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ABSTRACT

This study examined cross-cultural technology training and education. A four-part questionnaire addressed computer training preferences, computer attitudes and perceptions, and computer access among Chinese, Ghanaian, and American students in college business and education classes. The differences in computer ownership among students reflected economic realities. The majority of the American students have computers at home; the few Chinese and Ghanaian students who own a computer are likely to be children of university professors and to live at home. The willingness of Chinese and Ghanaian students to share a computer has economic and cultural roots; 42.3% of the Chinese and 31.3% of the Ghanian students preferred to share the computer while working in the university labs. Only 7.1% of the American students preferred to share a computer. The use of DOS versus Windows--the majority of the Chinese students used DOS without Windows--indicates that the power and relative state-of-the-art of Chinese computers is significantly lower than in the United States. In terms of attitudinal differences, the Chinese and Ghanaians feel as positive towards computers as American students, though they have less access to computers. Findings suggest that access and competency are closely linked, and that while the attitudes of Chinese and Ghanaian students are positive towards computers, they have little experience and competence in using them. (AEF)

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As in many cross-cultural contacts, the importation of technology into another society often creates initial cognitive dissonance, disrupts established behavior, and steadily introduces new patterns of response and organization. As a cultural artifact that expresses the culture of its creators, the computer organizes knowledge, reshapes work, changes learning environments, and expands information access in ways that mirror western heuristics and logic. Tallah (1996), noted a two-way cultural infusion "whereby the technologically rich nations draw from and inject into the societies of the less endowed" (p. 2). Thus the introduction of computers, especially into non-western and third world countries, will likely affect changes in interpersonal behavior, communication, and education (Darr & Goodman, 1993). The result of these changes is, at best, an unsettling co-existence in developing nations of the indigenous culture and the imported scientific culture (Yakubu, 1994).

Nevertheless, "one cannot talk about development without talking about computers" (Darkwa, 1996, p. 4). Computer literacy is vital in the effort to participate in and benefit from the global exchange of information, trade, and technology. Developing countries face a myriad of problems compounded by the issues of need and accessibility. Those nations at the periphery of world technologies must enhance "their ability to access, produce and use information as full and equal participants of the global community" (Tallah, 1996, p. 1). By implication, their competitiveness on the world market is increasingly dependent on computers and communications technology.

The acquisition of computer technology is, nonetheless, a massive financial burden. The dependence on western-made hardware, software and expertise keeps third-world nations with fragile economies economically subservient (Dixon, 1995). The acquisition of technology will require significant amounts of capital and technical skills, both meager commodities in most developing nations.

By the same token, social, cultural, and political factors influence how computers are perceived, used, dispersed, and experienced. Given the dependence on wealthier nations for hardware and software, as well as the computer's intrusion into traditional socio-cultural patterns, attitudes and perceptions toward computers in developing nations may be ambiguous at best. Moreover, the level of exposure to and experience with computers will likely influence individual perceptions and attitudes.

Research suggests that negative attitudes and unfavorable perceptions of computers may adversely affect computer literacy (Chen, 1986; Marcoulides, 1988). Similarly, limited computer experiences are related to computer anxiety and lack of confidence in computer use (Chen, 1986; Huang, Waxman, & Padron, 1995). Given the significant role of technology in national economic development, we embarked on an interdisciplinary investigation of attitudes and perceptions towards technology and technology training among college freshmen in China, Australia, Ghana, Mexico, Puerto Rico, and the United States.

This paper presents preliminary findings from China, Ghana and the United States. Data on the other participating countries in this study will be reported at a later time. Within this paper, the authors discuss the implications of their study for cross-cultural technology training and education. In addition, the authors draw conclusions based on this preliminary data regarding the development of technological competency within the framework of computer culture and national culture.

International Comparisons

In 1996 the People's Republic of China had a population of over 1 billion with 67% of its population between the ages of 15 and 64 (CIA, 1996). Mandarin is the official language, but seven distinct dialects and several minority languages are also spoken (CIA, 1996). Between 1978 and 1994 the annual economic growth averaged 9.4% (Jianguo, 1997). Yet in 1994, China had an external debt of $92 billion (CIA, 1996). Under Deng Xiaoping, national educational reform tried to narrow the gap between China and other developing nations; the government focused education on new technology, information science and

advanced management (U.S. Department of the Army, 1994). As a result of the government's emphasis, Internet access is spreading quickly (Qiang, 1995). China has some 900 e-mail users; the small number reflects the comparatively high fees for this service (Qiang, 1995).

Ghana, a largely agricultural country, has a population of almost 18 million with 51% in the 15 to 64 age range (ITA, 1997a). English is the official language, but several African languages are also spoken (ITA, 1997a). Ghana has twice the per capita output of the poorer countries in West Africa, but its economy centers around subsistence agriculture (ITA, 1997a). As in other developing nations, Ghana seeks the benefits of telecommunications technology. During 1996, the Ministry of Education created 36 science centers, equipped with computers, in selected senior secondary schools (Peprah, 1997). Nevertheless, Africa remains the least computerized continent; computers have as yet to penetrate many important sectors of the Ghanaian economy (Darkwa, 1996). Many Ghanaians lack computer skills, from basic knowledge to advanced knowledge and computer management (Darkwa, 1996). This lack of computer competency and lack of Internet access limits success in technology adoption. As in many developing nations, insufficient resources in the form of well-trained computer technology personnel and the capital to train them handicap Ghana (Morwenna & Parker-Jenkins, 1994).

Currently the United States has over 268 million people (U.S. Census Bureau, November 1997) with 65% between 15 and 64 years of age (ITA, 1997b). In 1992 an estimated 83.4% of Americans were White; this group is projected to be the slowest growing among the five racial/ethnic groups in the national census (U.S. Census Bureau, 1997a). Blacks comprise 12.7% of the U.S. population, Hispanics 8.9%, Asian and Pacific Islanders about 3.3%, and American Indian, Eskimo, and Aleuts 0.8% (U.S. Census Bureau, 1997b). Though English is the common language, 13.8% speak another language at home (U.S. Census Bureau, 1990). American schools have more computers and a higher ratio of computers to students than schools in other countries (Anderson, Beebe, Lundmark, Magnan, & Palmer, 1994). However, gender, ethnic and racial inequalities in computer access continue to persist (Coley, Cradler & Engel, 1997).

Hypotheses and Instrumentation

The researchers posed the following null hypotheses:

- Preferred ways of learning about computers do not differ across cultures and countries.
- Attitudes towards computer technology do not differ across cultures and countries.
- Perceptions of usefulness of computer technology do not differ across cultures.
- Increased access to computers is not related to more positive attitudes toward computer technology.

To test their hypotheses, the researchers developed a four-part questionnaire to address computer training preferences, computer attitudes and perceptions, and computer access. The first part, consisting mostly of multiple-choice questions and some open-ended questions, gathers demographic information such as sex and college major. The second part, also containing multiple-choice and some open-ended questions, gathers information about computer access and training. The third part, a twenty-seven item four-point Likert scale, elicits attitudes and perceptions toward computers. Part four, a four-point Likert scale with thirty-six items, explores training preferences and perceptions of computer technology.

A Spanish- and a Mandarin-speaking faculty translated the questionnaire into Chinese and into Spanish. Then they translated these back into English to ensure accuracy of translations. Results of a pilot administered to American college students majoring in business and education at a metropolitan university in the Southwest helped refine the instrument.

Sample

The Chinese sample consists of 53 Business majors and 44 from various other majors who attend Shandong University in Jinan, the capital of Shandong province in the People's Republic of China. Shandong University, with approximately 10,000 students, is a doctoral-granting institution and one of 37 key universities in China. The United States sample consists of 59 Business and 39 Education majors enrolled at Arizona State University West, an upper division, Masters-granting university in a large metropolitan area. The Ghanaian sample consists of 25 Business majors, 26 Business majors, and 48 from other disciplines who attend Cape Coast University. This institution is considered the premier university in Ghana.

The size of the sample is similar for each country, but the mean age of students in each is very different. The U.S. average age is 28.6 years, the Ghanaian average age 21.61 years, and the Chinese average 19.86 years. The age difference is due to the near absence of "adult" education in China where students are traditional age. The American sample comes from an upper division university where most students are "non-traditional" adults.

There are 27 females and 72 males in the Ghanaian sample; 63 males and 34 females in the Chinese sample and 34 males and 63 females in the U.S. sample. The high number of females in the U.S. survey is due to the many female undergraduate Education majors in the U.S. The percent of Business students in both U.S. and China who are females is quite low, plus the typical percent of female students in Chinese universities is below 50%.

Racial and ethnic backgrounds are almost homogeneous in each of the three national samples. Among the Chinese, there were 95 Han and 2 that indicated "other" ethnic

minority. The sample from Ghana consisted exclusively of Ghanaian people. The United States sample consisted of 71 Caucasians (non-Hispanic), 15 Hispanic Americans, 3 Asian Americans, 3 African Americans, and 5 undeclared individuals.

The samples are essentially convenience samples and, therefore, it is difficult to generalize from this data. The numbers are almost equivalent to percents due to sample sizes of almost 100 in each country. The U.S. data was collected in February of 1997; the Chinese data was collected in June of 1997 and the Ghanaian data in April of 1997.

Procedure

The researchers mailed copies of the final questionnaire to collaborating faculty at participating universities in each designated country. The collaborating faculty also received specific instructions for administering the questionnaire, as well as a cover letter to students ensuring their anonymity. The faculty administered the questionnaire to one hundred Education and Business freshmen at their institutions. The researchers personally collected the U.S. data from students attending Education and Business classes.

Results

The number of students who own their own computers is very different. Only five Chinese students and six Ghanaians students in our sample have a computer at home. However, 76 of the 97 U.S. students have computers. Though few Chinese and Ghanaian students can afford to own computers, they feel as positive towards computers as the U.S. students do. The data support the second, third and fourth hypotheses.

Forty-one (42.3%) of the Chinese students and thirty-one (31.3%) of the Ghanaian students preferred to share the computer with another while working on it in the university labs. The limited number of computers among Chinese and Ghanaian students dictate that they share computers when they work on their assignments. The same is not true for the U.S. students in our sample. Only seven U.S. students (7.1%) preferred to share a computer. This finding does not support the first hypothesis.

Only eight Chinese and seven Ghanaian students use computers at work. In contrast, 43 U.S. students use computers at work. This is not surprising since more U.S. than Chinese and Ghanaian students work while attending the university and virtually all U.S. businesses use computers.

Sixty-five U.S. and thirty-nine Ghanaian students used Windows. Seventy-six Chinese students used DOS without Windows. Fifty of the Ghanaian students did not know what operating system they had been using.

U.S. students spend more time using computers (15.28 hours per week) than the Chinese students (4.73 hours per week) or the Ghanaian students (1.77 hours). Concomitant with this difference in usage is a difference in self-reported computer competency. The Chinese and Ghanaians reported feeling less competent in their use of computers than did the U.S. students. Hence more U.S. students than Chinese and Ghanaians feel that computers are significant in their ability to conduct their work.

Conclusions and Implications

The differences in computer ownership among Chinese, Ghanaian and U.S. students reflect economic realities. In our personal experience, the few Chinese and Ghanaian students who own a computer are likely to live at home and be the children of university professors. Because much of the hardware and software is produced and sold by more affluent nations, the expense of importation makes the acquisition and maintenance of computers prohibitive for many people in developing countries.

Similarly, the willingness of Chinese and Ghanaian students to share a computer during work has economic and cultural roots. The limited number of computers among Chinese and Ghanaian students dictates that they share computers. Since the survey asked students if they "preferred" to share computers, the Chinese and Ghanaian students could have answered "no" if they preferred working alone. The fact that they indicated a preference for sharing computers is, therefore, indicative of a cultural valuing of collaboration and sharing. The willingness to share the computer fits within the larger cultural context of collaboration and establishing close relationships.

The use of DOS versus Windows indicates that the power and relative state-of-the-art of the Chinese computers is significantly lower than in the United States. The fact that 57.7% of the Ghanaian sample either did not know or did not indicate a platform is intriguing. This response may indicate a general lack of computer knowledge or a lack of knowledge about the specific computers used. Given Darkwa's (1966) statement regarding the need for increased computer skills among Ghanaians, it is likely that a lack of computer competence underlies this finding.

The authors find the attitudinal differences interesting and informative. The Chinese and Ghanaians feel as positive towards computers as U.S. students do, though they have less access to computers. At the same time, they report feeling less competent in their use of computers than do the U.S. students. Because of the perceived inherent benefits of the computer and the general lack of access to it, the computer has become an object of positive desire. In the U. S., the every-day presence and abundant supply of computers have made computers accessible to students. American's fascination with progress and technology leads to positive attitudes toward computers.

At the same time, social and political forces equate computers with economic progress and national well being. Indeed, the political and social push toward technology may have a positive influence on attitudes towards computers.

Even those with few opportunities to use a computer believe that it is important for economic growth. The government in the People's Republic places heavy pressure on Chinese students to support two major educational goals: to master English and to learn to use computers. Hence their attitudes and feelings towards computers are very positive.

Our findings suggest that access and competency are closely linked; those who have the most access also tend to rate themselves as more computer competent. This finding is consistent with previous research and with the need for extended hands-on practice before individuals feel computer competent.

Our findings suggest that students arriving at our institutions of higher learning from Ghana and mainland China will have positive attitudes towards computers, but are likely to have little experience and competence in using them. Given the increasing incorporation of technology in higher education, these students will be at a distinct disadvantage in classes where instructors require word-processed papers, internet searches for information, or even asynchronous learning activities. By the same token, American businesses in these countries will need to invest in employee computer training.

Our findings also suggest that attitudes and competence may not be directly related. Students with positive attitudes towards computers may still lack necessary computer skills. Societal and political valuing of computers seem to play a strong role in the development of computer attitudes.

In addition, our data suggest that cultural values and socio-economic factors influence how people prefer to work with the computer. Where collaboration is valued, individualized computer use may not be valued. Further research on culture and technology will increase our understanding of diverse learners' needs and expectations.

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