more support at all levels and (3) a commitment to the future. Changes in the education environment include communication processes, information access and most importantly, teaching and learning strategies. Support includes modeling by principals, staff development by technology leaders, support by leaders for changing paradigms and pedagogy and stakeholder involvement. A commitment to the future includes understanding the students that we are teaching today and reaching to understand the future that we are preparing our students to lead. Five themes emerge about technology methods and strategies for future technology goals. They are (1) modeling technology use, (2) providing more time for staff development, (3) reaching out to stakeholders, (4) providing more access to technology for teachers and (5) developing understanding in teachers about changing their paradigm.

8. DISCUSSION

Principals' technology leadership has been measured as one construct comprising seven technology leadership dimensions. The first technology leadership standard/dimension deals with "Leadership and Vision." This study attempted to place a quantitative score on the abstract concept of leadership and vision. To do so, the *Technology Leadership Questionnaire* asked questions about shared vision, innovation, using technology to make decisions, planning for research based technology practices. The combined mean score for the first technology leadership standard/dimension is 3.0833. It is the second highest of all the standard mean scores. This indicates that of the seven technology leadership standards, principals do well in the area of Leadership and Vision. In fact, the combined mean score for performance indicator 1c (Innovation) is the lowest of all the performance indicator scores (2.836). The performance indicator scores for questions asking about technology planning are much higher, indicating that

principals incorporated technology into their own campus improvement plans and developed technology plans. The performance indicator scores also indicate that principals very much support their teachers in Research-based Technology Practices. These scores point out a continued strength on the part of principals to provide the necessary vision and leadership for technology. Previous research shows that articulating, sharing, and demonstrating technology visions are effective leadership behaviors (Aten, 1996; Cory, 1990; Ford, 2000; Inkster, 1998; Jewell, 1998; Ray, 1992).

The questions related to the second technology leadership standard, "Learning and Teaching", were designed to measure principals' support for teachers' use of technology, principals' willingness to provide technology based professional development for teachers, and the principals' evaluation of teachers technology use. The combined mean scores for second technology leadership standard is 2.9514. The results in this standard indicate that the teachers felt their principals moderately supported the use of technology for teaching and learning. Indeed, 64% of the participants indicated that their principals provided technology staff development for the teachers, allocated additional budget money for technology, and reviewed classroom observations to evaluate the implementation of technology by teachers. This study indicates principals fairly support technology in the teaching learning process.

Technology leadership dimension/standard three concerns "Productivity and Professional Practice". This standard addresses how Professional College Principals use technology to make positive changes in productivity for themselves and others. For principals to be leaders in the use of technology, they first have to be knowledgeable about technology and model its use. The mean score for Standard three is 2.9618. The performance indicator combined mean score for indicator 3a (Modeling technology use) is 3.397. These scores indicate that the principals are technologically competent and to some extent frequent users of technology. This study confirmed that principals are becoming much more technologically literate and using technology more often. Communication technologies seem to be especially important to participants of this study.

The fourth standard is "Support, Management, and Operations." This standard is concerned with compatibility issues, technology based management systems, support issues, and continuous system improvement plans. Principals combined mean score for this standard is 2.8125. The survey data also indicate 54% of the principals regularly use student management

software program. This data shows that a good number of principals are very proficient in this area.

Technology leadership standard five refers to “Assessment and Evaluation” which specifically targets evaluation of technology use in learning, communication, and productivity. The combined mean score for this standard is 2.9653. The combined mean score in the performance indicators 5b (Use of technology to analyze data) and 5d (Assessment of Administrative Systems) are 3.632 and 2.586 respectively. The other two performance indicators in this standard dealt with assessment of the technology infrastructure (5a) and assessment of staff technology needs (5c). Assessment of the technology infrastructure has a combined mean score of 2.469 while the combined mean score for assessment of staff technology needs is 3.174. These scores indicate that the principals in the study used existing technologies such as student management programs, computerized grade programs, and attendance programs to evaluate and report results.

The sixth technology leadership standard deals with “equal access; social, legal, and ethical practices; safe and secure online use and; potential health and environmental issues”. Equal access pertains to the ability of all students being able to access the technology of a college regardless of their economic status, race, sex, educational program, or any other limiting factor. The combined mean score in the performance indicators 6a (Equity of Access) and 6c (Privacy, Security, and Safety Practices) are 2.163 and 2.834 respectively. In fact, the combined mean score for performance indicator 6e (Policies that Enforce Copyright) was the lowest of the entire performance indicator scores (1.477).

The seventh standard contains indicators dealing with “Interpersonal and Communication Skills”. The combined mean score for technology leadership standard seven is 3.1250 which is highest of all standards. Principals’ interpersonal and communication skills showed a significant and positive impact on principals’ effective technology leadership. This finding supports previous research (Chang, 2003) showing that to become effective technology leaders, principals must build positive working relationships, communicate change and new ideas well, and identify and support teacher needs and concerns.

9. CONCLUSIONS

This study indicates that professional college principals are doing a satisfactory job at integrating technology in education in their institutions and technology integration can be facilitated by principals with limited access to technology resources. The results of the survey questions pertaining to principal involvement demonstrate that principals are good at providing their teachers with access to technology for them to use with their courses. Allocating technology resources is more of a managerial role than a leadership role for principals to hold. It indicates that the manager role of principals is still an important one for principals to fill when it comes to technology integration. It also shows that principals understand how to implement new instructional initiatives by providing the support to do so and that technology is understood to be an instructional strategy by principals.

This study reveals that the principals' leadership of technology integration as an instructional strategy needs to be supported differently than other instructional strategy implementations. This is largely due to the fact that technology integration requires changing pedagogy and the structure of learning environments. Technology integration as an instructional practice requires a commitment and constant renewal of the resources involved, most often computer technology, at a much faster rate than is traditionally necessary for books or other instructional materials. Staff development for this implementation also has to combine a focus on skill development as well as pedagogy, with the larger focus on pedagogy. Staff development initiatives and follow-up support for a technology integration plan must also include constant monitoring and evaluation by leadership.

This study discloses that technology integration as an instructional strategy needs to be learned in the wider context of changing pedagogy and models of thought about technology use in education. Overwhelmingly principals noted that teachers needed to change their teaching style to integrate technology. Furthermore, this integration is not just about using technology but about creating student-centered constructivist learning environments where technology is used as a tool for inclusive development of the students.

The most important common themes shared by this study are:

- Principals who demonstrate technological proficiencies integrate technology with greater technological specificity.
- Principals who have advanced technology skills have an advantage in furthering the technological professional development of staff. Working personally with and training staff in technology, may decrease the principals' need for formal classroom technology observations.
- Principals should balance their roles of manager and leader to lead and implement a vision for technology integration.
- Principals should practice reflective leadership, examining technology use and integration from multiple perceptual orientations and lenses. Principals should expect from their teachers and students positive accountability of its use and effectiveness in the teaching and learning process.

REFERENCES

Anderson, R. E., & Dexter, S. (2005). School Technology Leadership: An Empirical Investigation of Prevalence and Effect. *Educational Administration Quarterly, 41*(1), pp. 49-82.

Aten, B. M. (1996). *An Analysis of the Nature of Educational Technology Leadership,* Unpublished doctoral dissertation, University of San Francisco.

Brooks-Young, S. (2002). *Making Technology Standards Work for You: A Guide for School Administrators*. Eugene, OR: International Society for Technology in Education.

Chang, I. (2003). The New Leadership Trend: Technology Leadership. *Journal of Education Research, 114,* pp. 83-95.

Cory, S. (1990). Can your District become an Instructional Technology Leader? *The School Administrator, Special Issue,* pp. 17-19.

Flanagan, L.& Jacobsen, M. (2003). Technology Leadership for the Twenty-first Century Principal. *Journal of Educational Administration, 41*(2), pp. 124-142.

Ford, J. I. (2000). *Identifying Technology Leadership Competencies for Nebraska's K-12 Technology Leaders*, Unpublished doctoral dissertation, University of Nebraska, USA.

Hedberg, J.G., Harper, B., Bloch, D., College, B. (1992). Educational Information Systems: Problems of the Small Educational Organisation. *Australian Journal of Educational Technology, 8*(2), pp. 132-160.

Hughes, M., & Zachariah, S. (2001). *An Investigation into the Relationship between Effective Administrative Leadership Styles and the use of Technology,* http://www.ucalgary/vol5/.html.

Inkster, C. D. (1998). *Technology Leadership in Elementary School Principals: A Comparative Case Study*, Unpublished doctoral dissertation, University of Minnesota, USA.

Jewell, M. J. (1998). The Art and Craft of Technology Leadership. *Learning and Leading with Technology, 26*(4), pp. 46-47.

Kearsley, G., & Lynch, W. (1994). Educational Technology: Leadership Perspectives, *Educational Technology*, pp. 5-17.
Kinnaman, D. E. (1994). What it really means to Integrate Technology. *Technology & Learning, 14*(8), pp. 130.
Mentz, M., Mentz, K. (2003). Managing technology integration into schools: A South African perspective. *Journal of Educational Administration, 41* (2), pp. 186-200.
Murphy, D. T., & Gunter, G. A. (1997). Technology integration: The Importance of Administrative Supports. *Educational Media International, 34*(3), pp. 136-139.
Orr, M. T., & Barber, M. E. (2006). Collaborative leadership preparation: A Comparative Study of Partnership and Conventional Programs and Practices. *Journal of School Leadership, 16*(6), pp. 703-739.
Pelgrum, W.J. (2001). Obstacles to the Integration of ICT in Education: Results from a Worldwide Educational Assessment. *Computers & Education* 37, pp. 163–178.
Ray, D. (1992). Educational Technology Leadership for the Age of Restructuring. *The Computing Teacher, 19*(6), pp. 8-14.
Redish, T., & Chan, T. C. (2007). Technology Leadership: Aspiring Administrators' Perceptions of Their Leadership Preparation Program. *Electronic Journal for the Integration of Technology in Education, 6,* pp. 123-139.
Riffel, J.A., Levin, B. (1997). Schools Coping with the Impact of Information Technology. *Educational Management & Administration, 25 (1), pp.* 51-64.
Rogers, B. A. (2000). *The Correlation between Teachers' Perceptions of Principals' Technology Leadership and the Integration of Educational Technology,* Unpublished doctoral dissertation, Ball State University, USA.
Schiller, J. (2003). Working with ICT Perceptions of Australian Principals. *Journal of Educational Administration, 41*(2), pp. 171-185.
Webber, C.F. (2003). New Technologies and Educative Leadership**.** *Journal of Educational Administration, 41*(2), pp. 119-123.
Wilmore, D. & Betz (2000). Information Technology and Schools: The Principal's Role. *Educational Technology and Society 3(4).* http://ifets.icce.org/periodical/vol4, 2000.html.
Yee, Diane (2000). Technology Leadership. *Journal of Education Research, 112,* pp. 151-152.
Zain, M.Z.M. & Atan, R.M. (2004). The Impact of Information and Communication Technology (ICT) on the Management Practices of Malaysian Smart Schools. *International Journal of Educational Development, 24,* pp. 201–211.