Technology and Multiculturalism in the Classroom
Case Studies in Attitudes and Motivations

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Abstract
This research uses a case study approach in examining the attitudes and motivations of five teacher educators who used technology in their classroom. It seeks to find out why teacher educators initially chose to get involved with technology and then addresses issues regarding the process by which the technology was implemented. Specifically, the research describes the teacher educators’ pedagogical beliefs, cultural preferences, and instructional strategies that influenced their selection of Smart Classroom technology (a network of six student computer workstations linked to an instructor). Moreover, it identifies and details six common elements of multicultural technology integration and concludes with a general discussion on the need to combine pedagogical methods with a practical vision of technology use and technical support. (Keywords: design of technology-rich classrooms, multicultural technology integration, teacher beliefs, teacher education.)

Although many centers of higher learning are relying on increased use of technology to improve upon their teaching practices, these efforts are often hampered by poor faculty implementation. Teacher educators in these institutions serve as role models, and when problems exist in their attitudes and practices, these problems are inevitably transferred to their students (Huang, 1994). Implementing technology becomes an individual responsibility, therefore, and it is made even more difficult
when teacher educators are confronted with culturally diverse learning environments.

Research shows that when it comes to “teaching the teacher,” our teaching institutions may not be doing an adequate job. Many teacher educators do not use technology in their classrooms (Parker, 1997) and thus, fail to effectively model its use for their students (Moursund & Bielefeldt, 1999). As a result, despite an increased emphasis on technology, many future teachers graduate to the workforce unprepared to use it effectively (U.S. Congress, Office of Technology Assessments [OTA], 1995).

The focus of this article is technology integration in the classroom with particular consideration given to the unique demands made of teacher educators in multicultural educational settings. Using a case study format, we examined five teacher educators and their use of technology in a classroom designed to support general teacher education classes. We follow up this study with a review of literature focusing on teacher educators: their pedagogical methods, their success or failure at multicultural technology integration, and finally, the support given them by teaching facilities.

**Faculty Pedagogical Beliefs**

In an exploratory study of 157 technology-using teacher educators, Robin and Harris (1998) found that the majority showed a tendency toward learner-centered teaching, were advocates of social constructivism, and preferred to engage their students in shared educational activities. Although the study did not specifically survey the participants about their uses of technology in relationship to their pedagogical beliefs, we may speculate that their worldviews and teaching approaches influence their selection and management of technology applications in the classroom.
In a recent study of five secondary mathematics teachers, it was discovered that resistance to using technology was related to the teachers’ beliefs about mathematics teaching, learning in general, and their existing pedagogies (Norton, McRobbie, & Cooper, 2000). The study also determined that teachers with a transmissionist approach—that is to say, an emphasis on the teacher and content matter—had a more limited view of the effectiveness of using computers for teaching and learning mathematics.

The relevance of teacher educator beliefs and practices to the practical application of technology in their classrooms is self-evident. Like all human beings, when faced with a problem, teacher educators are most likely to fall back on teaching methodologies that they understand, are comfortable with, and that have worked successfully for them in the past. As a result, it is safe to conclude that individual teaching pedagogies have a direct influence on the type and quantity of technology that individual teachers embrace in their classrooms. It is important, therefore, that serious consideration be given to modeling appropriate learning pedagogies as a means of shaping the level of acceptance and deference shown to technology by future educators. Observation of instructor modeling is a powerful form of learning—for good or ill; indeed, as Turroff (1999) argues, the learning methodologies used by teacher educators are as important as the technology itself.

**Multicultural Technology Integration**

Cultural preferences and beliefs play an important part in how technology-using educators organize their learning activities. Their approach to classroom management and acceptance of technology speaks to them as individuals, particularly with regard to their underlying cultural values, beliefs, and assumptions. Educators must be sensitive, therefore, to issues of cultural diversity. For example, some cultural groups strongly value social interdependence and interpersonal collaboration while others give higher regard to independence and personal achievement. Should the educator emphasize group
collaboration and peer tutoring at the computer, or should independent learning and individual achievement be encouraged? As a practical matter then, effective multicultural technology integration depends on educators knowing with whom they are dealing and modeling their teaching style accordingly.

Based on educational theory and research, Chisholm (1998) has identified six culturally supportive teaching elements for technology integration:

* **Cultural awareness** is an acknowledgement of cultural and individual differences through implementation of instructional and learning activities that support varied learning preferences, multiple intelligences, and native languages.
* **Cultural relevance** is achieved through culturally congruent and culturally relevant learning activities.
* **Culturally supportive environments** are safe and inclusive and integrate the learner’s culture, family, and community.
* **Equitable access** provides learners with access to technology in ways that best meets their needs.
* **Instructional flexibility** is the use of varied modes of delivery and assessment that harmonize with the learners’ strengths and preferences.
* **Instructional integration** is an acknowledgement of technology as an essential tool for learning and teaching.

Chisholm and Wetzel (1997) applied these six elements to a study involving 32 technology-based instructional units created by K–8 classroom teachers and found that general education and bilingual/ESL teachers, for the most part, demonstrated sensitivity with regard to cultural awareness, cultural relevance, instructional flexibility, and instructional integration. General education teachers, however, were less likely to provide culturally supportive environments for children acquiring English as a second language than were the bilingual and ESL teachers. The significance of this finding tends to validate the assertion.
that integrating technology into multicultural learning environments is a matter that must be addressed by teacher educators in their teaching methodologies. Whereas the bilingual and ESL teachers were instinctively more comfortable adapting their instructional units to the specialized needs of their students, the general education teachers showed a tendency toward less flexibility.

**Teaching Facilities**

Transfer of learning is facilitated when the environment in which material is learned is similar to the environment in which the learner will later be expected to demonstrate the learning (Woolfolk, 1995). It is important, therefore, that differences between a teacher’s preservice learning environment and their inservice K–12 classrooms be minimized. Based on this research, one might assume that institutions preparing new teachers would hold classes in facilities that mirrored the typical placement of computers in K–12 schools. Unfortunately, a recent study of four colleges of education considered exemplary for their integration of technology in teaching (Strudler & Wetzel, 1999) found this not to be the case.

In looking at this problem, it is important to first determine the typical computer configuration in which our graduates will be expected to perform. Nationally, the ratio of computers to students is 1:6 (“Nothing But Net,” 2000). Without the ability to provide each student with an individual computer, schools are faced with having to choose between distributing computers to classrooms or grouping them in labs. K–12 technology-using educators have long argued that placing computers in regular classrooms is superior to lab placement (November, 1997; Sandholtz, Ringstaff, & Dwyer, 1996). They find that having computers in the classroom makes integrating technology into the curriculum much easier because students do not have to wait their turn at the computer as in a lab setting (Barr, 1999). Furthermore, computer use is more open ended when computers are readily available (Quick, 1997) because teachers can use computers at the teachable moment.
Until such time as all K–12 classrooms are able to provide students with individual computers, it is an important part of a teacher’s preservice training that they be exposed to the problems that arise when the availability of technology is limited (Huang, 1994). To recreate a real-world environment, where access to computers is restrictive, our research involved the use of two computer classrooms (Smart Classrooms), each configured with a network of six student computer workstations linked to a single teacher workstation.

Each Smart Classroom contains a central area with 20 movable tables providing seating for as many as 30 students. The teacher workstation is located at the front of the room. Student workstations, each accommodating between three and five students, are arranged around the perimeter of the room. This configuration fits comfortably within the familiar 28’ x 40’ rectangle. (Figure 1)
Figure 1. Layout of the Smart Classroom.

One Smart Classroom contained Macintosh computers. The other contained PCs using Windows operating systems. Each student workstation was equipped with one recent model computer and two monitors, allowing three to five students to work together (Figure 2). The computers themselves were outfitted with Microsoft Office, selected educational software, and access to the Internet. Each student had individual and classroom work space set aside in their workstation computer.

Figure 2. Collaboration in a Smart Classroom.

In addition to the workstations, each Smart Classroom is equipped with a projection screen, VCR, overhead projector, ceiling-mounted projector, and presenter’s computer. The VCR and presenter’s computer are both connected to the ceiling projector. The ceiling-mounted LCD projection monitor enables the entire class to view computer and video displays. Sound output is routed through speakers installed around the
periphery. All computers are networked to the university computer system.

Methodology and Data Analysis

Using qualitative techniques, our research examined the pedagogical beliefs of five female teacher educators who were early users of the Smart Classrooms. Specifically, we were interested in learning their motivation behind using the Smart Classroom technology and determining how they went about designing instructional activities for use in their multicultural learning environments. Research data were obtained through oral interviews followed by a set of written questionnaires. (Read the questions in the Appendix.) Each of the 45-minute interviews was audiotaped and then later transcribed on paper. Interview questions included the following queries:

1. What is your teaching philosophy?
2. In what ways is your course student-centered?
3. Do you address the teaching of diverse populations? If so, how?
4. Describe some of the instructional activities you have conducted in this room.

Using the constant comparative method (Strauss, 1987), data collection and analysis were performed concurrently and continued throughout our research. The transcripts were initially read independently, but a subsequent meeting was held to share information and discuss emerging patterns we observed in the data. At the conclusion of this meeting, we decided to create a mini-case study of each participant to get a better appreciation of her individual teaching practices. To assist in the creation of these case studies, a written questionnaire containing the following questions was e-mailed to each of the teacher educators:

1. How long have you taught at ASUWest?
2. How long have you been in higher education?
3. What technologies are of primary interest to you?
4. Are these technologies related to your scholarly pursuits? If so, how?

After all the data from the written questionnaires were collected, the original transcripts were then reevaluated, and the initial case study drafts were completed. We observed certain commonalities among the case studies. These include beliefs, learning activities and technology fit, management of technology, student-centered approaches, learning activities, assessment of teaching, and multicultural teaching. To ensure that the case studies were accurate representations of the participants, we reviewed each study collectively then forwarded it to the respective teacher educator for comment. All of the case studies were accepted as being fair and accurate assessments. In fact, responses such as “seems to be a good summary of my intent and teaching style” were typical.

**Mini-Cases**

**Case 1**

Dr. A, a professor in special education, recently studied the effect of the Internet on the achievement and attitudes of students taking Internet classes. She also conducted research on the issues and challenges of teamwork using the Internet. Dr. A has been in higher education for 31 years, nine of which have been at the current institution where she teaches special education methods courses and strategies of academic behavior management.

Dr. A developed a Web-based distance education course for graduate students, yet perceives herself as less knowledgeable about computers than about their applications. Though she learned HTML, she indicated that she still does not feel comfortable in using computers, lacks computer terminology, and does not know computer programming. Her approach to computers is very functional. As she explained, “All I care
Several times during the semester, Dr. A met with students in her course on instructional management in the Smart Classroom. This course prepares preservice teachers to design and implement instruction, select appropriate materials and instructional procedures, and assess effects on academic performance. As a result of her interviews with graduates from the program, she now explicitly includes in this course computer-assisted instruction for children with special needs. She espouses experience-based learning, mastery learning, innovative teaching, and the application of knowledge and skills. She chose to use the Smart Classroom because of the capabilities of the room, which allows students to demonstrate their work at their computer station using an LCD projector.

In the computer classroom, students work concurrently in randomly assigned pairs or individually to complete a variety of activities. These preservice teachers completed a self-selected sequence of activities using a database instructional model. They assessed classmates using a specific instructional management system. Students also conducted a WebQuest on the Internet for specific information on how to use the Internet for good instruction. After reading an article on the effectiveness of computer-assisted instruction, students conducted an experiment comparing the effectiveness of a computer-mediated game and a board game.

Students’ learning is evaluated in a number of ways. Using a rubric, students self-assess their teaching in terms of their pace, use of techniques, use of professional vocabulary, and use of appropriate level of difficulty. Instructors also look for cohesiveness and consistency between the instructional management system they profess to demonstrate and their lesson plan, their interactions with students during teaching, and the research literature they summarize to support their chosen management system. Students also submit a list of effective
teaching practices that they have demonstrated. Classmates assess each other by listing the effective practices they have seen individuals demonstrate.

**Case 2**

Dr. C, an associate professor in bilingual and ESL education, has a research interest in culture and technology, particularly the creation of equitable access through culturally responsive teaching. She has been involved in higher education for nine years and teaches courses in multicultural education and bilingual and ESL language arts.

Dr. C feels very comfortable in using computers. Indeed, she described herself as a “virtual techie.” Though she does not see herself as a computer specialist, she does perceive herself as a high-end user. She has developed Web pages for all of her courses and uses them both as a means of instructional delivery and as a resource for students. She uses a digital camera to take and post photos of her students on her Web pages. She currently is experimenting with digital voice recording for use on Web pages for second-language learners.

Throughout the semester, Dr. C held her language arts classes in one of the Smart Classrooms. These courses focus on methodology for developing viewing skills, listening comprehension, speaking ability, and writing skills in children acquiring English. Over the years, Dr. C has increased her use of computers in these classes because of her belief that inservice teachers must experience computer use in teaching and learning if they are to provide, as teachers, second-language learners access to technology. Her approach to teaching is eclectic. She advocates faculty modeling of effective teaching methods and strategies, firsthand experience for learners, hands-on learning, and collaborative work. She decided to use the Smart Classroom so that students had direct experience with computers as tools for gathering information, with sharing information through presentations, and with teaching language arts to children acquiring English.
Students engaged in simultaneous learning activities in the Smart Classroom that generally required all students to use the computers concurrently but sometimes had students simultaneously on different tasks. Students usually worked in randomly assigned pairs or triads but sometimes individually or in self-selected groups. For example, students role-played being faculty members on a school committee and gathered information on assessment of non-native English students at their school. Committees, consisting of three students per group, used links on the instructor’s Web pages to gather information, summarize it, and present a report with recommendations to the other committees. Students also participated in jigsaw activities in which pairs select online readings from the instructor’s links and then share the information with other students. Students explored Web sites for listening and reading activities determining age appropriateness, educational value, and level of language difficulty. They have used metasearch engines to find Web sites on specific topics and then evaluated them using an instructor-developed form on her Web pages. In learning the writing process, students develop Kid Pix (1989–2001) slide shows, in conjunction with their educational computing class, and share them in class.

This instructor assesses student learning through applied projects and five multiple-choice quizzes throughout the semester. For each project, the instructor provides a set of weighted criteria in her syllabus. Writing skills and critical thinking are included in the criteria for all projects. The other criteria are project specific—for example, criteria in a total physical response activity include the use of commands, appropriate gestures, and appropriate materials to convey meaning.

**Case 3**

Dr. J, an associate professor in reading education, researches the role of the language arts in interdisciplinary connections. Given the current educational focus on technology integration in schools, Dr. J sees technology as an integral part of her scholarly work. She has been in
higher education for 11 years and teaches methods courses in reading and language arts.

Although Dr. J said she is a neophyte in using computers, we consider her to be a moderately competent user. She surfs the Internet for information, uses word processing software and e-mail effectively, and integrates several software programs into her teaching. As she explained during the interview, “I learn to do what I need to do.” Thus, her approach to computers is very practical and application oriented.

Each semester, Dr. J uses the Smart Classroom with preservice students enrolled in a collaborative project incorporating social studies, science, math, and the creative arts for early childhood majors. This project immediately precedes student teaching, and its primary purpose is to demonstrate how the academic subjects are integrated. Dr. J advocates collaborative learning, faculty modeling, hands-on learning, and application of knowledge. In her words, she wants the preservice teachers “to see how even young children can use the technology to enhance their learning and how to use technology to enhance the curriculum.” She selected the Smart Classroom based on the recommendations of a faculty member and the College of Education’s technical support analyst. She found this classroom both convenient and usable.

In the Smart Classroom, students learned how to use centers effectively. Students went on a field trip, gathered specific information, and then input it into the computer. They worked in self-selected groups of four, each with one competent computer user. Groups could rotate across the centers, and each center had activities requiring the use of the computer. In another activity, students used Kid Pix (1989–2001) to create a class haiku book, and they imported pictures of themselves taken with a digital camera.

Assessment of student learning includes multiple-choice tests to help students prepare for the Arizona Teacher Professional Assessment
required for certification. Other forms of assessment are reflective papers, observations of and a report on Reading Recovery, a portfolio on an individual child, a mock communication with a parent, and an integrated thematic project. Students do in-class presentations, and the instructor checks how well they are performing activities in class.

**Case 4**

Dr. N, an associate professor in secondary education, focuses her research on the uses and abuses of standardized testing. In doing scholarly work, she uses the Internet, word processing software, and e-mail as practical tools. Dr. N has been in higher education for 17 years, 14 of these at her current institution. She teaches social studies methods and principles and applications of effective instruction.

Dr. N feels very comfortable using computers. She has created Web pages for her courses, web pages to help students prepare for the new Arizona Educators Professional Assessment (AEPA); she also received training at the University of Virginia on using the computer-based CaseNet approach to teaching.

Dr. N used the Smart Classroom in team teaching a CaseNet distance learning course. This course is an issues-based case study course in which students discuss a different case study each week. Students formed synchronous discussion groups within the classroom or asynchronously with other CaseNet participants across the country. Dr. N believes in a student-centered approach to teaching that allows students to bring their personal perspective to the discussions. She chose the Smart Classroom because its configuration supported teams working at the computers.

Students generally worked in teams of four at the computers in the Smart Classroom. Each randomly chosen team had one competent computer user, and students helped each other with the technology. Graduate and undergraduate students worked together in these groups.
Use of the computer depended upon where the students were in their activities. Each team posted their analysis of the case study to the CaseNet threaded discussion after within-group discussion. Students also produced individual electronic journals and their own case studies. At times, individuals without home computer access used the computers to read the online case studies.

Dr. N assessed students both on the quantity and quality of their journal entries and electronic discussions. Dr. N expected students to pose questions and respond to other people’s journal entries at least three or four times per week. They were also expected to post a reflective journal entry at least once a week. The instructor used a rubric in evaluating the case study analyses that students posted on the Web as part of a national competition with external judges. They also presented in class their self-developed case study.

**Case 5**

Dr. S, an assistant professor in educational administration and supervision, has a research interest in school change and teacher evaluation. Dr. S is interested particularly in how school principals might evaluate teachers who integrate technology in their classrooms. She has been in higher education for five years and teaches courses in public school finance and the principalship and supervises administrative interns.

Dr. S feels moderately comfortable using computers. She competently uses e-mail and word processing, presentation, and spreadsheet software. Dr. S created Web pages for her classes with links to resources for current students. Though, she is not a computer expert, she is not afraid to try new things. As she told the interviewer about her computer skills, “I am able to do what I want to do.”

Dr. S used the Smart Classroom in teaching a graduate course in school finance that provides a comprehensive view of how schools are
financed. In this course, she presents the underlying values that affect public goals in school financing (equity, equality, and efficiency) and helped students understand that these values may be in conflict. The course also addresses how bonds and taxes work and how finance formulas are constructed. Dr. S uses an eclectic partially constructivist approach to teach this course. She uses multiple methods to convey information and multiple activities for student to process that information. She builds on students’ existing knowledge and previous experiences, thus making the information relevant to the learners. Dr. S used the Smart Classroom because she finds that the computer opens up a new dimension to students for retrieving, manipulating, and presenting information. In addition, the configuration of this room facilitated both group interactions at the computer and student and instructor presentations.

Students worked in assigned groups on instructor-created databases using local school district information. Each group had at least one computer-competent and one math-competent member. The groups computed tax rates, comparing the effects of different funding formulas for districts with differently valued tax bases. These activities helped concretely illustrate where the money comes from, where it goes, and why some districts have difficulty raising money. Students also engaged in jigsaw activities in which they discussed articles read and created a Microsoft PowerPoint (1987–2000) or Word (1983–2000) presentation that was shared with the class using the LCD panel and the overhead projector.

For student assessment, this instructor uses mostly summative exams and quizzes on the course content. During class sessions, she frequently checks for understanding as a formative evaluation measure.

Results

Beliefs, Learning Activities, and Technological Fit
All five participants voiced similar reasons for choosing to use the Smart Classroom technology. Chief among them was the fact that the physical layout of the learning environment was compatible with their planned activities and supportive of their teaching philosophies. The compact nature of the Smart Classroom gave students ready access to the computers and the instructor ready access to the students. As Dr. S observed, using small group computer workstations “forces peer interaction.” And yet, despite the close proximity of instructor and learners, all participants reported finding the layout both user friendly and convenient.

Another similarity we discovered was that all five teacher educators espoused a constructivist approach to teaching (i.e., a methodology that builds on students’ personal experiences and knowledge and provided for collaboration, small-group interaction, and hands-on learning). Two of the five participants indicated a preference for an eclectic or multi-modal approach that supported learning style differences and multiple intelligences. Two educators explicitly commented on the importance of the learners’ application while an equal number stated that instructor modeling was an important part of their teaching.

The Smart Classroom is not a panacea, however. As Dr. H observed, the rooms are “good for lots of things, but not for everything.” The teacher educators were unanimous in their belief in using computers when it best fits their courses and activities. According to Dr. S, “[With] other courses it’s more difficult. … Technology supports my teaching philosophy if it’s properly configured.” This sentiment was echoed by Dr. A, who commented that, if all her classes were held in a Smart Classroom, her students would only demonstrate instructional management strategies that require the presence of a computer. Heavy reliance on computers would cause her students to become less familiar with other essential management strategies.

Managing Technology
None of the instructors formally assessed computer competency. As Dr. S stated, “This course is not about teaching them [computers], but it’s time for them to begin to learn.” Nevertheless, three of the participants indicated that they used informal ways of assessing computer competency and that assessments were necessary to ensure that in every group of students there was a technologically competent colleague available to provide peer support.

As a procedural matter, all five educators mentioned having their student groups work at the computer stations. Only three indicated that they monitored individual learning and provided individual responses. And although two of the participants said all their students used the computers simultaneously, three stated that, on occasion, students worked on different activities or different stages of a process. Thus, not all of their students were all sitting at the computer at the same time at every class period.

**Student-Centered Teaching Approaches**

Instructional relevance was important to these teacher educators. All participants connected course content to students’ personal interests, past experiences, and prior knowledge. For example, Dr. S used data from the school districts where her graduate students worked and linked concepts to personal budgets in her discussions of school finance. Dr. N gave students the opportunity to bring their personal perspective on issues being discussed. Dr. A had students do literature searches on topics of interest to them. Dr. C had students select online readings based on personal interest. Two instructors linked content to classroom teaching through role-playing and discussion of classroom applications.

Most also provided their students some choices within the framework of common assignments. For example, Dr. J had all students produce pages for a class haiku book but each student group was allowed to develop its own unique subject matter and graphics. Both Dr. C and Dr. N allowed their students to choose from among sets of preselected online readings.
for each topic or theme. Two of the teacher educators allowed students to choose their own partners for computer work. The other three educators assigned students to groups randomly after first ensuring that every group had at least one computer-competent student.

Learning Activities Using Technology

The Smart Classroom learning activities varied considerably due to the nature of the courses and differences in teaching styles among the participants. For example, Dr. J had students use the digital camera and download photographs to add to their class book of Haiku poems. Dr. H’s students published case study analyses that were judged by outside reviewers as part of a national competition. Dr. C’s students, while learning and experiencing the writing process, produced Kid Pix (1989–2001) slide shows that incorporated both photographs of the authors and the authors’ reading of their text. Dr. S had students create a PowerPoint (1987–2000) or Word (1983–2000) presentation using the ClassWorks display system. Thus, these teacher educators successfully integrated technology into their learning activities by giving the technology relevance to their overall learning objectives.

Although all instructors included their e-mail addresses on their syllabi, only two made teacher–student e-mail communications a requirement. Dr. J told us that, when students used e-mail, they received more personal and in-depth responses. Three of the instructors created their own Web pages and used them in course delivery and learning activities. For instance, Dr. C presented her classes with Web pages containing topic outlines, main ideas, and examples of the course material. These remained available to the students throughout the semester.

Assessment of Learning

All five educators used formal summative evaluations to assess students’ learning. As two of the participants indicated, they provide multiple-choice tests and quizzes to give students experience with the format of
the teacher competency test required for certification. Four employed informal formative course-embedded evaluations as well. These informal measures included reflective papers, observations, and the quantity and quality of electronic journals and discussions.

**Multicultural Teaching**

All five of the participants addressed diversity issues within their course content to some degree. Dr. S spent a portion of her course on issues of equity in school finance. Dr. J addressed language diversity, multiple intelligences, and the concept of comfort and challenge zones. Dr. A’s course focuses on the design, implementation, evaluation, and redesign of instruction for children with special needs, including second language learners. Dr. C’s class explored differences in first and second language writing development, differences in home literacy experiences, and differences in educational expectations between home and school culture. In Dr. N’s class, students read and analyzed case studies on bilingual education, migrant education, and special education.

Our analysis of the transcripts applying Chisholm’s (1998) elements for multicultural technology integration revealed that all six were present to varying degrees among the five teacher educators (Table 1).

**Table 1. Faculty Application of Six Elements for Multicultural Technology Integration**

<table>
<thead>
<tr>
<th>Element</th>
<th>Faculty</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culturally supportive environment</td>
<td>A</td>
<td>Group work</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Students incorporate own experiences, collaborative work</td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>Collaborative groups, allow for comfort zone through self-selection of groups</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Team approach and individual work, express own perspective, allow different interpretations</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>Peer help with math and computing, students</td>
</tr>
<tr>
<td>Cultural awareness</td>
<td>A</td>
<td>Coaching non-native English writers, content focuses on child with special needs and ESL, individual feedback by e-mail</td>
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<tr>
<td>--------------------</td>
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<td>------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Individual feedback, varied activities to support multiple intelligences and learning preferences, content focuses on second-language learners</td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>Collaborative, individual feedback, formative assistance</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Student-centered approach, community of learners, e-mail for private communication with students</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>Eclectic approach, multiple methods, aware of physical needs, study sessions, groups with math-confident and computer-competent members, self-evaluation of initial skills, content on equity issues</td>
</tr>
<tr>
<td>Cultural relevance</td>
<td>A</td>
<td>Students polled for needs and learning interests</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Firsthand experiences with Web and computers in teaching and learning, students link to what they see in field</td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>Took field trip to gather info and report, created personal haikus, photos imported, address second-language learners</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Use own experiences and knowledge in case analysis, personal journals; case studies on bilingual education, school in Indi, and special education</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>Build on knowledge and experiences, data from districts, use personal finance examples</td>
</tr>
</tbody>
</table>
| Equitable access   | A | Don’t require Internet assignments, provide computers in class (cart) for those with none at home, paired with computer competent,
<table>
<thead>
<tr>
<th>Instructional flexibility</th>
<th>A</th>
<th>Choice in management system, choice in Web sites to visit, choice in sequencing of activities, choice of partners, assessment by instructor, self, and peers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>Choose topic within assignments, choose partners, choose online readings, choose metacrawler to find Web pages</td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>Pick teams/pairs, choice within assignments, some at computers &amp; some at tables</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Choice of team names, strand, and strand; large- and small-group discussions; readings; qualitative assessment and objective assessment (rubric, outside evaluators)</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>Study sessions optional</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instructional integration</th>
<th>A</th>
<th>Students integrate computers in their teaching use computer to find information students decided they needed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>Role playing, information gathering, writing process integrated with Kid Pix (1989–2001), Web page evaluation</td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>Field trip linked to computer work, Kid Pix haiku book, learning centers with computer</td>
</tr>
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Cultural awareness refers to an acknowledgement of cultural and individual differences through implementation of instructional and learning activities that support varied learning preferences, multiple intelligences, and native languages. These educators demonstrated cultural awareness through instructional activities such as providing individual coaching for non-native English learners, giving individual feedback, providing for students’ physical needs, and using a variety of instructional activities that support multiple intelligences and learning preferences.

Cultural relevance is achieved through culturally congruent and culturally relevant learning activities. To have cultural relevance, learning activities must relate to the learner’s background, personal experiences, personal interests, and prior learning. They must also focus on the realities and challenges of living in a culturally diverse society. The participating teacher educators incorporated cultural relevance by having students self-identify their needs and interests, linking learning to field experiences and connecting personal experiences and prior knowledge to content. Similarly, by providing direct experiences, such as a field trip or hands-on computer use, the instructors created relevant shared experiences that gave meaning and an appropriate context for what was being learned.

A culturally supportive learning environment is one that integrates the learner’s culture, family, and community. It is a safe, inclusive
environment where divergent opinions are accepted. These teacher educators created an inclusive classroom environment by encouraging a widespread use of collaboration, group work, and peer help. This teaching approach fosters interdependence and acceptance of peers. They also actively sought their students’ opinions and perspectives. To the extent that they provided content dealing with issues in the larger community, they also integrated the students’ community. However, the findings suggest that there was limited integration of the students’ culture and family backgrounds in the content and activities.

Managing technology for equitable access implies providing learners with access to technology in ways that best suit their needs. The implication is that not all learners need the same software or hardware and that their access to the technology may require different levels of support, depending on their individual skills and knowledge. The teacher educators in our study generally supported their learners’ access to technology by assigning a competent computer user to each group after having students self-identify their level of expertise. The self-described competent user in each group then became a resource and a peer teacher for those less competent. Other ways of increasing equitable access was to provide computers in the classroom for those without computers at home and allow students to use the computer as needed. As a result, students were able to use the technology at different times and for different purposes. Because these teacher educators used technology as a tool rather than as the focus of their instruction, they did not evaluate or formally teach computer skills.

Instructional flexibility refers to the use of varied modes of delivery and assessment that harmonize with the learners’ strengths and preferences. Where instructional flexibility is present, students have choices in content and in ways of demonstrating learning. We found that the participants provided choices within the framework of their assigned activities. For example, students in one class chose which management system they wished to demonstrate in class. In other classes, they had choices in readings and topics.
Instructional integration of technology occurs when technology is an essential tool for learning and teaching. Hence, students and teachers use technology for challenging, purposeful, authentic, and productive endeavors. The participants in this study clearly indicated authentic and productive applications of technology. Use of the technology was directly linked to classroom teaching and preservice teachers’ learning. For example, one educator linked the use of the writing process to the development of an electronic slide show. Another used the Internet with students to locate pertinent information related to their stated interests. Yet another used spreadsheets to illustrate tax rates and their relation to school funding.

Discussion and Implications

Teaching Methods Matched Smart Classroom Capabilities

The participants chose to use these Smart Classrooms because the classrooms matched their teaching methods and instructional goals. They valued collaborative student work groups, and the eight computer stations made it easy to arrange projects for their students. They valued group sharing, and the ClassWorks system made it easy for students to share their work. Although the participants were not formally aware of the six elements of multicultural technology integration, our analysis showed that the faculty designed some activities and made some choices that reflected them.

Technology Skill Level Matched Smart Classroom Capabilities

Four of the participants thought they were not technology experts, but their expertise was sufficient to give them the confidence to try a new teaching environment. For example, one teacher educator commented that her level of technology skill was sufficient to enable her “…to do what I want to do.” Another said, “I learn to do what I need to do.” It should also be noted that four participants had previously designed their
own Web pages; although their Web pages varied in content and complexity, they often included two or more of the following: course syllabi and links to electronic mailing lists, online journals, and Internet sites related to course content and classroom activities. The participants did not need to use valuable class time teaching step-by-step use of computer applications. A critical mass of the students had sufficient skills to allow the group work to focus on meaningful course outcomes. For example, three of the five participants assigned a self-described competent user to each student group with the expectation that the Internet search, PowerPoint (1987–2000) presentation, school budget spreadsheet simulation, or Kid Pix (1989–2001) field trip slide show would be successful and model appropriate uses of technology in their academic areas. This technique also encouraged peer-centered learning, rather than relying on a “sage on the stage.”

**Smart Classroom Support Matched Faculty Needs**

An analysis of the interview transcripts revealed no mention of the issue of technology support by central campus computing. This is important because adequate technology support is a key to inducing faculty to use technology in the classroom (Strudler & Wetzel, 1999). It is our contention that faculty members take for granted just-in-time support for technology use in their classrooms. For example, a technology assistant starts each computer and makes sure it is working prior to each class period. Instructors have access to on-call support personnel during class time. If a problem arises (e.g., a network or printing question), a support person usually reports within 10 minutes. Problems that are not taken care of immediately are noted on a whiteboard in the classroom and are usually corrected by support technicians prior to the start of the next day’s session. As a result of this level of outside support, instructors using the Smart Classroom are essentially free from any direct involvement in technical support issues.

**Faculty Vision of Teaching, Learning, and Technology Match Smart Classroom**
We did not teach faculty to use technology for this study. Each participant developed a variety of meaningful technology uses for their students prior to our research. In an earlier survey (Wetzel, 1993), a faculty member wrote, “I’d be happy to use technology in my classroom, but I can’t think of any appropriate uses. I don’t lecture a lot.” By contrast, participants in our study knew what to do, addressed many aspects of the six elements of multicultural integration, and had the technological expertise to create a successful learning environment.

For Further Study

Only five teacher educators out of a total education faculty of 40 chose to use the Smart Classrooms. Further research is needed to determine why the remaining 35 teacher educators elected not to use this facility. In the meantime, based on our current research, and our involvement with the five teachers educators who participated in this study, we arrived at the following conclusions:

1. Faculty chose not to use the Smart Classrooms because their teaching methods may not match the Smart Classroom design (e.g., they may not emphasize student collaboration).
2. Faculty may not feel sufficiently confident in their technology skills.
3. Faculty may not have a vision of meaningful and compelling use of technology in their areas.
4. Smart Classroom layout does not accommodate classes larger than 30.

We recommend further study of faculty who choose not to use technology in their teaching to better understand the factors that influence their decisions. If the obstacle is technology expertise, what level of technology expertise is required to make reluctant faculty feel comfortable using technology in teaching? If the obstacle is vision, what
instructional goals might correlate with appropriate and compelling use of technology for faculty in their specific content areas? What experiences will help them develop personally compelling uses of technology in teaching? Developing culturally appropriate uses of technology in teaching is perhaps the most difficult hurdle needed to be overcome. How do we model the six multicultural technology integration elements in faculty training?

**Next Steps**

Following this study and through a Preparing Tomorrow’s Teachers to Use Technology (PT3) Implementation Project (“Preparing,” 2000), this College of Education offered faculty members a series of eight half-day to two-day summer technology workshops. Five of the eight workshops were offered in the Smart Classrooms to model the use of technology in these facilities. More than half of the faculty enrolled in one or more of the workshops. The workshops included such topics as Building Your Web Page, Using the Internet to Support ESL/BLE Classes, Using the Internet to Prepare Students for the State Teaching Exam, PowerPoint and the Smart Classroom, and Using Inspiration across the Curriculum. This research has helped us consider the training needs of faculty so they can develop ideas about compelling uses of technology in their areas, particularly with regard to multicultural learning environments. As a result, we can look to forward to new teachers beginning their inservice careers with the competence, and confidence, to use technology in meaningful ways.

**Contributors**

Dr. Ines Marquez Chisholm teaches bilingual and English as a second language methods courses and has conducted research on multicultural technology integration in preservice and inservice education. Dr. Keith Wetzel teaches undergraduate and graduate courses in educational technology. He is the director of a Preparing Tomorrow’s Teachers to Use Technology (PT3) Implementation Project, and his research focuses
on the integration of technology in teacher education. Together, they have a long-term interest in issues raised in this research. Through Dr. Chisholm’s research into multicultural technology integration into preservice and inservice education, six culturally supportive teaching elements have been identified (Chisholm, 1998). Dr. Wetzel’s recent research has focused on factors common to teacher education programs exemplary in their integration of technology throughout their programs (Strudler & Wetzel, 1999). Together, the authors have evaluated K–12 staff development programs for technology integration in multicultural schools (Chisholm & Wetzel, 1997) and team planned their preservice courses in educational applications of technology and ESL and BLE language arts respectively (Wetzel & Chisholm, 1998).

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References


Appendix
Interview Questions: Faculty Use of Smart Classrooms

1. What courses have you taught in a Smart Classroom?
2. What is this course about?
3. What is your teaching philosophy for this course?
4. In what ways is your course student centered?
5. How do you provide for individual skills, language proficiency, personal experiences, and background?
6. Do you address the teaching of diverse populations in this course? If so, how?
7. What were your reasons for deciding to use a Smart Classroom?
8. How frequently have you used a Smart Classroom?
9. Who did you work with in planning your use of technology for this course? In what ways did you find this helpful?
10. Describe some of the instructional activities you have conducted in this room.
11. To what extent do you make your instructional activities in a Smart Classroom relevant to the learner? In what way?
12. How have you assigned students to use the computer stations?
13. Do all students use the computer stations simultaneously?
14. Are there any alternative or choices for students in either activities, assignments, or grouping? Please explain.
15. What products do your students produce for this course?
16. How do you evaluate student learning in this course?
17. Do you use e-mail, group conferencing, or your own Web page as part of this course? How?
18. Do you assess students’ computer competency in any way? How?
19. Do you find that the use of technology supports your teaching philosophy? In what ways?
20. How comfortable are you in using computers in general?
21. Is there anything else you’d like to say about using a Smart Classroom in teacher preparation?