# Technology Leadership Cadre: A Mutually Beneficial Relationship

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## Abstract

*The purpose of this study was to explore the effects of employing preservice teachers as leaders in technology to change teacher education curriculum, and to mentor and support inservice teachers, teacher education faculty and preservice teachers. We describe the evolution of the design of this program by comparing the first and fourth year, and examining the mutual benefits for 49 members of the Technology Leadership Cadre (TLC) and the people they influenced. Using design-based research, we used an iterative approach to revise the structure of the program based on data we collected and analyzed. This data included 121 postings from an electronic discussion board, 964 surveys, observations, interviews with four faculty consultants, and focus group interviews with members of the Technology Leadership Cadre. TLC members collaborated with faculty in changing the portfolio assessment process from paper to electronic. This change in turn prompted faculty to incorporate technology-based artifacts for students to incorporate in their e-portfolios. Most important, as TLC members taught others technology skills through workshops and mentoring, they developed leadership in technology and in the classroom through this mutually beneficial relationship.*


Rarely is enough assistance provided for novices trying to learn technology in schools and universities, and this lack of support may contribute to educators' reluctance to adopt technology into the curriculum in spite of expenditures on hardware and software. Several reports on technology use in schools emphasize that expenditures on professional development needs to keep pace with expenditures on hardware (Trotter, 1999). One promising and cost-effective approach to professional development is to connect technology-savvy students with faculty and/or teachers.

Design teams that pair faculty with graduate students studying technology have been used to create distance education courses (Koehler, Mishra, Hershey & Peruski, 2003). This use of preservice teachers as technology mentors is linked to the research on peer tutoring, in that both adapt teaching to the learner's needs. The generative model of learning (Wittrock, 1989) provides a theoretical explanation for the benefits of peer tutoring for the tutor in that elaborative explanations and responding to questions engender learning for both parties. Peer tutoring clearly benefits both the tutor and the tutee (Fuchs, Fuchs, Yazdian & Powell, 2002; McCormick & Pressley, 1997).

Opportunities for preservice teachers to develop leadership in technology were provided over a four-year period by participation in the Technology Leadership Cadre (TLC), an intrinsic part of a three-year implementation grant funded by Preparing Tomorrow's Teachers to Use Technology ($PT^3$). TLC members are instrumental in supporting each of the four components: (1) faculty and faculty consultants (faculty who wrote proposals to infuse technology); (2) preservice teachers (prospective teachers in the program); (3) the Teacher Education Program (curriculum change and program evaluation using reflective multimedia portfolios, etc); and (4) partner schools.

An important avenue for faculty assistance is having a TLC member mentor faculty individually in faculty offices. If a faculty member is a novice with a technology application, yet has assigned a class project using this application, the faculty member invites TLC members into their classes to lead technology workshops. TLC members assist prospective teachers in the program individually, in small group settings, or through technology workshops. One major task TLC members are responsible for is to help prospective teachers in the program develop reflective multimedia portfolios, a requirement for graduation beginning in Spring 2004. This portfolio has five uses: (1) to allow students to engage in reflection and express their individuality as teachers; (2) to serve as an assessment portfolio indicating how students have met the Wisconsin Teacher Standards (INTASC) and the Wisconsin Content Standards; (3) to provide data for program evaluation; (4) to form the basis for or to be used as a job portfolio; and (5) to use and modify later on as a professional portfolio (http://www.uwrf.edu/pt3).

TLC members worked collaboratively in live and virtual communities to assess and meet the needs of the teacher education community, participate in committee work, promote the use of Web-based, multimedia learning resources through workshops, Web resources and handouts. In the first two years, they reflected on their progress through electronic discussions and focus group interviews; in the last two years, they reflected in writing on every workshop they led and also participated in focus group interviews.

Our research questions included the following:

1. How did the Technology Leadership Cadre evolve over a four-year period?
2. What impact did the TLC have on assessment and curriculum changes in the use of technology in the College of Education?
3. What were some unintended positive and difficult aspects of this program design?
4. In what ways did the members of the TLC develop leadership?

## Method

Using a combination of design-based research (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003) and the case study approach (Merriam, 1988; Yin, 1984), we focused on the Technology Leadership Cadre as both a "program design " and a "case." Consonant with the design-based research approach, we used a multi-disciplinary team and an iterative approach to collect data and revise the program structure according to results.

This data included 121 postings from an electronic discussion board, 964 surveys, four focus group interviews with members of the Technology Leadership Cadre, observations, and interviews with four faculty consultants who had worked with TLC members. Using interpretational analysis (Gall, Borg, & Gall, 1996), we examined the case study data for constructs, themes, and patterns that could be used to describe the leadership development that emerged in this context.

### Participants

Forty-eight preservice teachers (eight graduate assistants and 40 undergraduate members of the Technology Leadership Cadre) participated in this study. In the first year, participants were 29 members of the Technology Leadership Cadre (TLC) (including four graduate assistant team leaders), who were divided into four base groups, each led by a graduate student. Year 4 participants were 20 preservice teachers, graduate and undergraduate, and no team leaders.

### Data Sources

Data sources from year 1 included 121 posted discussion comments from 29 students on an electronic Blackboard discussion board that spanned four months (February-May). Year 1 data sources also included two focus group interviews with 29 TLC members, interviews by the external evaluator with four faculty consultants, evaluation of projects from these faculty consultants, and 474 surveys from workshop participants. Data from year 4 included two focus group interviews with TLC members as well as 490 surveys from workshop participants.

***Electronic Blackboard discussion.*** We used this Web tool for communication among members of the TLC. The TLC posted announcements, discussed challenges and successes they experienced in leading workshops, posted extensive workshop calendar schedules, used the e-mail function to send group or individual messages and had online chats among group members in teams. One hundred twenty-one (121) responses from the discussions among 29 TLC members were analyzed to look for themes in the challenges and successes TLC members experienced, and to examine what (if anything) these preservice teachers were learning about teaching technology and becoming leaders.

***Focus group interviews.*** At the end of each semester, we divided the members of the TLC into two groups and collected focus group interview data from the TLC participants regarding their experiences as members of the Cadre. We transcribed and coded this interview data. Questions 1–4 were asked during both the 1999–2000 and the 2002–2003 interviews:

1. What do you think are some important contributions you have made?
2. What have you learned from participating in this project?
3. What are some of the greatest challenges you have faced thus far?
4. How could we improve this program? What went well? What should be continued? What should we change?

***Survey data.*** After each workshop, TLC members distributed a survey to assess usefulness of topic, organization, handout effectiveness, individual attention, and overall effectiveness on a scale of 1–5 with 5 being excellent. Surveys were collected by the TLC member(s) leading the workshop, who read them, wrote a reflection on the outcomes and challenges of the workshop, and put the surveys and attendance sheets in a drawer to be tabulated by a graduate research assistant.

***Interviews with faculty consultants.*** Four faculty members who were first-year faculty consultants (faculty who volunteered to integrate technology projects into their courses) were interviewed by an external evaluator, a College of Education Dean from another university. They reported that they participated in several workshops that assisted them in planning, preparing, creating, and modeling technology-enhanced projects that their students could both include in their reflective multimedia portfolios as well as replicate and/or redesign to meet the needs of classrooms in their field practice. This evaluator transcribed the interviews, examined the faculty consultant reports, and wrote an evaluation. We use parts of this evaluation relevant to the TLC.

### Data Analysis

Categories of analysis for the responses to the interactions in electronic conferences, e-mail responses and the transcripts of inter-

views were constructed by following Strauss and Corbin's (1990) approach to grounded theory generation. Raters searched the data for dimensions, sorted the data, and collapsed and realigned dimensions until there was consensus between raters and no new categories emerged.

## Results

### How did the Technology Leadership Cadre change over time?

***Changes in topics and attendance at workshops.*** In 1999–2000, TLC members offered 53 workshops for 503 attendees (teacher education students, faculty, and teachers). These workshops ranged from Microsoft PowerPoint to Web editing, as well as course-related software programs such as Family Tree Maker and Microsoft Excel. The majority of these workshops were held within teacher education courses.

In contrast, in 2002–2003, TLC members offered 88 workshops for 1,306 attendees (teacher education students, faculty, and teachers). Rather than being workshops on single topics (e.g., PowerPoint) as was the case four years ago, these workshops were sequenced to assist students in developing their reflective multimedia portfolios and were primarily offered outside of courses. Topics included Dreamweaver, Photoshop, Adobe Acrobat Files, INTASC, Reflective captions, iMovie, PowerPoint, CD burning, and creating CD labels. This instruction came in the form of Portfolio Open Houses primarily held for education majors. Portfolio Open Houses, offered every Monday and Tuesday, are two-hour blocks of time for students to develop their reflective multimedia portfolios. The first hour is dedicated to instruction on one of the above topics and the second hour is assisted work time with TLC members present.

***Changes in structure, instruction, and reflection.*** In the first year of the program, the four team leaders met weekly with smaller groups of 7–8 TLC members, and the entire TLC met monthly. These participants formed teams among themselves to lead workshops and joined one of three subcommittees: multimedia portfolio committee, Web page committee, and scheduling/publicity committee. During focus group interviews, TLCs reported that they wanted to meet weekly rather than monthly as a large group so they could communicate more with one another than was possible in the smaller group meetings. We changed the structure of this in the fourth year and this allowed us to have more time to discuss integration of technology into specific subject areas.

Initially, in the first year, we encouraged TLC members to lead workshops individually. However, in the third and fourth year, we moved to an apprenticeship model. New TLC members observed experienced TLC members and assisted in workshops for the first few sessions. Then, under the guidance of experienced TLC members, the newly apprenticed TLC members led workshops and received feedback from the experienced ones on their performances. This apprenticeship model allowed for a gradual increase in responsibility and lessened the anxiety of leading workshops.

A third change involved requiring written reflections from the TLC members who led workshops, analyzing what they did well, how well students learned, and what they would change for future workshops. Both experienced and new TLC members reflected collaboratively on workshops they co-led.

***Changes in quality of performance.*** Participants rated workshops according to a scale of 1–5 with 5 being excellent and 1 being poor. These ratings improved over the four years. In the first year of the project, participants completed 474 surveys and rated the workshops as follows: Usefulness of topic (4.4), Organization (4.3), Handout Effectiveness (4.2), Individual Attention (4.4), Overall Effectiveness (4.4). In the last year of the project the participants, who completed 490 surveys, rated the workshops as follows: Usefulness of topic (4.7), Organization (4.5), Handout Effectiveness (4.6), Individual Attention (4.6), Overall Effectiveness (4.55).

### Impact of the TLC on curriculum and assessment changes in technology

A major change in assessment prompted curricular change. In 1999, preservice teachers had the option of constructing paper or electronic portfolios. To create models for other preservice teachers, TLC members constructed electronic portfolios, and presented their work to faculty in Teacher Education. After faculty observed the pride and relative ease with which TLC members created their portfolios, the department voted to require all preservice teachers to create electronic rather than paper portfolios.

This change in assessment led to curricular ramifications, in that faculty now were motivated to design course assignments so that preservice teachers could use these artifacts in their electronic portfolios. For example, where traditional papers had once been required, now faculty were allowing students to create Web pages, PowerPoint presentations or iMovies. TLC members mentored faculty members and led workshops in classes to provide technology instruction for these new projects. Faculty reported they would not have attempted some technology projects in classes without the assistance of the TLC members. In speaking for several colleagues, one faculty member said,

> The faculty prefer to get help by TLC students rather than by faculty. They (TLC) tried things we wouldn't have done before or taken the risk to do. You don't have to be an expert in everything, but can take pedagogical risks…the members of the TLC are not considered technical experts but facilitators.

### Unintended positive and difficult aspects of this program design

A major unintended outcome was a change in assessment in the art department. For some years, in senior art seminar, a local artist presented her multimedia portfolio as an example of what future artists might wish to construct. These students were never taught how to create their own online portfolios. A TLC member in-

volved in her art seminar proposed to her art professor that she be allowed to teach the seminar students how to create their own multimedia artist portfolios. The art professor agreed to allow the TLC member to teach the workshop, and after the first semester of instruction, the art department changed the course curriculum to require artist multimedia portfolios from all art majors.

Some additional, unanticipated positive outcomes of this program included TLC members successfully writing grants for equipment at the university and later, for their schools. Other unanticipated benefits included TLCs being asked to lead inservices for schools, being paid to be consultants to teachers in school districts though CESA (Cooperative Educational Service Agency, a state organization to support teacher development), making presentations about their experience and work at local, state, and national conferences, and finally, being asked to serve as consultants to school technology committees.

The TLC also encountered unanticipated difficulties. Due to large state budget deficits, rather than immediately institutionalizing the TLC program at the end of the grant, we had to continue to find external funds to supplement the internal funds that were allocated.

In the first year of the program, a few faculty expected TLC members to do everything for them rather than to teach them how to use technology. By the fourth year of the program, faculty understood that the role of TLC members was to teach them rather than do for them.

Finally, a perennial challenge, both in the beginning and in the fourth year, was that TLC members found it difficult to do their own work in the Educational Technology Center because others would ask them questions. A common complaint from a TLC member was "I can't study in the Ed Tech Center anymore; I refuse to try."

In an attempt to solve this challenge, we set up a TLC station in the Educational Technology Center to provide more formal assistance and to allow other TLCs who wanted to do their own work an opportunity to do so without so many interruptions. However, every semester during focus group interviews, students reported being recognized by strangers in all of the computer centers on campus as a TLC member and being asked for assistance when they were trying to do their own work. As one member said, "You can't help but help someone wherever you go on campus."

### *In what ways did TLC members develop technology leadership?*

This overriding belief—that technology integration is important—along with the value they placed on teaching others to use technology well was a central theme reiterated in the data we collected. This value seemed to inspire TLC members' responsibility for their choices in learning technology, a second core theme. TLC members chose to learn certain kinds of technology in order to teach and mentor others who expressed a desire to learn a particular kind of technology. They also chose to learn certain kinds of technology they wanted to use as future teachers in their classrooms. This freedom to choose motivated students to initiate workshops, create handouts, and take risks in learning and teaching technology to others. Risk-taking was encouraged and supported by the structure of the TLC program, the third theme emerging from the data.

***Analysis of electronic Blackboard discussion.*** These TLC members discussed challenges they were facing as technology leaders (41%), focused on observations about how technology can change teaching (26%), reflected on what they were learning by teaching others about technology (20%), and analyzed how technology can change student learning (13%). Leadership themes emerged from 49% of the Blackboard discussions, with initiating growth in peers as the largest category of responses (41%). Other leadership themes included networking (21%), responsibility (14%), freedom to explore new ideas (13%), and risk-taking (9%). TLC members shared the mission of integrating technology into the curriculum and they valued initiating growth in peers, faculty, and teachers for what they perceived as positive changes.

***Initiating growth in others for positive change.*** TLC members shared a common vision: to create positive change in integrating technology in schools. Their purpose was not to promote technology for the sake of technology, but to promote changes in the teacher education curriculum, in schools, and in assisting their peers to construct electronic portfolios needed for graduation. Their sense of mission is found in the language some TLC members used to describe their work. For example, TLC members talked about bringing the "TLC word" to new areas on campus: "… I've had classes in the computer sciences and brought TLC into those classes and no one had even heard of it…so it's nice having people in all areas of campus to spread the word." Part of this mission was to decrease the fear of and frustration with computers:

> … there are a ton of professors over there who are pretty petrified to even touch a computer. Right now I'm helping a professor learn how to use PowerPoint and he's just almost scared of it. Only recently has technology become a big part of the agriculture industry.

TLC members assisted peers individually as well as in workshops. This often gave TLCs who were just beginning to learn a program the opportunity to learn it through teaching it and through figuring out answers to others' questions. In turn, this built confidence and satisfaction in facilitating others' growth. After an extended focus group discussion of how excited TLC members felt when they witnessed growth in their peers, one TLC member said,

> What a feeling of empowerment, you're just on fire, wow, I have confidence, I can do this. If you apply that to people who are hesitant towards technology and get them the proper training and support, they are going to learn it and they are going to get that confidence and it's just going to build and build and build!

Collaboration among peers in learning new technology helped to foster an atmosphere for creating change and promoting growth. In reference to a Spring Technology Conference planned and led by TLC members, one focus group interviewee reported:

> I'd like to go back to the conference to the contributions that the TLC made, it's the entire TLC, not anyone person. To me it's probably the most important thing I'll do in college…we're really reaching out to people.

In addition to campus work, TLCs worked with four partner school districts on request and demonstrated leadership in their field placements in schools.

We also found that many of the principles that apply to sound pedagogy also apply to initiating others' growth in technology. For example, during Blackboard discussions and the focus group interviews, TLC members discussed the importance of prior knowledge, teaching to the level (and needs) of the learner, recognizing adaptive/special needs, modeling appropriate thinking, clarity, and organization in presentations, benefits of discovery learning, pacing lessons appropriate to the audience, and facilitating group work in computer use. Finally, in the last year of the project, we observed a shift from discussions of individual assistance to systemic change in curriculum and teaching.

***Responsibility for choices.*** Freedom to explore technology and choose which programs to learn motivated students' sense of responsibility. Responsibility within the TLC meant students initiated workshops, created handouts, scheduled, led, and evaluated workshops, and mentored others. One major responsibility for making a choice was to learn the various software programs and make decisions about how to teach a new program or piece of equipment to others. Students reported that the structure of the TLC program helped them in helping others become more knowledgeable about technology, instructing others, problem solving, and knowing the abilities of others. In the interviews, a couple of students provided long lists of programs they learned, for example: "I learned Dreamweaver, PowerPoint, Excel, Family Tree Maker, Inspiration, Kid Pix, Hyperstudio."

In addition to the kind of technology they learned, TLC members had freedom to choose where to teach people about technology: schools, classes, open workshops, faculty or one on one mentoring. In talking about her work in schools, one student reported, "I went to Prescott and helped some real teachers in action and that was very educational because then you actually see what a lot of these teachers who didn't have technology are doing, what the situation they are in…"

Students also prepared and gave workshops on campus, commenting on valuing the opportunity to be engaged in "real teaching":

> I just think that as future teachers it really helps us to be teaching. This is like for-real teaching, not just observing in a classroom or helping the teacher with something. This is something we've put together ourselves and are actually using.

Students consistently reported gaining much from teaching workshops:

> Not only did I learn what other people didn't know, from all the questions that were given to you in the course of an hour-long workshop, I learned a lot of stuff that I didn't know, I learned what I needed to learn.

Another choice involved the kind of assistance to give. In addition to workshops, students could provide individual assistance to other peers, work at the TLC station in the Educational Technology Center, provide e-mail support to others and mentor professors or teachers. Individual assistance ensured that people's needs were met.

As one might expect, students did not always take responsibility for choices in a timely fashion. Two TLC reported procrastinating in their preparation and had difficulties with computers freezing:

> Every single one of them in the lab froze on our PowerPoint presentation….so I just kind of started …the hardest part was trying to explain the program when they couldn't see what you were doing…. We were supposed to have copies but the copy machine up here was broken….

When students failed, they reflected on this and/or sought out the assistance they needed to prevent failure a second time. Collaboratively teaching workshops meant that success as well as failure was a shared responsibility, and it was a common practice for co-presenters to reflect on and discuss the workshop afterwards with the intent of improvement.

***Risk-taking was encouraged and supported by the structure of the TLC program.*** The TLC structure included faculty consultants creating change in their courses, team meetings, committee work, Blackboard discussions, and workshops. For their TLC Web site, the Web committee chose a quote from Emerson on the value of risk-taking: "A ship is safe in the harbor, but that's not what a ship is for." This metaphor of venturing out from the security of what one already knows and can do, to explore new territories, along with other passengers, was a salient theme reverberating in much of the data.

Finally, TLC members enabled faculty to take risks. The high anxiety and high risk that faculty consultants faced in redesigning their courses for the inclusion of technology, and also for the reorganization of course content, meant that the TLC members must have a more consultative and facilitative role while teaching new knowledge and skills. The report from the interviews indicated that the TLC members became cognizant of their roles and worked in very positive ways to make this a valuable opportunity for all.

Networking took place face-to-face in team meetings, large group TLC meetings, committee meetings, co-led workshops, in the Ed Tech Center, and electronically through the Blackboard discussion board. As one TLC member reported during an interview:

> The whole structure of TLC really sets up leaders and sets up risk taking because of the freedom we have. We're allowed to step off the ledge if we want to, but we're also allowed to stay and assist people who are stepping off the ledge...to be a support for people…Support is probably the most important thing with technology...without support, I don't know what we'd do...in the technology field, if you don't have somebody there to catch you, to get you out of that jam....support is essential to TLC. … Being a leader also goes way beyond risk taking. It's seeing a group of people as a whole. Being a leader of something like the TLC, it's not just going for yourself...it's taking the rest of the people in the group and making them part of what you're doing and giving them a chance to lead and being a support person for them.

In focus group interviews, students reported, "we're not going to know all the answers and that's why we have each other as resources." Another TLC member added,

> This whole group is a constant reminder of the value of group projects. We all know something different and when things don't work, there is power and knowledge among us. This has made me reassess how I will use cooperative learning when I teach science.

In his reapplication letter, one TLC member wrote about risk taking and his satisfaction in assisting faculty and students with digital video editing:

> The Technology Leadership Cadre has been one of the most rewarding experiences of my college career. I have gained valuable information regarding technology preparation and risk taking. The TLC gave me the opportunity to explore leadership in several ways. This leadership is perhaps best seen in the new genre of digital video editing. Last time at this time, students and faculty would not have been able to do digital video editing. We have come a long way!

Finally, during a presentation to a national conference, a TLC member reported the changes she observed in the College of Education and what she learned from being part of this process: "Above all, I've learned to fight for what I believe in. The TLC has allowed me to see the changes I've fought for."

## Discussion

Support from the TLC has enabled preservice teachers to be taught and mentored by their peers and has enabled faculty to incorporate more assignments using technology. In turn, TLC members have become more confident and reflective regarding integration of technology and have developed leadership experience. Our results indicated that preservice teachers can teach others effectively about technology and that they reflect critically on technology integration through this process. Although most of the TLC members were successful in the program, there were a few TLC members who did not thrive in this environment. We realize the experiences, personalities, and various stories behind these TLC members will provide additional information about leadership. It was not in the scope of this study to examine this question; however, we hope to address this at a later time.

Although our results are limited to the context of this case study, they corroborate Hsieh and Shen's (1998) finding that leadership can be perceived in many different ways based on environment and according to the context in which it is being discussed. Furthermore, preservice teachers' perspectives on leadership are typically excluded from the literature; given their status, these students are in the process of developing leadership skills rather than being considered as true leaders. In Hsieh and Shen's study, they found superintendents viewed leadership from a political and moral perspective, principals viewed leadership from a managerial, personality, and moral perspective, and teachers viewed leadership from a personality and moral perspective. We found that preservice teachers viewed leadership from a personality (e.g., risk taking), a moral (e.g., the importance of helping others and the value of creating positive change), and a structural perspective. Two structures emerged from this data: community and freedom. The community structural perspective they identified was the importance of the network of support to cushion some of the failures they experienced as they took risks and the collaboration with others that promoted success. This corroborates some of the research on the importance of cooperative learning, mentoring, and learning communities (Bonk & King, 1998).

Although all students were required to learn how to use the electronic bulletin board to communicate with peers and were required to begin their multimedia portfolios, we did not require them to learn any specific software or hardware. This freedom, however, was not in the absence of clear goals. We provided opportunities to learn, stressed the importance of integration of technology into the curriculum, and found that most students wanted to be familiar with the software and hardware that was most in demand by teachers and students. However, they also learned programs that no one else on campus had yet learned (such as iMovie), pushing the limits. Literature on motivation (Stipek, 1988) has stressed the value of individual choice and responsibility in the classroom; we found choice and responsibility also related to leadership development in preservice teachers. Ironically, many universities specify minimal requirements for technology proficiency, treating technology as a skill to be learned in isolation. Future research might examine whether requiring specific technology for students to learn versus giving students choices increases or decreases leadership in using technology.

Consistent with Jantzi and Leithwood's (1996) findings on transformational leadership, we also found that a clear vision—in our case, communicating why technology should be used, how it should be used, and the skills needed to use technology as a tool to enhance learning—helped TLC members maintain continued

interest and involvement in various tasks. There was plenty of intellectual stimulation and an array of meaningfully related events to choose from.

Finally, although these preservice teachers showed leadership among their peers—on campus doing workshops, mentoring faculty, and assisting teachers in schools—it remains to be seen whether they will continue to be leaders in the absence of a Technology Leadership Cadre. If we develop leadership in technology among preservice teachers at our universities, will those students become leaders in their future schools, and can this model transfer to secondary and possibly elementary schools? Will former TLCs mentor other teachers when they are hired in schools, and be viewed as technology leaders—that is, as able to lead workshops, mentor others and integrate technology into the curriculum?

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