
Teacher Preparation for Equitable Access through the Integration of TESOL Standards, Multiple Intelligences and Technology

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ABSTRACT Schools need teachers who can provide English language learners with equal access to academic content and to information technologies. The authors propose that the integration of standards in TESOL (teaching English to speakers of other languages), the theory of multiple intelligences (MI) and technology can provide an equitable education, support learning differences and develop English language skills across the curriculum. The authors suggest how the integration of TESOL standards, MI theory and technology can become a part of pre-service teacher education and discuss some of the challenges to transferring this integration into the classroom.

Introduction

The number of children in the United States whose first language is other than English continues to increase (Federal Interagency Forum on Child and Family Statistics, 2000). Yet English language learners (ELLs) frequently receive an inequitable education for several reasons. First, not all ELLs are enrolled in programs that address their language needs (National Clearinghouse for Bilingual Education, 1998). Second, few mainstream classroom teachers feel confident in their ability to teach limited-English or non-English speakers or children from diverse backgrounds (National Center for Education Statistics [NCES], 1999). Third, ELLs often attend schools in high-poverty areas where technology access continues to lag (Cattagni & Westat, 2001) and teachers are less technologically competent (Kleiman, 2000).

What English language learners need is an education that is equal in instructional quality and academic rigor as that of native English speakers. To provide an equitable education, schools need teachers who build upon their students' strengths, who acknowledge and respect differences, and who have the knowledge and skills to develop the English language proficiency

of ELLs. In addition, classroom teachers should expand their students' existing knowledge, build on individual strengths, and enhance cognitive and academic skills. Above all, schools need teachers who can provide ELLs with equal access to academic content and to information technologies.

To cultivate teachers who can meet the needs of a variety of students, teacher educators must rethink and reassess pre-service teacher education. Teacher education graduates should go into their classrooms with a repertoire of professional skills and instructional methods, an understanding of second language acquisition and cultural diversity, expertise in second language teaching methods, and competency in the effective integration of technology. Our graduates should be able to teach students who differ in cognitive strengths, cultural background, and language proficiency.

The authors present an overview of diversity in American schools, the state of information technologies, and current theory and practice in the teaching of ELLs. They propose that the integration of standards in TESOL (teaching English to speakers of other languages), the theory of multiple intelligences (MI), and technology can provide an equitable education, support learning differences, and develop English language skills across the curriculum. The authors close with suggestions on how this integration can become a part of pre-service teacher education.

Diversity in American Schools

Of the total school population in the United States in 1998, 40 percent were minorities (NCES, 2000). In 2000, 64 percent of US children were white, non-Hispanic; 16 percent were Hispanic; 15 percent were black, non-Hispanic; 4 percent were Asian/Pacific Islander; and 1 percent were American Indian/Alaska Native (Federal Interagency Forum on Child and Family Statistics, 2002). That year, there were 2.8 million immigrants in our country, the largest number ever recorded in the United States. This group accounts for 8.6 million school-age children in our schools (Camarota, 2001).

The number of school-age children who spoke a language other than English and who had difficulty speaking English more than doubled between 1979 and 1995, rising from 1.3 million to 2.4 million (Federal Interagency Forum on Child and Family Statistics, 2000). There are 176 languages spoken at home (Grimes, 2000) and approximately 154 indigenous American languages spoken in our country (Estes, 1999).

Each cultural group has its own set of learning expectations and its own emphasis on what should be learned (Hopkins, 1998). Gardner contends that learning characteristics are the consequences of cultural, motivational, and experiential factors that are enhanced when teachers teach to students' strengths in the Multiple Intelligences (as cited in Ghosn, 1997). MI theory proposes that individuals possess several mental representations and intellectual languages that differ from those of other individuals in their representational forms, relative strengths, and in how the

representations can be changed (Veenema & Gardner, 1996). Educators need to base language teaching and the use of technology in ways that harmonize with our diverse learners' intelligences.

American schools also serve children from a range of socioeconomic backgrounds. A large number of children live in poverty. These children are more likely to have difficulty at school than those above the poverty line (Duncan & Brooks-Gunn, 1997). The United States, in fact, has one of the highest child poverty rates in the developed world (Kids Count, 2001). Almost 12 million of America's children are poor and nearly 80 percent of them live in working households (Children's Defense Fund [CDF], 2002). One in five of our children under age 3, the most important time for brain development, live in poverty (CDF, 2002). Over 16 percent of American children lived in poverty in 2000 (CDF, 2001). In 2000, 17 percent of children under age 6 lived in poverty, compared with 15 percent of older children (Federal Interagency Forum on Child and Family Statistics, 2002). In contrast to 13 percent of white children and 14.5 percent of Asian and Pacific Island children, 30.9 percent of black children and 28 percent of Hispanic children are poor (CDF, 2001).

Poverty is related to access to learning resources, access to technology and school dropout rates. In 1999, those living in families with incomes in the lowest 20 percent were five times as likely to drop out of high school as those living in the top 20 percent of the income distribution (NCES, 2001). Many ELLs live in the poorest families.

Educational Challenges

Though federal and state mandates require instructional accommodation for English language learners, only 76.8 percent of children of limited English proficiency were enrolled in programs designed to meet their educational needs (National Clearinghouse for Bilingual Education, 1998). ELLs often are taught by teachers who are not trained in second language teaching methodologies. In fact, only 20 percent of classroom teachers feel well prepared to meet the needs of students with limited English proficiency or from diverse cultural backgrounds (NCES, 1999).

Applebome (as cited in Ovando & Collier, 1998) asserts that teacher education faces its greatest challenge in the twenty-first century in preparing teachers to address the mismatch between the backgrounds of students and teachers. The culturally influenced learning characteristics of the students are frequently in direct conflict with the culturally influenced instruction of their teachers (Felder, 1995; Elliott & Gintzler, 1999). The traditional American style of teaching, lecture and direct questioning differs from the learning experiences of many ELLs, e.g. stories and adult modeling that demonstrate expected behaviors. When two divergent styles meet in the classroom, ELLs have difficulty adjusting to what may appear to be an unfriendly, intimidating instructional approach.

Information Technologies

Education, as preparation for constructive citizenship, requires the preparation of technologically competent individuals who can locate, manipulate, and organize information to solve problems, create new knowledge, and produce useful outcomes. Twenty-nine percent of our nation's economic growth is attributed to information technologies and Internet industries (The Children's Partnership, 2000); by 2006, half of all jobs in the United States will be in information technology or will require information technology skills (Carvin, 2000). Clearly, technological competency is a must for tomorrow's workers.

Home Access

According to The Children's Partnership (2000), computer ownership in households with children is as common today as newspaper subscriptions. In 1999, about 68.2 percent of households with children between the ages of 2 and 17 had a home computer and 41 percent had Internet access (Stanger & Gridina, 1999). Some 43 percent of elementary school children (ages 6-11 years) in 1997 used computers at home (Stanger & Gridina, 1999). As of June 2000, 40 percent of children between the ages of 2 and 17 were on-line (The Children's Partnership, 2000). This growing trend in home computer use has been linked to academic achievement. Controlling for family income and cultural and social capital, Attewell & Battle (1999) found a significant relationship between having a home computer and higher test scores in mathematics and reading.

Access to technology varies across racial, ethnic and economic groups. Household income, educational attainment, geographic location and race continue to be determinants of home computer access. There is a 50 percent gap in computer ownership between households earning \$10,000 to \$14,000 and those earning \$50,000 to \$75,000 (Nickell, 1998). Hispanic households are less likely to have a computer than white households. In August 2000, 43.5 percent of American households had a computer but only 23.6 percent of Hispanic households had one (Department of Commerce, 2000). Use of a computer at home among Hispanic children is at 18 percent and at 52 percent among white children (ERIC Clearinghouse on Urban Education, 2001). Similarly, the proportion of rural Native American households with access to computers is 26.8 percent, almost half that of the national average (Luening, 2000).

Disparities in Internet access continue to widen. Ben Shneiderman (2000) calls this Internet divide 'Internet apartheid' (p. 86) because the gap between the rich and poor, between the well and poorly educated, and between majority and minority groups is widening. Households earning \$75,000 or more are 20 times more likely to have Internet access at home than those in the lowest income brackets (Carvin, 2000). Only 2 percent of

children living in poor, rural households have Internet access (The Children's Partnership, 2000). Carvin (2000) notes that 6.6 percent of individuals with an elementary education or less use the Internet. Thus, children from the poorest households and living with adults with the least schooling are the least likely to have Internet access at home.

School Access

Because 'schools are a primary location for accessing and teaching computer skills' (Bagasao et al, 1999), a number of programs attempt to extend children's access to computers. According to the National Center for Education Statistics (2001), the average public school in 1999 had 100 computers. The ratio of students to computers decreased from 6:1 in 1999 to 5:1 by the fall of 2000 (Cattagni & Westat, 2001). Ninety-eight percent of schools had access to the Internet and nearly 77 percent of instructional classrooms had access to the Internet (Cattagni & Westat, 2001). Students' computer use at school increased from 59 percent in 1993 to 69 percent in 1997 (NCES, 2001). Similarly, their use of the Internet at school has more than tripled since 1997 (Grunwald Associates, 2000), with 55.3 percent of students using the Internet at school (Lebo, 2000).

Educational Challenges

Despite the increase in the number of school computers, classroom computers and connectivity to the Internet, disparities still exist across economic sectors. While the national school ratio of students to computers is 5:1, schools with the largest concentration of children in poverty have a 9:1 ratio (Cattagni & Westat, 2001). Despite the fact that 74 percent of classrooms in high-income areas have Internet access, 39 percent of classrooms in low-income areas do (Carvin, 2000). Only half of schools in the poorest communities report that students use the Internet (The Children's Partnership, 2001). Consequently, many ELLs not only lack computer access at home, but have limited or no access at school.

Even when schools have computers with Internet connectivity, their presence does not guarantee classroom technology integration. Teachers are central to the creation of a computer-supported learning environment that is learner centered and pedagogically sound. Teachers decide who uses classroom computers, who accesses the Internet at school, for how long and for what purpose. Teachers also determine the degree to which classroom computers are used effectively as an integral part of the learning process.

Most teachers today have computer experience and are comfortable using the Internet. Woodall's (2001) survey of 600 teachers found that 87 percent felt comfortable using the Net and 84 percent believed that it could improve the quality of education. Yet most teachers in this study said that the Internet was not well integrated into their teaching and 74 percent felt

no pressure to use it in teaching (Woodall, 2001). Another study found that almost two-thirds of teachers reported that they do not feel qualified to integrate technology in teaching (Web-based Education Commission, 2000). Teachers in poor inner-city and rural schools have less technology training than those in wealthier schools (Kleiman, 2000). These teachers are also most likely to have the least number of computers available at their schools. As a result, ELLs in the poorest regions of our nation have the most limited access at school to computers and the Internet.

What We Know

What works with the linguistically diverse students in our schools? What educational theories underpin effective practices? What does educational research say about effective teaching of ELLs? Where does technology fit in the educational process? Does technology integration have any educational benefits? Or, are information technologies just another passing fad in the history of pedagogy? A review of the literature provides answers to these questions.

Language Acquisition Theory

Language development is a lifelong activity as individuals' language grows in complexity and sophistication and as new words are added to their repertoire. For children or adults to successfully learn a new language, three critical elements must be in place (Wong-Fillmore, 1991). The first is a need to learn the language. The learner has an authentic, personal reason for learning the language. The second is opportunities to practice the language, i.e. access to speakers of the target language. The third is social settings in which learners and fluent speakers are in the same place often enough to make language learning possible. In short, second language acquisition occurs in social contexts when there are authentic reasons for communicating and opportunities to use the language.

Social language acquisition, which is informal and context embedded, can occur in 2 to 3 years (Wong-Fillmore, 1991). Academic language, the language of science, mathematics and social studies, is much more abstract and requires more time to acquire. Academic language is defined 'as a complex network of language and cognitive skills and knowledge required across all content areas for eventual academic success ...' (Collier & Thomas, 1989, p. 27). ELLs may not develop academic language proficiency for 7 to 10 years (Cummins, 1981). The challenge for teachers is to use teaching strategies that effectively promote development of English skills in listening, speaking, reading and writing in a non-linear or dictated style.

ELL Instruction

The term 'English language learner' refers to any student who is less than proficient in English. The term covers a broad range of learners from those who are just beginning their English learning experience to those who are socially proficient but still struggling to understand, speak, read and write the more abstract language of academics (Rivera, 1994). Gersten & Baker (2000) identify two strategies that are effective in instructing ELLs: cooperative grouping and content-based instruction.

Cooperative learning is found to be effective with ELLs because it presents opportunities for students to communicate orally with peers (Kagan, 1989), thus increasing the use of the second language through interpersonal interaction. Cooperative grouping also provides for the integration of language and content knowledge. Students become resources for each other in both language and academic learning (Ovando & Collier, 1998). However, even with older students, cooperative learning requires that teachers teach their students how to work together, take turns, contribute to the task at hand, and be responsible for each other's learning. In short, cooperative learning is more than placing students into groups. Further, cooperative learning activities for language development should be carefully planned so that students actually engage in verbal communication and not merely in nonverbal activities, such as completing a puzzle.

Content-based instruction, or Sheltered English, attempts to merge intentional language teaching with academic content (Gersten & Baker, 2000). The assumption is that students can acquire the abstract language of academics through sheltered strategies (Cummins, 1994). Features of Sheltered English that facilitate learning include a focus on vocabulary development, use of visuals, manipulatives or hands-on learning, teacher's modification of language and speech patterns, collaborative learning between teacher and among students, and links to students' experiences (Krashen, 1985; Ovando & Collier, 1998).

Krashen & Terrell (1983) urge the creation for ELLs of classrooms with non-threatening environments in which there is a need to hear and give messages and in which all students receive praise for their efforts to use English. The use of multiple strategies that elicit active involvement facilitates the acquisition of English and academic knowledge simultaneously (Herrell, 2000). The use of information technologies in such an environment increases learning motivation, bolsters self-esteem and creates an authentic reason to use English for communication and learning.

Information Technologies and Learning

As attendees at the US Secretary of Education's conference on educational technology concluded, the effectiveness of technology is set within the context of other school improvement efforts, such as administrative

procedures, curricula and teachers' pedagogical approaches (McNabb et al, 1999). In studying the effect of technology on student learning, a number of confounding variables must be taken into account, such as type of software used, the type of learning expected, the degree of integration carried out and the teacher's expertise in instructional technology integration. Moreover, learning itself has so many interacting factors that traditional experimental designs may not capture the complexity of the interactions and the variety of possible outcomes (McNabb et al, 1999). Nevertheless, several meta-analyses have sought to glean a more comprehensive perspective of computers and learning in an effort to capture this complexity.

Native English Learners. Meta-analyses (Kulik et al, 1985; Roblyer, 1989; Kulik & Kulik, 1991; United States Department of Education, 1996; Schacter, 1999) have revealed that students in computer-using instructional settings showed significant gains in academic achievement. In addition, achievement gains were found to be unrelated to gender, student ability, age, race, and family income (Roblyer, 1989; United States Department of Education, 1996).

Meta-analyses (Roblyer, 1989; Schacter, 1999) also indicate a link between educational technology use and improved student attitudes toward school and learning. Smaller studies (Dershimer, Jr., 1979; Miller, 1984; Hessemer-Stegemann, 1986) similarly reported academic improvement and more positive attitudes. Other benefits found in the use of educational technology are improved student motivation and increased family involvement (United States Department of Education, 1996), as well as greater social awareness, increased self-confidence, more independence, and the ability to problem solve with greater ease (Apple Computer, 1991).

English Language Learners. Though there is a paucity of studies on ELL children using information technologies, the few studies that focus on English language learners provide indications of a positive impact on their learning.

The research literature (Diaz, 1984; Knox & Anderson-Inman, 2001) evidences that Spanish-dominant, computer-using ELLs improve their academic performance and make strong gains in English. Sayers (1989), reporting on the 'De Orilla a Orilla' project with Spanish bilingual children, asserts that students improved both their native and English literacy skills. Likewise, Cecilia Chandler in 1989 (in Soska, 1994) reports that ELL students using computers in grades one through six (ages 6-11 years) made significant gains in English reading and language arts skills. A 2-year study of exemplary uses of electronic texts with ELLs (Meskill et al, 1998) concluded that technology, in conjunction with the teachers' goals, purposes and epistemologies, allowed students to take control of their own meaning making and created socially mediated literacy activities that fostered the development of listening, speaking, reading, writing, and thinking.

The impact of computers in second language learning is not limited to ELL children. A quantitative and qualitative study (Levine et al, 2000) of 58 Bar-Ilan University students acquiring English found that a computerized learning environment contributed more to the development of critical literacy skills in English and literacy strategies than the control classroom environment. This comparative study also detected that students in the computerized environment had a more positive attitude and higher motivation for learning.

The research suggests that the effective integration of technology can improve academic achievement, promote English and native language proficiency, augment positive self-concepts, enhance motivation, stimulate positive attitudes towards learning, and foster higher-level thinking skills. Technology offers opportunities for cooperative learning which not only increase instructional effectiveness and efficiency, but also promote positive social interactions (Johnson et al, 1986; Schlechter, 1990). When ELLs use technology in small groups, their verbal interactions enhance interpersonal and communication skills (Steinberg, 1992).

Further study of ELLs using computers and other forms of technology is necessary before educators can reach any solid conclusions. The Meskill et al (1998) study with ELLs and a Milken Exchange meta-analysis (Schacter, 1999) of native-English speakers point to the primacy of educational goals and the crucial role of the teacher in effective classroom use of technology. Eisenberg & Johnson (1996) maintain that effective integration must directly link information skills to the content area curriculum and assignments. In short, the teacher, the goals and the curriculum must determine the use of technology; the technology should not drive the goals and the curriculum.

TESOL Standards

The professional advocacy group, Teachers of English to Speakers of Other Languages (1997), published TESOL standards to:

... articulate the developmental English language needs of English language learners and highlight special instructional and assessment considerations that must be given ... if they are to benefit from and achieve the high standards proposed for other subjects. (p. 2)

The standards list descriptors of expectations and suggest ways to identify progress. For example, Goal 1, Standard 2 requires students to use English to communicate in social settings for personal expression and enjoyment through both spoken and written English. A suggested descriptor for development of a language objective is to describe, read about or participate in a favorite activity. A suggested indicator of progress for this Standard is for the student to locate written information about leisure activities.

The TESOL standards are guidelines intended to help teachers address the challenges accompanying the increasing numbers of English language

learners in our schools. The standards help educators become intentional language teachers with clearly stated language and academic objectives for the English language learners in their classrooms, thereby 'providing a more equitable and effective education for ELLs from preschool to 12th grade' (Teachers of English to Speakers of Other Languages, 1997, back cover).

Multiple Intelligences

Howard Gardner defines intelligence as 'the capacity to solve problems or to fashion products that are valued in one or more cultural setting' (Gardner & Hatch, 1989). Gardner (1983) contends that intelligence has both a biological and cultural basis. He calls attention to neurological studies that indicate that the human brain stores elements of different types of learning in particular regions of the brain and that various types of learning result in synaptic connections between cells in different areas of the brain. He explains that the cultural value placed on the ability to perform certain tasks provides the motivation to develop the concomitant skills.

Based on cultural and biological research, Gardner (1983) expands the concept of intelligence from a unidimensional human attribute to a multiple, interrelated set of traits. Gardner's multiple intelligences are logical-mathematical, linguistic, spatial, musical, bodily-kinesthetic, interpersonal, and intrapersonal intelligences. To these initial seven intelligences, Gardner later added an eighth: naturalist intelligence (Checkley, 1997).

According to this theory, all individuals are born possessing each of the intelligences and all eight intelligences are necessary to effectively function in society. Nevertheless, each person develops some intelligences more strongly than others and children develop inclinations towards some of the eight intelligences at an early age (Armstrong, 2000).

Information Technologies and MI Theory

Although the educational literature suggests the benefits of integrating technology with Howard Gardner's theory of multiple intelligences and a number of writers (e.g. Gibson, 2001; Gen, 2000; Keefe & Dickenson, 1998; Veenema & Gardner, 1996; Davis, 1991) suggest how this integration may be achieved, research on the effectiveness of this integration is sorely lacking. Yet several authors have endorsed the use of technology as a means of implementing instruction that addresses the various intelligences. As Gen (2000) states: 'While modern technology is not essential for the utilization of these learning intelligences, technologies can certainly make their demonstration and implementation more accessible in the classroom setting' (p. 7). The fact that computers and the Web can be used across disciplines and that they can address all learning styles (Davis, 1991; Rosen, 1997; Gen, 2000; Gibson, 2001; Haywood, 2001) suggests that they can support ELLs with varied cognitive strengths and abilities.

Haywood (2001) advocates that the integration of technology should complement teaching and learning. Information technologies can provide varied entry points to learning that match the learners' cognitive strengths and intelligences. Computers, multimedia and the World Wide Web can address the multiple intelligences because of the varied forms of digital input and output. For example, they can relay not only text, but music, video, photographs, and visual art. Voice recognition and digital sound recording allow for oral/aural input and output. User-drawn or imported graphics enhance texts and provide comprehensible input for the ELLs. That capacity of providing different gateways to learning is a major asset of information technologies.

In brief, information technologies can make the learning process:

... richer as students have access to new and different types of information, can manipulate it on the computer ... in ways never before possible, and can communicate their results and conclusions in a variety of media to their teacher, students in the next classroom, or students around the world. (United States Department of Education, 1996)

Integration of TESOL Standards, MI Theory, and Technology

MI instruction helps teachers support the rich diversity of cultures and languages that children bring to the classroom. It complements a range of learning preferences and strengths which are individual and, to a degree, culturally influenced. Incorporating MI into instruction enhances teaching (Campbell, 1997) and helps students develop all of their intelligences (Christison, 1999).

Information technologies combined with MI theory stimulate students' desire to learn because the learning activities appeal to their personal intellectual strengths. Technology can provide a suitable medium to develop language and academic skills, e.g. through exposure to authentic text, digital voice recording, and students' input of written text. It is also an excellent means for students to demonstrate learning using their strongest intelligences. For example, students with a highly developed visual/spatial intelligence may demonstrate their learning using digital video movies, animated models, or selected graphics. By helping students discover and develop their talents, 'the school not only awakens children's joy in learning but also fuels the persistence and effort necessary for mastering skills and information and for being inventive' (Campbell, 1997, pp. 1-2).

The integration of TESOL standards with MI theory and information technologies provides a structured, intentional approach to the development of second language proficiency while developing academic skills and knowledge. It also provides equitable access to technology for authentic purposes to those students least likely to have that access outside their school. MI theory and technology provide multiple entry points into the

academic content while the TESOL standards allow the teacher to purposely plan for the students' English language growth in a variety of contexts and for a variety of purposes.

Particular uses of technology readily lend themselves to the application of MI theory. Figure 1 lists examples of application software and hardware that correspond to the eight intelligences. Though this list is not exhaustive, it illustrates how technology can complement different ways of learning and of evidencing learning that harmonizes with the learner's intellectual strengths. Figure 1 also shows that software applications can work with more than one intelligence. For example, programs that allow students to draw images, e.g. *KidPix* (Broderbund Software, 1994-1996), can benefit not only those with strong visual/spatial intelligence, but also those who have high bodily/kinesthetic, interpersonal, intrapersonal and naturalist intelligences. Ultimately, the learning objectives and the type of learning activities determine the type of technology applications and hardware that may be used productively. Learner preferences, cognitive strengths, English language proficiency, teacher technological competency and availability of technological resources are additional determinants of technology use.

Multiple intelligences	Mode of learning	Applications
Verbal/linguistic	Manipulation of words and their concepts	Word processing; using desktop publishing; publishing on-line; using multimedia authoring programs; emailing Key Pals; creating multimedia presentations; making digital recordings; using voice recognition software; producing videodisks; using web searchers; searching on-line dictionaries; exploring on-line encyclopedias; reading newspapers, stories, poems; playing on-line word games
Logical/mathematical	Manipulation of numbers and logical precepts; discovery of relationships and patterns; categorization and making connections	Creating spreadsheets; building databases; using on-line calculators; doing multimedia authoring; solving interactive word & graphic puzzles; using problem solving software simulations; graphing using appropriate software; creating cognitive maps using suitable software; generating timelines using software; creating illustrations and graphics using a drawing software; playing on-line math games
Visual/spatial	Viewing images, pictures, models and representations	Word processing; creating spreadsheets; building databases; using on-line calculators; solving interactive graphic puzzles; using desktop publishing; using presentation software; solving interactive graphic puzzles; creating and using graphic images; drawing images with drawing software; producing graphs with

		suitable programs; creating cognitive maps with software; taking, managing, and reformatting digital photos; producing and viewing videos; creating and editing <i>iMovies</i> on a Mac computer; creating timelines on a computer; viewing camcorder images on-line; viewing computer and multimedia simulations; visiting museums on-line
Bodily/kinesthetic	Physical manipulation and movement	Keyboarding; word processing; drawing with computer software; digitally recording their voice; using a computer mouse or joystick; manipulating objects or text on screen; searching the Web; using camcorders; using digital cameras
Musical	Rhythm and melody; pitch and tone; rhymes; poetry	Writing poetry on a word processor; listening to music and songs on-line; creating music with music software; reading on-line poetry; adding midis to multimedia presentations and web pages; using Internet music practice and drill sites; playing with simulations of musical instruments; using programs with digital sound; creating and listening to CDs
Interpersonal	Brainstorming with others; pair and small-group work; body language; role playing	Engaging in group projects that integrate technology; working in pairs at a computer; using simulations that involve role playing; using problem solving software simulations; working with others on interactive puzzles
Intrapersonal	Individual work; independent learning; self-selected activities or topics; reflection and introspection; trial and error learning	Word processing; completing individual projects using technology; doing individual work using technology; creating individual spreadsheets; using desktop publishing individually; creating individual presentations using technology; conducting individual web searches; creating outlines on a computer; using authoring tools independently; using a camcorder; creating and editing individual <i>iMovies</i>
Naturalist	Nature and natural forms; sees broad patterns or structures in nature and concepts	Creating concept maps on a computer; using computer-aided design software; creating databases; viewing on-line nature camcorder sites; creating outlines on a computer; creating and viewing videos; viewing digital wildlife photographs; taking on-line zoo tours; visiting natural history museums on-line

Figure 1. Examples of technology applications that are consistent with MI theory.

Integration of technology in the teaching of ELLs blends well with cooperative learning. Most classrooms have a limited number of computers and other related technologies, such as digital cameras, video cameras, camcorders and tape recorders. Small-group and pair work can effectively maximize the use of the existing technologies by allowing several students to simultaneously use the hardware and software. When ELLs work with others they have an authentic purpose for oral communication as they brainstorm, plan, gather information, organize data, clarify concepts and finalize their product. Partner and small-group work allow peer support for academic content, as well as the development of technological competencies. Partner and group work meet the needs of the verbal/linguistic and interpersonal intelligences while developing the social and collaborative skills needed in our interdependent society.

The integration of technology with content-based learning creates a powerful combination for English language development. For example, drill and tutorial software can offer ELLs individualized, self-paced practice which builds on their intrapersonal intelligence. Other content-specific and higher-level thinking resources, such as problem solving games, simulations and videos, present information in ways that appeal to various intelligences and expand cognitive skills. Interdisciplinary projects – executed in pairs, small groups or individually – become richer, more meaningful and enjoyable through the utilization of appropriate technologies. The Internet offers authentic language written generally by native English speakers and children’s on-line published work offers a rich source of age-appropriate content with language that is usually comprehensible to ELLs.

Figure 2 shows how learning activities can integrate the TESOL standards, MI theory and technology across disciplines. These representative examples illustrate activities that address content area knowledge, higher-level thinking, and problem solving, while building on students’ intelligences and developing English language skills.

Content and language instruction that incorporates TESOL standards and technology has clear benefits for ELLs. Integrated learning activities such as those in Figure 2 make learning meaningful, transferable and engaging because they complement students’ preferred ways of learning, develop weaker intelligences, and engage students in genuine communication. Technology in this approach becomes a viable means to attain information, reconstruct knowledge, and demonstrate learning. Technology thus serves as a means to an end, rather than becomes the end itself.

TESOL standards	Activities	Description	Multiple intelligences
G2, S2; <i>Descriptors:</i> Analyze, synthesize and infer from information; compare and contrast information <i>Progress</i> <i>Indicators:</i> Research information on academic topics; construct a chart/graph synthesizing information (TESOL, 1997, p. 87)	Graph tally results of observed transportation (e.g., walking, cars, trucks, buses, bicycles)	In small groups students tally traffic passing their school at different times of day. Tallies are graphed using computer software.	Verbal/linguistic; logical/mathematical; visual/spatial; bodily/kinesthetic; interpersonal; naturalist
G1, S1 <i>Descriptors:</i> Share and request personal information; use nonverbal communication <i>Progress</i> <i>Indicators:</i> Correspond with Key Pals; volunteer information about self (TESOL, 1997, p. 71)	Write and illustrate a report using word processing software and digital pictures.	For 2 weeks Key Pals compare weather and exchange photographs of local topography in their respective countries.	Verbal/linguistic; logical/mathematical; visual/spatial; bodily/kinesthetic; interpersonal; intrapersonal; naturalist
G2, S2 <i>Descriptor:</i> Demonstrate knowledge through application <i>Progress Indicator:</i> Explain change in self (TESOL, 1997, p. 87)	Visit the on-line movie simulation of a human heart at http://www.mco.edu/iarc/movies/heart.mov . Observe how the heart rhythm affects pulse rates.	Pairs view the on-line movie and act out with their bodies how the heart moves. They then count pulse rates at rest and after jogging in place. Students listen to	Verbal/linguistic; logical/mathematical; visual/spatial; bodily/kinesthetic; musical; interpersonal; naturalist

		music with different beats to identify which rhythms match the heart beat at rest and after exercise.	
<p>G3, S3 <i>Descriptor</i>: Observe and model how others speak and behave in a particular situation <i>Progress</i> <i>Indicators</i>: Rehearse different ways of speaking according to the formality of the setting; test appropriate use of gestures and language (TESOL, 1977, p. 103)</p>	<p>Compose a video commercial for an original product of their choice (e.g., cereal, laundry soap, toy, ice cream, candy).</p>	<p>Small groups brainstorm an original product and then create a rap infomercial using a camcorder and appropriate software such as <i>iMovies</i>.</p>	<p>Verbal/linguistic; logical/mathematical; visual/spatial; bodily/kinesthetic; musical; interpersonal</p>
<p>G2 S2 <i>Descriptors</i>: Represent information visually, interpreting same; understand and produce academic vocabulary for geometry <i>Progress</i> <i>Indicators</i>: Locate geometric shapes to photograph; construct a graphic showing photos (TESOL, 1977, p. 87)</p>	<p>Identify geometric shapes (e.g., squares, rectangles, circles) found in their surroundings.</p>	<p>Pairs of students use a digital camera to photograph geometric shapes observed around their school and community. Students upload their pictures and create a <i>PowerPoint</i> presentation to share with parents and students in other classrooms. Students may choose to add an oral narration, sound effects or</p>	<p>Verbal/linguistic; logical/mathematical; visual/spatial; bodily/kinesthetic; musical; interpersonal; naturalist</p>

		music to their presentation.	
G1, A3 <i>Descriptors:</i> Determine and establish the where, when, and how to study; actively connect new information with previously learned information <i>Progress Indicators:</i> Select materials and resources to complete project; take notes to summarize main points provided in source material (TESOL, 1977, p. 91)	Students create a <i>HyperStudio</i> presentation on a country of their choice. They gather information using <i>Encarta CD, Ask Jeeves</i> (on-line) and resources within the school library.	After brainstorming places around the world they'd like to visit, students may work alone or in pairs to gather information and illustrations about their selected country. They create <i>HyperStudio</i> stacks to share with parents and classmates.	

Figure 2. Sample activities integrating information technologies, MI theory and TESOL standards.

Planning these integrated learning experiences begins with clear learning objectives, for when 'learning objectives are unclear and the focus of the technology use is diffuse' the utilization of educational technology is less effective (Schacter, 1999, p. 10). The defined academic and language development objectives determine which content knowledge, which cognitive skills, what learning activities, and what technologies will lead students to the attainment of those objectives.

Teacher Education

Given the cultural and linguistic diversity in America's classrooms and the persisting inequitable access to technology, teacher education programs must graduate teachers with the following competencies:

- The ability to use a variety of methodological approaches and teaching strategies. This ability empowers teachers to provide for multiple intelligences and varied levels of English language proficiency.

- The capacity to apply MI theory to classroom instruction. By integrating multiple intelligences in their teaching, teachers support individual learning strengths while strengthening students' less developed intelligences.
- The capability of using second language acquisition theory to understand ELLs' language learning experiences and their second language development process. This underlying knowledge base provides guidance to teachers in the adaptation of activities for students acquiring English.
- The capacity to apply second language teaching methods. These methods not only help the child acquiring English, but also support the learning of native English speakers by providing additional scaffolding, multiple input, paraphrasing of discourse, and careful pacing of new concepts and materials.
- Skill in the application of the TESOL standards. Application of these standards helps teachers ascertain the ELL's progress in acquiring English and establish expectations for language and content learning.
- Proficiency in the use of computers and multimedia technology to enhance teaching and learning. This ability goes beyond knowledge of how to use technology for personal use. Its focus is on effective integration of technology for instruction and learning enhancement.
- Development of expertise in the integration of technology, multiple intelligences and TESOL standards. Teachers who merge these three aspects in their teaching will then be able to maximize their instructional effectiveness and augment their students' learning.

Clearly, knowledge of educational theories, instructional methodologies, and the TESOL standards is necessary for the development of these competencies. In the same way, pre-service teachers need to know more than how to use a computer and how to use a number of software applications. Such knowledge can be gained outside a college of education – often at home. Knowledge of technology and personal use of computers do not automatically transfer into effective classroom use of technology. Computer engineers do not necessarily know how to use computers effectively in teaching.

In order for pre-service teachers to understand how technology becomes a part of effective instruction, they must see in-service teachers and education faculty using technology. They must discuss what they observe schoolteachers and university faculty doing with technology in the classroom, understand what are essential and what are non-essential uses of technology, and know how to evaluate the educational value and appropriateness of software applications and Internet sites for English learners.

Though professional knowledge is a requisite for effective teaching, pre-service teachers absolutely need to observe classroom applications of language acquisition theory, MI theory and the TESOL standards in the

teaching of ELLs. Mentor teachers and teacher educators can model the integration of technology, TESOL standards and MI theory in their own teaching. Once pre-service teachers recognize how technology, TESOL standards and multiple intelligences can be integrated, they can begin to plan such lessons. They can learn to develop Units of Practice (UOPs), a thematic, integrated approach created by Apple Computers, the National Science Foundation and the New American Schools Development Corporation, that allows children to explore knowledge across disciplines in a holistic way that reflects the real world (Humphreys et al, 1981; Shoemaker, 1989). The UOP focuses academic instruction and the integration of technology on developmentally appropriate standards across grade levels and content.

However, pre-service teachers do not always recognize how their instructor or mentor teacher applies theory to teaching. To see the instructional applications requires their becoming an observer, rather than a participant. Consequently, when pre-service teachers' focus is on acquiring professional knowledge and skills, they often fail to note what an instructor or mentor teacher is modeling. Therefore teacher educators have to guide their students' observations of instructional activities and help pre-service teachers evaluate what they observe.

Pre-service teachers are more likely to notice the integration of MI theory, TESOL standards and technology when the instructor clearly indicates what is being modeled. At the beginning of a class, the instructor can tell students what he or she will integrate into the instructional activities that day. Then, he or she may specifically ask pre-service teachers to note how he or she does so. At the end of the class, the instructor then leads students in a discussion on what they observed. Similarly, an instructor-provided observation checklist can draw pre-service teachers' attention to the integration of MI theory, TESOL standards and technology during the observation of their instructor's or mentor teacher's teaching.

Guided observations are possible only when education faculty model effective integration of MI theory, TESOL standards and technology applications in their own teaching. Such modeling should occur across the entire teacher preparation program. Administrative support for faculty development in such areas as technology integration and the application of the TESOL standards is essential. Such support may take the form of stipends for participation in faculty development workshops, recognition of effective instructional modeling in the promotion and tenure process, computer upgrades for technology integrating faculty, provision of instructional technology support within the college, or software and materials purchase to support instructional integration of the TESOL standards, MI theory and multimedia technology.

Likewise, mentor teachers need to model and demonstrate effective integration of these areas in their classroom teaching. For this to occur, teacher education programs must carefully select mentor teachers and,

ideally, offer in-service teacher training in such areas as the TESOL standards and technology integration. An incentive, such as graduate credit hours or a stipend for participation in the in-service training, promotes their participation. Another effective incentive is faculty service to the school or classroom. This service may include helping teachers conduct classroom research, providing in-service teacher training at the school site, or helping a school assess the effectiveness of a new program. Needless to say, these incentives require financial, time and human commitment, resources which are not always available.

Additionally, pre-service teachers' development of the above competencies requires time, repeated practice and multiple opportunities for application. However, time within teacher education programs is generally limited to required course and field experience hours. Consequently, the use of that allocated time must either be extended or maximized.

While some colleges of education have added a 5th year to the teacher preparation program, many colleges cannot increase the required credit hours and course time due to state mandates. In addition, the need to maintain competitiveness in the recruitment of students deters other institutions from increasing time and credit hour requirements. The urgent need for teachers also limits the requisite time for teacher preparation. School administrators need teacher candidates to go into teaching as soon as possible. Hence, maximizing the available time is generally our best alternative.

To capitalize on the available time, teacher education programs can offer pre-service teachers multiple and increasingly complex opportunities to integrate MI theory, TESOL standards and technology into instructional activities. Early in their preparation, teacher candidates must engage in guided observations of their instructors and master teachers. Later, they may examine classroom scenarios and, working in collaborative groups, make suggestions for how the situation depicted might be addressed differently or improved through specific application of what they have learned. In learning to develop lesson plans and student assessments, pre-service teachers should be expected to incorporate MI theory, the TESOL standards and instructional technology into lesson plans and student assessment. They should also integrate technology to meet educational objectives, support diverse intelligences and incorporate the TESOL standards.

Pre-service teachers should develop their professional competencies through in-class activities such as mini-lessons for peers, small-group teaching activities, teaching a class lesson on an assigned content, and lesson planning. Opportunities at their field placement site for direct experience and development of competencies should include conducting a small-group instructional activity, teaching mini-lessons, and teaching full lessons under the supervision of a mentor teacher. In short, teacher education programs should systematically build into their curriculum

professional activities that enrich the candidates' experiences and provide practical applications without requiring additional credit hours.

Concluding Remarks

Attaining the goal of graduating teachers who can teach to linguistically and culturally diverse learners, help ELLs expand their second language proficiency, and use technology in pedagogically sound and effective ways will not be easy. There are a number of obstacles that we must be able to overcome.

The first hurdle is the availability of equipment for lessons requiring Internet or email interactions. Not all colleges of education and not all schools are created equal in this regard. Education faculty must have available the technological resources at their institution and in their classrooms if they are to effectively integrate technology into their teaching. Similarly mentor teachers who work with our pre-service teachers must also have technology available in their classrooms if they are to model its integration in teaching.

Another challenge in the preparation of future teachers is the need for technologically competent education faculty who can integrate technology and, though most faculty can use a computer to do word processing, calculate grades and analyze data, many are still lagging behind their own students' computer competency. Though many faculty agree that technology needs to be a part of pre-service teacher education, many also do not know what the technology can do to enhance teaching and learning for their own particular course. Consequently, few faculty model technology integration in their teaching (Chisholm et al, 1998). Before education faculty can integrate technology they must first know what technology resources are available to them, have support for instructional technology planning and teaching, and be rewarded for their efforts. Technology integration demands a high investment of time, yet faculty reward systems do not always acknowledge the value of this effort.

Similarly, though education faculty generally recognize that future teachers need to be accepting of diversity and know multicultural and English as a Second Language (ESL) teaching strategies, not all faculty incorporate these into their own teaching. Faculty awareness of the importance of these areas does not mean that they feel competent or have the knowledge necessary to incorporate them into their own teaching. Frequently, diversity-related courses are delegated to minority faculty who are deemed experts in this area by their colleagues because of their minority status. Furthermore, most faculty outside the areas of ESL or Bilingual Education are not familiar with the TESOL standards.

Perhaps the biggest hurdle is administrator and faculty buy-in. Preparing future teachers to plan instruction integrating the TESOL standards, multiple intelligences and technology 'involves viewing these

students [ELLs] in new ways that may contradict conventional notions, and coming to a new set of realizations' (Garcia, foreword in Flores, 1996, p. ix). As educators, we find success in our students' successes. When administrators and faculty see that the integration of TESOL standards, multiple intelligences and technology leads to our graduates' success and to academic achievement of their students, buy-in will follow. Ultimately, the integration of TESOL standards, multiple intelligences and technology is a win-win educational experience for pre-service students and, in turn, for their future students.

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