PARENTS' ATTITUDES AND EXPECTATIONS REGARDING SCIENCE EDUCATION: COMPARISONS AMONG AMERICAN, CHINESE-AMERICAN, AND CHINESE FAMILIES

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ABSTRACT

This study examined the differences in attitudes toward science education among American, Chinese-American, and Chinese parents and students. Parents' expectations for their high school children's science performance were also compared among the three cultural groups. It was found that both Chinese parents and students had more positive attitudes toward science education than did their American counterparts. Chinese parents placed greater emphasis on self-improvement, set higher standards, and more often helped their children to learn science than did American parents. The attitudes of the Chinese-Americans appeared to show the influences of both their Chinese heritage and American culture. Overall, a high positive correlation was found between parents' and students' attitudes toward science education.

Although reports that Asian students greatly surpass their American counterparts on science tests have received attention for many years (International Association for the Evaluation of Educational Achievement, 1985; Stigler et al., 1982), our knowledge of the factors responsible for this difference is incomplete. It has been attributed to differences in national educational systems, including the time students spend in school, the time they spend on solving problems while in the classroom, the content of textbooks, and the comprehensiveness of the curriculum (Hess, Chang, & McDevitt, 1987). However, Asian-American students also outperform other American students on tests that measure academic achievement, as well as additional measures of educational accomplishments. An example is the performance of Chinese-Americans in the annual Westinghouse Science Talent

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Search, in which the top ten students are selected from about 1,300,000 high school seniors nationwide. One to four Chinese-American students have been chosen every year over the past decade. Considering that less than one percent of the population is Chinese-American, they have performed extraordinarily well in science. In explaining why they did so well, a Westinghouse spokesperson said that at least one thing was certain: they all had the strongest possible support and encouragement from their families throughout their school career (Browne, 1986). It is interesting that the same situation exists in other countries as well (Chung & Walkey, 1989).

This suggests that national differences are not due solely to differences in educational systems, but may also reflect differences in culturally transmitted values, beliefs, and behaviors. Clark (1983) and Havighurst and Neugarten (1971) have argued that a family's overall cultural style, not parents' marital status, educational level, income, or social class, greatly determines whether children are prepared to perform well in school.

It is well accepted that parents' expectations have a major effect on children's academic performance (Boocock, 1972; Vollmer, 1986). Henderson (1988) found that this held true across all social, economic, and ethnic backgrounds. However, what must be determined is whether there are cultural differences in such expectations. For example, the cultures and histories of the United States and China differ dramatically, which may affect parents' attitudes toward education and their expectations regarding children's performance in school.

China is an ancient civilization, and for over 2000 years attitudes toward education were strongly influenced by Confucian philosophy. This philosophy placed the scholar in a position of prominence and prestige. According to an old proverb, "Scholars are respected above all." Consequently, education was considered an important route to success (Ridley, 1973). In this cultural environment, intellectuals were highly respected. This tradition of exalting academic accomplishments persists today.

At the same time, respect for scholarly attainment accompanied a high regard for effort. Hard work remained, in most cases, the only means of achieving success (Munro, 1977). Given the cohesion of the Chinese family, these values were preserved. Recent studies (Hess, Chang, & McDevitt, 1987; Siu, 1992) have shown that even American-born Chinese parents retain some traditional Chinese parenting values and practices.

In comparison, America's history spans a few hundred years and reflects a nation built on immigration from different cultures with di-
verse languages. The National Science Board Commission on Precol-
lege Education in Mathematics, Science, and Technology (1991) has
stated that "America's students and its education system are much
less culturally homogeneous than those of other countries. Our schools
reflect a broad diversity of racial, national, cultural, and economic
backgrounds that characterizes the nation as a whole" (p. 2). This
educational system encourages personal independence and the devel-
opment of each individual's potential. For most, practical knowledge
is more important than textbook knowledge (Lindgren, 1976).

METHOD

Subjects
The data for this study were collected from two suburban public high
schools in the People's Republic of China and two suburban public high
schools in the United States. A total of 185 Chinese students and their
parents, 140 American students and their parents, and 39 Chinese-
American students and their parents participated in this research. The
students were in the tenth grade.

The organization of public schools in China is similar to that in the
United States. Children enroll in school in September after their sixth
birthday, and study for six years in elementary school, three years in
junior high school, and three years in senior high school. In China, as
in America, residential housing patterns often determine which high
schools students attend. Tenth-grade students were chosen because in
both the United States and China, science courses usually are required
in this grade.

Parents' highest year of school attendance, parents' gender, and stu-
dents' gender were used as control variables to ensure that the Chinese
and American samples were comparable. A one-way ANOVA was used
to determine whether there were statistically significant differences in
parents' education; z-tests were used to examine differences in parents'
and students' gender distributions among the three cultural groups.
No significant differences at the .05 level were found in either gender
distribution or parents' educational background.

Instruments
Two different questionnaires, using Likert-type scales, were pre-
pared, one for students and one for their parents. The questionnaire for
the parents consisted of two parts. The first part, "Parents' Attitudes
Toward Science Education," contained 19 items, which were catego-
rized into three subscales: Value of Science—parents’ attitudes toward science, technology, and scientists; School Science Learning—parents’ opinions about the importance of learning science in high school; and Curriculum Design—parents’ satisfaction regarding their children’s school science curriculum. The second part of the questionnaire, “Parents’ Expectations for Their Children’s Academic Performance in Science,” contained 21 items, which were categorized into three subscales: Learning Ability—parents’ beliefs concerning the role of innate ability versus effort in school learning; Behavior—whether or not parents do something to help their children learn science at home; and Standards—parents’ beliefs concerning the importance of parental expectations for their children’s achievement, and whether or not they set high standards for their children’s performance in science. The questionnaire for the students contained 20 items, which were categorized into three subscales: Value of Science—students’ attitudes toward science, technology, and scientists; School Science Learning—students’ opinions about the importance of learning science in high school; and Curriculum Design—students’ satisfaction regarding their school science curriculum. All the questionnaires were printed in the native language for each country (English and Chinese). The accuracy of the Chinese translation of the questionnaires was validated by a panel of judges. The alpha reliability of the English version of the questionnaires and their subscales ranged between 0.45 and 0.94. The construct validity of the questionnaires was judged by a panel of nine experts. Chi-square tests were used to assess the goodness-of-fit between observed counts and expected counts for each item. There was no significant difference at the .05 level between expected counts and the panel’s judgment (observed counts) for any item, indicating good validity for all questionnaires.

RESULTS

Although the parents in all three cultural groups had positive attitudes toward science education ($M_C = 3.74$, $SD_C = 0.50; M_A = 3.48$, $SD_A = 0.50; M_{CA} = 3.75, SD_{CA} = 0.33$), a significant difference was still evident ($F = 17.10, p < .01$). Pairwise tests revealed significant differences between Americans and Chinese ($p < .01$) and Americans and Chinese-Americans ($p < .01$). These differences were consistently found on all three subscales. Chinese parents ($M_C = 4.11$, $SD_C = 0.46$) had more positive attitudes regarding the value of science than did American parents ($M_A = 3.83, SD_A = 0.55; p < .01$). Chinese parents
\( M_C = 3.79, SD_C = 0.48 \) also had more positive attitudes concerning the importance of learning science in high school than did American parents \( (M_A = 3.62, SD_A = 0.73; p < .01) \). Both Chinese \( (M_C = 4.11, SD_C = 0.46) \) and Chinese-American parents \( (M_{CA} = 3.75, SD_{CA} = 0.33) \) had more positive attitudes toward the school science curriculum than did American parents \( (M_A = 3.62, SD_A = 0.73; p < .01) \).

Parents’ expectations for their children’s academic performance in science among Americans \( (M_A = 3.14, SD_A = 0.48) \), Chinese \( (M_C = 3.47, SD_C = 0.37) \), and Chinese-Americans \( (M_{CA} = 3.41, SD_{CA} = 0.40) \) were also different \( (F = 26.49, p < .01) \). Pairwise tests revealed significant differences at the .01 level between Americans and Chinese, as well as Americans and Chinese-Americans. These differences were consistently found on all three subscales. There were large mean differences in parents’ beliefs concerning learning ability, specifically between American parents \( (M_A = 2.93, SD_A = 0.57) \) and both Chinese parents \( (M_C = 3.64, SD_C = 0.56) \) and Chinese-American parents \( (M_{CA} = 3.65, SD_{CA} = 0.45) \). In addition, Chinese parents \( (M_C = 3.36, SD_C = 0.47) \) set higher standards for their children’s performance in science than did their American counterparts \( (M_A = 3.17, SD_A = 0.39; p < .01) \). Chinese parents \( (M_C = 3.48, SD_C = 0.48) \) also more often helped their children to learn science than did American parents \( (M_A = 3.26, SD_A = 0.66; p < .01) \).

The results also showed that among Americans \( (M_A = 3.23, SD_A = 0.60) \), Chinese \( (M_C = 3.54, SD_C = 0.46) \), and Chinese-Americans \( (M_{CA} = 3.53, SD_{CA} = 0.52) \), students’ attitudes toward science education differed significantly \( (F = 14.69, p < .01) \). Pairwise tests revealed differences between Americans and Chinese \( (p < .01) \) and Americans and Chinese-Americans \( (p < .01) \). More specifically, both Chinese students \( (M_C = 3.78, SD_C = 0.47) \) and Chinese-American students \( (M_{CA} = 3.86, SD_{CA} = 0.54) \) possessed more positive attitudes regarding the value of science than did American students \( (M_A = 3.37, SD_A = 0.63) \). Chinese students \( (M_C = 3.12, SD_C = 0.62) \) and Chinese-American students \( (M_{CA} = 3.16, SD_{CA} = 0.46) \) also had more positive attitudes toward their school science curriculum than did American students \( (M_A = 2.75, SD_A = 0.72) \). No significant difference was found in students’ attitudes regarding the importance of learning science.

In addition, correlation analysis between parents’ scores and their children’s scores, and between the scores of different generations of Chinese-Americans, was conducted. Results showed that between different generations of Chinese-Americans, parents’ and students’ views did not significantly differ at the .05 level. In other words, there was no generational effect. Results also showed a high positive correlation
(r = 0.63) between parents’ and students’ attitudes toward science education. Interestingly, a cultural variation regarding this correlation was found. Parents’ attitudes were more highly related to their children’s attitudes for Chinese-Americans (r_{CA} = 0.69) than for Chinese (r_{C} = 0.67) and Americans (r_{A} = 0.47).

A limitation of this study is that it was impossible to obtain random nationwide samples. The data were collected from only two high schools in the People’s Republic of China and two in the United States; therefore, the results should not be construed as generalizable to the whole population. Because of the small sample size of Chinese-Americans (n = 39), any conclusions about this cultural group should be treated with even more caution.

**DISCUSSION**

**Cultural Assimilation or Cultural Independence?**

No significant differences were found between the Chinese and Chinese-American groups. In other words, there was little difference between Chinese parents and Chinese-American parents regarding their attitudes toward science education and their expectations for their children’s science performance, and there was little difference between Chinese students and Chinese-American students in their attitudes toward science education. However, by carefully examining the trends in the data, some differences become evident. Although Chinese-American parents’ and students’ scores were close to the scores of their Chinese counterparts, those of the Chinese-American group were often lower than those of the Chinese group and consistently higher than those of the American group. This suggests that the beliefs of the Chinese-Americans are being influenced by both their Chinese heritage and American culture. Although it cannot be concluded from this single study that Chinese immigrants are gradually moving away from a traditional orientation due to assimilation, the question remains as to how long and how successfully this cultural tradition can be transmitted to future generations in the United States.

From another perspective, China is changing. The recent Chinese “open door” policy brought not only foreign investment, but Western culture as well. As rapid economic development takes place, the Chinese people’s values are also changing. Thus, another interesting question is whether Chinese cultural traditions can be transmitted to successive generations in their own land.
The Meaning of Parents’ Involvement

The Chinese and American groups significantly differed regarding parents’ behavior in helping their children learn science at home. More specifically, the Chinese parents spent more time working with their children, more frequently checked their children’s homework, and bought more books or equipment relating to science for their children than did the American parents. These findings support the conclusions of many previous researchers (Hess et al., 1987; Krum & Astleitner, 1991; Stevenson, Lee, & Stigler, 1986), namely that Chinese parents place greater value on home involvement. However, it is beyond the range of this research to evaluate the various types of parental involvement. The question remains: What methods can parents employ to best help their children achieve educational success?

Individual Differences in Learning Processes

The relatively low expectations of American parents regarding their children’s science performance might stem partly from the degree to which they believe innate ability determines performance. There was a particularly large difference between Chinese and American parents’ beliefs concerning learning ability. This supports the findings of previous research (Spence, 1985; Stevenson, 1987; Chen & Uttal, 1988; Holloway & Hess, 1982). American parents in general seem more concerned with whether children have an opportunity to achieve some measure of success commensurate with their particular capabilities. In contrast to American parents, Chinese parents set high standards for their children and devote much time and energy to helping them, because of the belief that their children can excel (e.g., at science) if they work hard enough.

CONCLUSION

Chinese parents and students seem to have more positive attitudes toward science education than do their American counterparts. Chinese parents place greater emphasis on the importance of self-improvement, set higher standards, and more often help their children to learn science than do American parents. In the absence of data on students’ actual achievement, no conclusions can be reached on how these differences might affect children’s school performance in science. However, it can be concluded from this study that parents’ attitudes toward science education are strongly related to their children’s attitudes. All
parents, therefore, should encourage their children to work diligently, monitor their children’s study habits, and nurture curiosity, creativity, and confidence.

REFERENCES


