THE IMPACT OF CALL INSTRUCTION ON CLASSROOM COMPUTER USE: A FOUNDATION FOR RETHINKING TECHNOLOGY IN TEACHER EDUCATION

Joy Egbert
Washington State University

Trena M. Paulus
Indiana University

Yoko Nakamichi
Indiana University

ABSTRACT

This purpose of this study is to examine how language teachers apply practical experiences from computer-assisted language learning (CALL) coursework to their teaching. It also examines ways in which teachers continue their CALL professional development. Participants in the study were 20 English as a second language and foreign language teachers who had, within the last 4 years, completed the same graduate-level CALL course and who are currently teaching. Surveys and follow-up interviews explored how participants learn about CALL activities; how what they learned in the course interacts with their current teaching contexts; the factors that influence whether or not they use technology in their classrooms; and how they continue to acquire and master new ideas in CALL. The findings support previous research on technology teacher education as it suggests that teachers who use CALL activities are often those teachers who had experience with CALL prior to taking the course; that lack of time, support, and resources prohibits the use of CALL activities in some classrooms; and that colleagues are the most common resource of new CALL activity ideas outside of formal coursework. Implications for teacher education are that teachers learn better in situated contexts, and technology courses should be designed accordingly.

INTRODUCTION

While teacher education is in some ways still an "unstudied problem" (Freeman, 1996; National Center for Research on Teacher Education, 1988), there is a large body of literature describing and examining what happens in teacher-education technology courses and programs. The majority of studies on teacher technology education explore the following issues: what teachers are and/or should be learning in technology courses (Hargrave & Hsu, 2000; Johnson, 1999); teacher-education students' knowledge of and attitudes toward technology (Atkins & Vasu, 2000; Milbraith & Kinzie, 2000); and how teachers think about and use computers in the classroom (Ertmer, Addison, Lane, Ross, & Woods, 1999; Levy, 1997a; Pilus, 1995; Walker, 1994). Much of this research shows that teacher-education technology courses and programs have a limited impact on how teachers think about and implement technology-supported teaching (Cuban, 1996; Feiman-Nemser & Remillard, 1996).

Within this body of literature, however, few studies explore transfer from the practical content of teacher-education technology courses to the classroom. There is also a gap in the literature specific to the relatively new area of computer-assisted language learning (CALL; Lam, 2000). In order to help language teachers learn about and use technology effectively, we need to know more about the transfer of CALL coursework to the classroom. More specifically, we need to ask

- How do teachers learn about CALL-based activities?
- How does what they learned in their coursework impact their current teaching contexts?
- What factors influence whether they use computers in their classrooms?
- How do participants continue to acquire and master new ideas in CALL after formal coursework ends (professional development)?

If we discover that learning about technology integration does not occur as well through coursework as by other kinds of experiences, teacher educators will need to reexamine the opportunities they provide teachers learning about CALL.

This study begins to address this gap in the literature by describing how language teachers use the practical knowledge and experience gained in graduate coursework on computer integration in their teaching. The authors then examine ways in which teachers continue their professional development in CALL. More specifically, this study explores how the teachers learn about computer-assisted activities; how what they learn in their coursework interacts with their current teaching contexts; the factors that influence whether they use computers in their classrooms; and how they continue to acquire and master new ideas in CALL. The results of this study can help teacher educators better understand the impact of CALL coursework on classroom computer use and rethink ways to facilitate pre- and in-service teachers' continued development in the area of CALL.

REVIEW OF THE LITERATURE

Pre- and in-service language teachers should clearly learn about computer use. When integrated appropriately, CALL technologies can support experiential learning and practice in a variety of modes, provide effective feedback to learners, enable pair and group work, promote exploratory and global learning, enhance student achievement, provide access to authentic materials, facilitate greater interaction, individualize instruction, allow independence from a single source of information, and motivate learners (Lee, 2000; Warshauer & Healey, 1998).

The promise of computer technologies, supported by both research and practice, underlies the emergence of technology classes across teacher-education programs and a sharp increase in courses specifically aimed at language teachers (Johnson, 1999). However, the appropriateness of technology for student learning is only one factor in understanding teachers' use of CALL. Teacher educators need to design CALL courses that teach what language teachers really need to know. Course content should also be readily transferable to school settings across language contexts and language teachers should continue to learn and grow in the technology area as practicing professionals. Understanding the impact that coursework has on practice can enable teacher educators to plan technology-related courses that are authentic and "generative" (McKenzie, 2001).

The literature review below includes four separate but not mutually exclusive foci: how teachers learn technology, the interaction between coursework and the classroom, factors affecting technology use, and professional development in technology use. Together, these overlapping foci present a picture of the relationship between teachers and technology learning and use.

How Teachers Learn Technology

Research in teacher technology use shows that preservice teachers gain confidence in the use of computer technologies through formal teacher-education coursework (Knezek, Chiristensen, & Rice, 1996) and that their attitudes towards computers improve through such coursework (Lam, 2000). Although this research shows changes in perceptions that are often correlated with classroom technology use, it does not explain what preservice teachers take away from the courses and actually use in their classrooms. Galloway (1996) stresses the need for research that addresses questions about what computer experience teachers need to gain, how they actually use computers, and how they learn to use and adopt computers. The

literature to date that attempts to answer such questions suggests two overarching themes: first, that teachers learn what they actually need to use; and second, coursework does not always address teachers' or students' needs. These two points are explained further.

While the emergence of a great variety of technology courses for teachers suggests a belief that teachers can learn about education technology theory and practice through coursework, some researchers have found that coursework seems to have little or no impact on teacher-education students' beliefs about their abilities or use of what they have learned in their teaching. For example, Grau (1996) found that after a semester-long technology course, only 22% of the preservice teachers rated their computer skills as being above average, and the same percentage rated them below average. Twenty-five percent of his participants did not use computers at all in their first year of teaching.

McMeniman and Evans (1998) conclude that language teachers alter their practices and beliefs (or "learn") when "presented with evidence that shows positive effects of the new teaching method on quality of learning outcomes" and "develop expertise in the new method" (p. 1). In other words, since they do not perceive that there is sufficient evidence of any positive effects of technology-enhanced teaching, many teachers may not change their practice to incorporate technology. Even when teachers do believe that technology has "empowering potential," they do not always know how to make this happen in the classroom (Debski, 2000). Langone, Wissick, Langone, and Ross (1998) also discovered that although teachers do learn new skills as a result of instruction, they do not necessarily use those skills in their daily practice or change their instructional practice in the long run. Levy's seminal study (1997a) suggests that there should be a fit between teachers' philosophies of language teaching and learning and what they see as the capabilities of technology to facilitate teacher use of the technology in their classrooms.

Along the same lines, Galloway (1996) and Smerdon et al. (2000) found that most teachers learned to use computers outside of coursework. While this helps to prepare teachers for CALL coursework in the use and integration of appropriate technologies, it also has other implications for teacher education in CALL. The important trend noted in both of these studies is that the majority of respondents learned to use those applications that they *needed to use in their lives* outside of school. Galloway explains this trend by noting that the most-used computer application among his participants was word processing. This is because teachers use word processing for both personal and professional work. Galloway also found that few teachers actually used telecommunications, hypermedia, or even other business programs such as databases and spreadsheets because they did not need to use these technologies in their lives outside of the classroom. He suggests that we show teachers how their personal and professional knowledge and experience with computers can also be used in the classroom. The United States Department of Education (Smerdon et al., 2000) similarly reports that teachers use technology most frequently to prepare or supplement instruction rather than for instructional delivery, thereby working to save themselves time or to enhance student learning beyond the classroom. Keirns (1992) concurs, noting that "the practical experience of learning computer skills which are personally useful has a positive effect" on teacher technology use (p. 34). This implies that, for CALL coursework to have an impact, it should focus on the needs of individual teachers and their contexts.

Currently, what teachers are learning in coursework might not be what they need (or perceive they need) to know. Abdal-Haqq (1995) argues that teachers are not integrating new and advanced technologies into their syllabi, possibily because teacher education in computers often focuses on "older and simpler instructional applications of computer technology" rather than multimedia, problem-solving applications, and other newer tools. In short, teachers cannot implement what they do not know about. Grau (1996) also found that the first-year teachers in his study who used computers most frequently used a word processor and a grade book, and Levy (1997a) also commented on the pervasiveness of word processing. Strudler, McKinney, & Jones (1999) note that first-year teachers, when they use computers at all, "rarely venture beyond word processing and/or drill and practice games" (p. 117). Findings indicate that even more experienced teachers use the computer mainly for word processing, spreadsheets, drills, and to some

extent Internet research and problem-solving (Smerdon et al., 2000). Teachers are more likely to use these programs for creating worksheets, tests, and forms to supplement their practice. This suggests that teachers are using technology in ways that fit their current practice, rather than transforming their practice through the use of technology.

What seems to have more of an impact on teacher learning is peer collaboration in situated learning contexts (Smerdon et al, 2000; Fisher, 1999). Programs like those described by Fisher and Ringstaff, Yocam, and Marsh (1996) seem to have a greater impact on teachers' personal use and on their instructional delivery because the technology is situated in the context where it will be used, and learning takes place during their actual teaching. During these programs, teachers apply technology in their own classrooms and plan with real students and colleagues. It should be noted that teachers in these programs still experienced barriers to implementing technology, and those who did experience such barriers made fewer changes in their thinking and instruction.

This review of the literature suggests that coursework alone, devoid of the opportunities to practice, apply, and see evidence of student improvement, may lead to technology learning but not necessarily to its use. Cuban (1986) remarks that "teachers will alter classroom behavior selectively to the degree that certain technologies help them solve problems they define as important" (p. 70). However, the structure of CALL coursework and professional development experiences are rarely built on a model of teacher inquiry, and Langone et al. (1998) found that even with a set of courses and school-based practica, there were still barriers to teacher technology infusion.

Interaction Between Coursework and Classroom

A second focus of this literature review is the interaction between teacher-education coursework and the classroom. Although it is difficult to find research on the interaction between technology coursework and the teaching context, the existing literature shows that even when teachers are willing to integrate technology in their classrooms, their coursework may not facilitate doing so. Wentworth (1996) found in her study of teacher-education students that they could not use projects they developed in their technology class in their teaching because the schools did not have the proper facilities. Her participants also felt that they did not have enough time to adapt their projects to their specific teaching and school contexts. Grau (1996) compared the transfer between traditional one-course computer training for teachers and a year long on-site implementation program, and found that mentoring and site-based application led to transfer, as suggested in the previous section. He also concluded that it takes a minimum of 3 years to cause considerable change in teacher practice and that a one-shot course is not effective in doing this.

Keirns' (1992) study of coursework transfer supports this conclusion, noting that although participant practice may not be significantly altered by one course in technology, the course can help teachers develop a positive attitude toward technology and encourage them to "think about the integration of computers into their personal teaching situations" (p. 34). Parr (1999) agrees, noting that slow integration might also be due to the lack of a collaborative culture supporting computer use in the schools. This research indicates that a single, non-site-based technology course will likely not have much direct immediate impact on teachers' classroom uses of computers (Hargrave & Hsu, 2000) because this type of course does not prepare teachers for the realities of their classrooms. Other factors influencing transfer are described in the next section.

Factors Influencing Technology Use

The next focus of this literature review is the influences on teachers' use of technology. A wide range of factors have been found to influence teachers' use of computers. Debski (2000) found that teachers in his study, offered the chance to join an innovative computer-enhanced project, did so for reasons ranging from pressure to use computers in their courses to the opportunity to learn new technical skills. Other factors seen as facilitating teacher computer use are pre-service use, perception of the usefulness of

technology for teaching, and overcoming technology-related anxiety (Knezek, Chiristensen, & Rice, 1996). Reed, Anderson, Ervin, and Oughton (1995) agree that even one computer course can positively affect teachers' attitudes toward computers, giving them more confidence and convincing them that technology is a valuable tool. Fisher (1999) found that teachers' attitudes were strongly related to their success in using technology. Lam (2000) also notes that teacher confidence is crucial, and adds that other factors in the complex decision by teachers of whether to use computers include whether the technology is useful for job performance and how easy it is to use. The current uses of the technology in their schools and having a computer at home may also influence teacher computer use (Yildirim, 2000).

However, a positive attitude toward technology does not ensure that teachers will be able to use it in the classroom. Educators are prevented from using technology in many ways. These include time pressures both outside and during class (Lam, 2000; Levy, 1997a; Reed et al., 1995; Smerdon et al., 2000; Strudler, Quinn, McKinney, & Jones, 1995); lack of resources and materials (Loehr,1996; Smerdon et al, 2000); insufficient or inflexible guidelines, standards, and curricula (Langone et al., 1998); lack of support or recognition for integrating computers (Grau 1996; Strudler, McKinney, & Jones, 1999); a clash between new technologies at universities and older ones in schools; lack of leadership (Smerdon et al., 2000); and inadequate training and technical support (Abdal-Haqq, 1995; Lam, 2000; Langone et al., 1998; Levy, 1997a; Smerdon et al., 2000). Other factors that may influence technology use are age, gender, attitudes toward technology, and teaching experience, but the results are mixed as to what extent these variables are related to teacher use of technology (Lam, 2000). Levy (1997a) also suggests that the rate of technological change poses a barrier to technology use.

In addition, Lam (2000) notes that the top-down implementation of technology by authorities may cause resentment and avoidance by teachers. He adds that the lack of perceived legitimacy of the computer as an educational tool has an influence on teacher adoption of the technology. Lam also suggests that language teachers do not use computers in their classrooms not because they are technophobes, as some suggest, but because institutions and programs overlook the importance of training teachers and matching their goals with the tools they hope to employ. Similarly, Cuban (1986, 1996) notes that technology advocates have ignored realities such as the social organization of classrooms that serve as an inhibitor of classroom technology use. He also observes that "innovations for solving productivity problems defined by nonteachers invariably were mandated into use by district policy makers, not teachers" (1986, p. 54). He adds that "views of teaching and organizational compliance ill-fitted to schools and classrooms and married to feckless strategies aimed at coercing teachers to use the innovation explain limited use of the new technologies" (1986, p. 56). Teachers' attitudes and philosophies toward teaching and technology, regardless of their basis, can both support and prohibit the use of technology in the classroom.

It is important to note that some teachers implement technology in spite of the barriers listed above. Reed et al. (1995) found that "those able to overcome some of these hindrances included teachers who had had prior experience with computing" (p. 2). If this conclusion were true, we would expect to see a relationship between teachers' previous experience with computers and implementations in the classroom. In fact, studies show that technology-using teachers are those more likely to have more teaching experience in the classroom.

Professional Development in Technology Use

A final focus of this literature review is professional development for technology-using teachers. Levy (1997b) addresses the link between CALL coursework and further professional development in CALL by proposing that a CALL course should be looked at from a more holistic view than whether or not teachers become computer experts during a course. That is, teachers can learn additional skills after their coursework on their own if they receive a firm grounding in CALL theory through their coursework. Levy argues that it is nearly impossible to cover every piece of technology in a course. However, if

teachers understand the underlying theories and perspectives of technology integration, they can continue to learn and develop their materials according to their future needs.

Little empirical research has been conducted on computer-using language teachers' professional development. Grau's (1996) participants noted that it was hard to continue learning about technologies because the school had no resources to help teachers do so. This may be the case for many language teachers. Studies have found, though, that "teachers who spent more time in professional development activities were generally more likely … to indicate they felt well prepared" to teach with technology (Smerdon et al., 2000, p. iv). Although CALL professional development materials and resources in the form of books, Web sites, electronic discussion lists, journals, and courses exist, it is unclear which of these provide the most effective development and which provide theories and activities that directly transfer to classroom implementation. We may take a cue from the Apple's "Classrooms of Tomorrow" project (reported in Sandholtz, Ringstaff, & Dwyer, 1997), where hands-on, active learning by teachers allowed exploration, experimentation, and most important, reflection; these "situated teacher development" activities, in turn, supported many different kinds of change in classrooms.

In sum, this review of the literature indicates that technology coursework can change teachers' attitudes toward and confidence with technology and can also provide them with skills that they did not previously have. It also suggests that one course alone is probably insufficient to change teachers' practice either immediately or over time. Furthermore, it shows that teachers learn many of their technology skills on their own and use technology specifically to support their current teaching practices. In addition, teachers have different reasons for using or avoiding technology, but those who have more experience in teaching and in technology use, especially in practice, are more likely to integrate technology in their classrooms. More important, teachers need to have specific needs met during their technology learning. Finally, barriers to classroom use may also prevent the professional development of technology-using teachers. If these conclusions hold true for language teachers, they hold important implications for the design of CALL coursework.

The purpose of this study is to examine how language teachers learn about CALL activities, how they apply the knowledge and experience gained in one graduate-level CALL course to their teaching, and what factors influence their use of technology in their classrooms. It also investigates language teachers' pursuit of opportunities for professional development after the CALL course. Finally, it outlines implications for teacher educators.

METHODS

Participants

Participants in the study were 20 English as a second language (ESL) and foreign language (FL) teachers who had taken the same graduate-level CALL course (L530) within the past 4 years (1996-2000) and who were currently teaching. Participant data are included in Table 1.

Table 1. Participant profile (*N*=20)

First language	Urdu	1
	Spanish	1
	Mandarin	1
	English	17
Years of experience	0-1	2
	1-5	5
	5-10	8
	more than 10	4
Current teaching level (*n*>20 due to participants teaching in more than one level)	Pre-K	1
	K-6	5
	6-12	5
	College	8
	Adult	6
	Other (Special Education)	1
Current teaching area (*n*>20 due to participants teaching more than one area)	ESL	6
	Teacher education	3
	Content	3
	FL	8
	Other	4
Reason for taking the L530 course (*n*>20 due to participants marking more than one answer)	Interested	17
	Required	1
	Looks good on resume	3
	Other	2

Participants were fairly evenly divided between K-12 (*n*=11) and postsecondary education contexts (*n*=14) with some teachers working in both contexts. There were a variety of teaching areas represented, although no participants were currently teaching English as a foreign language. Participants ranged from more experienced (more than 5 years experience, *n*=12) to less experienced (5 or fewer years of experience, *n*=7) teachers, and the majority of participants (*n*=17) took the class because they were interested in the topic.

CALL Course

L530: Computer-Assisted Language Learning is a graduate course offered at a large midwestern university in the United States. The course serves as an elective course for several graduate degree programs at the university. According to the course syllabus,

> This course is intended to give participants a broad general view of computer-enhanced language learning. It will involve participants in exploring a working theory of language learning environments, using and discussing existing and potential applications of computer technology in the language classroom, and creating projects to use and test knowledge gained through reading, discussion, and hands-on experience. (Yalcin, 2001)

The syllabus was founded on the principle that, as Erben (1999) notes, "teachers learn best how to use technologies for educational purposes if their own learning takes place through such technologies" (p. 230).

Offered twice yearly, the course has used a relatively consistent framework of activities since its inception in 1996, although the content of some of the activities has changed to reflect changes in technologies, theories, or available software. Participants in this study had completed either the Web-based or on-campus version of the course. Both the Web-based and on-campus versions of the course consist of the same activities and were designed by the same faculty member. When both versions of the course ran

simultaneously, participants in both versions participated in discussions together in an asynchronous Web forum.

Data Collection

A paper-based survey questionnaire was developed based on the literature review and the content of the L530 course. The instrument was pilot-tested with several students who had completed the L530 course, but who were not currently teaching. Revisions were made based on the findings from the pilot test.

The six-page survey was mailed to all students who had completed the L530 course within the past 4 years. The mailing included a cover letter, the survey instrument, and a stamped, addressed return envelope. The students who were not currently teaching were asked not to respond. Eight surveys were returned as undeliverable. Of the 81 domestic surveys mailed, 20 completed surveys were returned, making the return rate 25%. This falls within the 10-33% average survey return rate as outlined by Sommer & Sommer (1991). As in Keirns' (1992) study, the pool was limited in part due to the lack of forwarding addresses available and those potential participants who were currently not teaching.

Nine of the participants volunteered to be contacted for follow up interviews. These participants answered structured interview questions by electronic mail (e-mail).

Instruments

The survey instrument was developed to address the research questions stated in the previous section. Parts 1 and 2 of the survey asked participants to identify which activities they participated in during the L530 course, which of those activities they had participated in prior to taking the course, and which activities they are using in their current teaching contexts. Participants were also asked to identify other CALL activities they used in their teaching and where they learned about these CALL activities. In part 3, participants who indicated that they do not use CALL activities in their teaching were asked why they do not use them. They were also asked to identify which factors would make them more likely to use CALL activities in their teaching. Finally, in part 4 participants noted what they wish they had learned during the L530 course.

The e-mail interviews asked participants to clarify, further explain, or supply additional information. Interviews included the following questions:

1) You indicated that you use some CALL activities in your teaching now. What motivates you to use CALL activities when you do?

2) You indicated that you had already used previously some of the CALL activities that were presented in the L530 class. Where did you learn these activities?

3) What, in retrospect, would be more appropriate activities for L530, considering the teaching job you have now?

4) You didn't indicate whether you have resources where you find information about CALL activities. Do you? If so, what are they? OR You indicated that you have resources where you find information about CALL activities. Can you describe one activity that you have used recently and discuss where you heard about it and what motivated you to try it?

Several of the participants were also asked to supply missing information in sections of the survey that they had overlooked in their initial responses.

Data Analysis

The results of surveys and follow-up interviews were compiled and analyzed according to the four research questions:

1) How do participants learn about computer-assisted language activities?

2) How does what they learned in the L530 course interact with their current teaching contexts?

3) What factors influence whether they use computers in their classrooms?

4) How do participants continue to acquire and master new ideas in CALL (professional development)?

During the analysis, patterns that emerged from the data were grouped into categories that addressed the issues raised in the research questions.

RESULTS AND DISCUSSION

Research Question 1. Learning About CALL Activities

Table 2 illustrates the activities the participants completed in the L530 course and whether they had had previous experience with those CALL activities. During the course, participants worked through the activity and the relevant principles supporting its use in language classrooms. Column A shows the number of participants who participated in each CALL activity as part of the L530 course. Column B shows the number of participants who already had participated in these activities before taking the L530 course.

Table 2. CALL Activity Use.

CALL activity	A. Completed in the course (*n*=20)	B. Had previous experience with (*n*=20)
Creating an external document	12	6
E-mail mystery activity	5	0
Presenting software to the class	11	4
Using content based software	15	8
Developing a Hyperstudio stack	7	1
Creating a Web address book	9	5
Participating in a professional listserv	13	8
Creating a WebQuest	7	2
Creating an instructional Web page for students or teachers	12	4
Creating a personal Web page	11	5
Developing computer enhanced lesson plans	14	9
Reviewing software/Web sites	17	7
Developing a technology solution for an inquiry project	4	1
Using an electronic conferencing system	13	6
E-mailing activity	18	16
Other: Using a MOO	1	0
Other: Taking a personality test on the Web	1	0

First, these findings illustrate the types of activities designed into the L530 course. The L530 course presented participants with an opportunity to learn about many new activities that involve technology and

the underlying pedagogical principles that support them. There was a focus on both professional and personal uses of technology included in the course. E-mail, reviewing software, developing computer-enhanced lessons, and using content-based software were the applications most frequently covered during the course. A majority of participants created personal and/or instructional Web pages, used an electronic conferencing system, and participated in an electronic discussion forum (such as a listserv). Several of these applications used state-of-the-art technologies, while others employed pedagogically sound strategies for using older technologies in classrooms.

However, it is important to note that except for new applications of familiar technology, such as the e-mail Mystery project or creating a Hyperstudio (Knowledge Adventure, 2001) stack, from 25% to 89% of the participants had already participated in each of the activities prior to the course. This indicates that they were not learning about these activities for the first time in this course.

When asked how they had learned about these activities prior to the L530 course, interview results revealed an almost equal distribution of participants who said that they had learned about the activities in a different course and those who indicated they learned it by themselves (such as on listservs, at conferences, or by playing with the software at their schools). Learning new technologies on their own is consistent with findings of Smerdon et al. (2000) who found that 93% of teachers prepared themselves for using new technology.

E-mail, reviewing software, developing computer-enhanced lessons, and using content-based software were the applications that the greatest number of participants had previously used; three of these were also activities that the most participants took part in during the course. According to the literature (e.g., Keirns, 1992), this extra "practice" on previously learned skills should lead to a more positive attitude and greater implementation of these activities in classrooms.

Research Question 2. CALL Coursework Transfer

Of the participants in this study, 70% (n=14) currently use at least one CALL activity in their classrooms. Table 3 presents findings regarding coursework transfer. Column A shows how many of the 14 computer-using participants currently use the various CALL activities in their classrooms. Column B presents the number of participants who had used the activity prior to the course and also currently use it in their classrooms.

Table 3. Transfer of CALL Activities

CALL activity	A. Use it now (n=14)	B. Did it before and do it now (n=14)
Creating an external document	5	5
E-mail mystery activity	1	0
Presenting software to the class	3	1
Using content based software	5	5
Developing a Hyperstudio stack	2	1
Creating a Web address book	1	1
Participating in a professional listserv	2	2
Creating a WebQuest	1	0
Creating an instructional Web page for students or teachers	6	4
Creating a personal Web page	3	2
Developing computer enhanced lesson plans	7	6

Reviewing software/Web sites	2	1
Developing a technology solution for an inquiry project	1	0
Using an electronic conferencing system	2	1
E-mailing activity	12	12
Web portfolios	1	0
Internet research	1	0
Word processing	1	0
Skill-building activities	4	0

These findings follow a pattern similar to that in the previous section. E-mail, developing lessons, and creating instructional Web pages are among the most frequently used CALL activities. Participants also noted other CALL activities that they currently use that were not part of the course, such as portfolios on the Web, Internet research, word processing, and skill building activities. These activities are consistent with the findings of Smerdon et al. (2000) who found that teachers assigned students to use word processing (61%), Internet research (51%), and practicing drills (50%). The frequency of the use of activities such as e-mail and Web page building in the classroom range from daily to monthly. An example of using the Internet as a teacher resource tool is described by one participant:

> I usually search the Internet daily looking for new and different ideas for the integration of technology in the classroom. I recently contacted Learning Systems for evaluation software Kidspiration. Though I don't like it as well as Inspiration, the second graders I worked with loved it. We did a unit on "Where in the World Are You?" The youngsters used the software to mindmap their location from house to planet.

Using e-mail to facilitate communication with native target language speakers was described by another teacher:

> I recently had my German III/IV class begin an email project with a group of students in Germany. We're using the site epals.com, which has been wonderful in that it allows me to monitor my students' incoming and outgoing email, so that I may assess their writing and provide tips for both content and mechanics. Best of all, my students have very much enjoyed writing to Germans first-hand to learn more about the culture and to share with them information about their own. My desire to make the German culture and the study of the German language more personalized for my students led me to do this activity.

The use of presentation software to teach oral communication skills was mentioned by this participant:

> I use [PowerPoint] as the final activity in the speaking class here. Students teach their classmates and teacher about their specific area of interest. They are required to put together an 8-10 minute speech with PowerPoint, with their research done in English (for vocabulary support). Q & A sessions follow.

These comments show how participants have integrated a variety of activities into their classrooms, including technologies such as Web pages and e-mail. Their reasons for going beyond simple programs such as word processing are suggested in answers to the e-mail interviews. For example, when asked what motivated the participants to use CALL activities, participants responded that they use CALL to enhance student learning, motivate students, and teach skills students will need in the future: "I use CALL only if the learning is enhanced by the technology and engages students." Another participant responded "I use computers for teaching when 1) they seem to be the most effective way of getting the point across and 2) when I think they will have to use the computer skill in their academic and/or professional careers." This demonstrates a sound theoretical understanding of how technology should be used in teaching.

Foreign language teachers in particular use CALL to connect their students with native speakers of the target language. Two participants remarked: "I find that I am usually motivated to use CALL activities when I want my students to connect with native speakers of German" and "I found the e-mail mystery project very exciting and great for practicing Spanish, since all the interaction was going to be in the target language." Participants also cited their personal motivation to keep up with current instructional innovations and using CALL to have students develop their language skills "through means beyond those offered in a traditional classroom."

Those participants who use CALL activities are more frequently those who used those activities in their teaching before they took the L530 course. E-mailing is the most frequently used CALL activity, and one which all of the participants had engaged in before taking L530. Almost all those who developed technology-enhanced lesson plans, created an instructional Web page, and used content -based software previous to the course were using them in their classes after the course. This supports previous findings that teachers use what they know well, and that much of what they learn is driven by personal exigency rather than by coursework. In many cases, it does seem that previous teaching experience is a good predictor of implementation (Reed et al., 1995).

Other CALL activities that participants said would be useful, retrospectively, in the L530 course and that would help them perform more effectively in their current positions fell into several general categories. These included strategies for applying CALL techniques to a variety of teaching situations (including business, large multi-section university courses, and K-12 environments); use of Internet applications for language teaching (including asynchronous discussions, teaching online, and Web page creation); innovative technologies such as translation software and virtual 3D worlds; and technical skills (such as using content-specific software or tools such as word processing skills, Web editors and XML.) Previous research has suggested that transfer might be more effective if coursework dealt with the needs and circumstances surrounding specific teaching situations (Fisher, 1999; Ringstaff et al., 1996).

One participant eloquently expressed what she felt teachers need (and would transfer) from CALL courses:

> They need strategies and tools on how to sort through what is there, how to do so efficiently within time constraints that they typically work under, and how to guide their students in becoming judicious users of technology. As a part of a larger emerging trend in classroom management and instruction, teachers also need strategies and confidence-building practice in 'loosening-control' on their students -- allowing students to take more leadership and initiative in creating and discovering learning experiences for themselves.

This teacher's feelings reflect Levy's (1997b) call for coursework to more strongly emphasize a theory of technology integration in addition to teaching how to use the technology itself.

These findings reinforce the need not only for theory and skills to be taught directly in relation to CALL, but also for more practical classroom management and good pedagogy in general. There is also a need for classroom-based teacher training in how to transfer personal uses of computers into their classrooms. It would be difficult to address each of these issues deeply enough in one course to have the impact that teacher educators hope to have, underscoring the need for new ideas about the process of teacher education in CALL.

Research Question 3. Factors Influencing CALL Use

The 6 participants who did not use CALL activities in their current teaching position cited lack of time, administrative or curricular restrictions, and lack of resources as the top reasons. Participants were asked to check all factors that applied to their situation. Results are shown in Table 4.

Table 4. Influences on Lack of Computer Use

Factor	Number (*n*=6)
Lack of time	6
Administrative or curricular restrictions	4
Lack of resources	3
Not currently teaching language	3
Lack of knowledge	1
Lack of confidence	0
Lack of interest	0

These findings support previous research on factors that limit the use of technology in the classroom (e.g., Lam, 2000; Reed et al.; 1995; Strudler, et al. 1995). Time was the most important factor in lack of technology use, cited by all six of the participants and found as well by Levy (1997b). One participant specifically mentioned that "the students only get 6 hours of ESL at each level. Too much to cover, and I have 6 preps."

Administrative and curricular restrictions were the second most important influence on lack of technology use by these participants. Two participants responded that they had rigid curricula which left them with no time or support to integrate CALL: "We also have a curriculum to follow and, since we use block scheduling at our school, we already struggle to find enough time to complete the required agenda each year. There never seems to be enough time to incorporate CALL activities."

Regarding lack of resources, the third most influential barrier to technology use, one participant stated, "Although we have several computer labs in our school, they are often crowded and it is hard to schedule time for students to work in the lab. Also, not all students have access to computers in their homes."

None of the participants who do not use technology remarked that it was due to a lack of confidence or interest. This is in keeping with previous findings of Keirns (1992) that coursework can make a difference in teachers' attitudes and confidence.

For those participants who were unable to integrate CALL activities, Table 5 presents factors identified as being most likely to enable CALL use. These included more time, more resources and better support. Whether and how these teachers try to overcome these barriers, and what actions they would take if these barriers were not present, are interesting questions for future research.

Table 5. Factors Enabling Greater Use of CALL

Factor	Number (*n*=6)
More time	6
More/better resources	4
Better support	3
Better training	1
Better rewards	1
More flexibility in the curriculum	1
More student interest	0

Participants indicated that time, resources, and support would enable technology use in their classrooms. These participants felt that right now CALL activities take time away from what teachers need to do. In fact, one of the criteria for effective CALL integration is that it be efficient (Egbert & Hanson-Smith, 1999; Egbert, 2001), but these participants were not able to efficiently use CALL in their classrooms. This is an issue that should be addressed in the design of CALL courses.

Research Question 4. Professional Development in CALL

Participants were asked where they have learned about CALL activities since the completion of L530. Table 6 outlines the resources identified as useful.

Table 6. Resources for CALL Activities

Resource	Number (*n*=14)
Peers/Colleagues	7
Web browsing	5
Books (Egbert & Hanson-Smith, 1999; Ryan, 2000)	4
Conferences	4
Journals *(TESOL Journal, Educational Technology)*	4
Courses	2
Electronic discussion lists (TESL-CA list, AATG)	2
Self	2
AskEric	1
Publisher promotions	1

Participants cited their colleagues as the most commonly used resource for finding out about new activities. This supports previous findings (Smerdon et al., 2000). Teachers seem to "learn best by seeing methods used in actual classrooms, by trying out new techniques and getting feedback on their efforts, and by observing and talking with fellow teachers" (U.S. Congress, 1995, p. 80). If this explanation is accurate, it builds a strong case for developing networks of CALL teachers during coursework. This can include assignments such as consulting with experts, participating in fieldwork, or working with mentors on inquiry projects.

Participants also used Web resources to find more CALL activities. One participant shared, "I engage frequently in web-browsing, usually springboarding from items/links I encounter in the NCBE online newsletter and Multilingual Matters online. From this surfing, I have located sources such as 'Teachers guide to international collaboration on the internet' which lend themselves to a variety of classroom uses." Helping learners develop a list of sites for professional development might be a useful course activity to build a foundation of resources that can be quickly accessed for future technology integration ideas.

One surprising finding is that even though 13 of the participants participated in a professional listserv (TESLCA-L) during the course, only two mentioned that they learned about CALL activities that way. One participant said "I have unsubscribed now … I did not have time to keep track of all the discussion in the field, and also because it did not directly relate to my own field of interest." Facilitating course participants in choosing personally meaningful methods for professional development might result in more lasting connections for CALL teachers.

Limitations of the Study

There are several limitations to this study. First, because of the small sample size and the diversity of participant teaching contexts, these findings cannot be generalized to the greater language teaching population. However, the findings from this study support the conclusions from the literature closely enough to suggest trends that can be noted. Second, the participants in the study were all at one time graduate students who chose to take the L530 course because they already had an interest in technology. This certainly is not the case with most teachers in the field. These findings are useful, however, because we expect these participants to be the ones who infuse technology into their classes, and yet this was not always found to be the case. Finally, in using self-report data there is always the potential for error in recall. Similarly, in using questionnaires and structured interviews, details such as what other courses

participants had taken since L530, links between coursework in CALL theory and classroom practice, and other useful information proved beyond the scope of this study.

CONCLUSIONS

Most of the participants had already used many of the CALL activities in their teaching prior to taking the L530 course. They had learned about the activities in a different course or had learned them by themselves. After the course, 70% currently use at least one CALL activity. These are more frequently those participants who used the activities in class before they took the L530 course, providing evidence that previous experience may be a good predictor of CALL use. Participants use colleagues and Web resources as their primary source for ongoing learning about CALL activities. It is not due to a lack of confidence or interest in CALL that teachers do not use CALL activities; rather, it is due to a lack of time, administrative or curricular restrictions, or lack of resources. The findings point to the need for more contextualized instruction directly related to the teaching environments in which language teachers will be practicing.

What are the goals of CALL coursework? In the main, teacher educators hope to help language teachers to understand and apply CALL activities to promote student achievement. The data suggest that the course provided some of the participants with skills that they did not previously have, while reinforcing those skills for others. Findings also suggest that one course like L530, if not situated in authentic learning contexts, is probably insufficient to directly change teachers' practice.

Furthermore, our participants learned many of their technology skills on their own, and interview evidence shows that they use technology to facilitate their current practice and beliefs. The participants had different reasons for using or avoiding technology, but those who had previous experience with technology use were more likely to implement technology in their classrooms. These results hold important implications for the design of formal CALL coursework.

IMPLICATIONS FOR COURSE DESIGN

Teacher educators need to address the theoretical underpinnings of CALL and present guidelines for effective technology use in context-based situations. For example, Strudler et al. (1999) proposed that we link novice teachers with experienced computer-using teachers, develop networks of experts, and find school sites that use technology and incorporate these into our courses, providing evidence that teaching and learning can change through the use of technology. To help our teachers overcome obstacles to technology use, we might do what teachers in Langone et al.'s (1998) study suggest, including helping teachers use technology efficiently, demonstrating ways to secure financial support, and assisting our students in developing arguments for school support of technology and technology-using teachers. We might also address the barriers of time constraints and limited access and demonstrate ways to teach around these barriers. Perhaps we should free teachers from the constraints of guidelines and rules, as Fisher (1999) suggests, while they come to their own understandings of the uses of technology in their classrooms.

Our findings support a shift away from isolated coursework in CALL to the development of a sequence of situated technology experiences for teachers. Freeman (1994) supports this view, using Lave and Wenger's (1991) theory to suggest that legitimate peripheral participation in discourse/practice communities leads to transfer, as does Erben (1999), who suggests that teachers who learn through technology also learn the theory and pedagogy of technology. In the same vein, Koet (1999) and Hatasa (1999) remind us that the locations where practical experiences occur and the contexts in which our teachers practice may not only be quite different from each other but may differ greatly from our views of what schools should be doing with technology. McKenzie (2001) agrees that a focus on "teaching and learning strategies that make a difference in daily practice" will influence how teachers use technology,

noting that "learning is the goal. Technologies are mere delivery systems" (p. 2). Langone et al. (1998) suggest that ongoing field coaching for several years after graduation might be one way to support teachers in technology implementation in specific contexts. Debski's (2000) findings support the need for CALL coursework situated in the contexts in which teachers will actually use it. It is crucial that future research examine these possibilities more closely, and that coursework take into consideration individual students' knowledge and experience.

IMPLICATIONS FOR FUTURE RESEARCH

This study underscores a great need for "studies of how teachers gain subject-matter and pedagogical content knowledge; studies of how teachers learn ambitious forms of teaching on their own and in the company of other teachers; studies of teachers' practical knowledge and how it develops" (Feiman-Nemser & Remillard, 1996, p. 21). Studies that examine whether in-service courses are more useful than pre-service graduate courses are one possible approach. Examining the usefulness of a sequence of CALL education courses and experiences, as opposed to one course, could also shed light on this area. Furthermore, we might investigate whether and what theories of learning with technology transfer from coursework to the classroom, and how this is evidenced by the applications that teachers employ. In addition, we should describe what teachers do with technology when freed from governmental, school, and classroom constraints. Ultimately, research in this area should continue to identify the needs of both language learning students and instructors and the role that effective technology education and integration can play in meeting those needs.

ABOUT THE AUTHORS

Joy Egbert is Assistant Professor of ESL and Technology at Washington State University, Pullman. Her research interests include computer assisted language learning, distance education, and teacher education.

E-mail: egbert@wsunix.wsu.edu

Trena M. Paulus is a doctoral candidate in Instructional Systems Technology at Indiana University. She holds an MA in Applied Linguistics from Ohio University and has taught EFL/ESL in Lesotho, Ohio, and Michigan. Her research areas are professional development, technology-enhanced language teaching, and online collaboration in distance education courses.

E-mail: tpaulus@indiana.edu

Yoko Nakamichi is a doctorate student in Speech and Hearing Sciences at Indiana University Bloomington. She holds an MA in Teaching Japanese as a Second Language from Ochanomizu University. Her research interests include bilingual development and technology enhanced language learning.

E-mail: ynakamic@indiana.edu

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