2006-315: A COMPARATIVE ANALYSIS ON LEARNING CHARACTERISTICS BETWEEN ELECTRONICS STUDENTS IN CHINA AND IN THE UNITED STATES

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A Comparative Analysis on University Student Characteristics between Electronics Students in China and in the United States

Abstract

How much time did university students spend on learning, working, and doing leisure activities in China and in the United States? Were there statistically significant differences between university students in China and in the United States, in regard to the time investment on learning and doing other activities? This research statistically compared student characteristics between electronics students in China and in the United States. The research statistically analyzed, in China and in the United States, the average hours per week electronics students spent on taking lectures and scheduled labs, studying outside classrooms on reading and homework, working on paid-jobs, and doing leisure activities. Meanwhile the research compared the above student characteristics between female and male students in the sample. The research also tried to compare these statistical data between students in China and students in the United States for the same gender group. The study used various statistical tools (2X2 ANOVAs, *t*-tests, Mann-Whitney U tests, etc.) to conduct analysis and comparisons.

The actual survey was conducted to a sample of electronics students at a four-year university in the United States, and a comparable group of students at a university in Beijing, China. Among surveys being collected, about 100 (approximately 50 from each country) had valid data which were used in the analysis.

The research resulted in several interesting findings in descriptive statistics regarding the percentage of American and Chinese students' average time spent in classroom taking lectures and performing scheduled labs, studying outside classrooms, working on paid-jobs, and doing leisure activities.

The research found that there were statistically significant differences between Chinese university students and American university students, in regard to almost all areas that were investigated. University electronics students in China spent significantly more time on taking lectures and performing scheduled labs, studying outside classrooms, and doing leisure activities than their counterparts in the United States. On the other hand, university electronics students in the United States spent significantly more time working on paid-jobs than their counterparts in China. There were no significant differences found between two gender groups for all research questions investigated. The significance of this research was to develop better awareness to facilitate the cultural understanding of recent university student characteristics in different educational settings.

Introduction

This research was attempted to find whether there were statistically significant differences between electronics students in China and electronics students in the United States, in regard to the time they spent weekly on (a) attending classroom lectures and scheduled labs; (b) on studying outside the classroom; (c) on paid-jobs; and (d) on leisure activities.

The actual sample included students in an electronics program at a four-year university campus at Chicago, and the students in a comparable electronics program at a four-year university campus at Beijing. The research found that electronics students sampled in China spent significantly more time on attending classroom lectures and scheduled labs, on studying outside the classroom, and on leisure activities than their counterparts in the United States. However, the research also found that electronics students sampled in China spent significantly less time on paid-jobs than their counterparts in the United States.

Two-way ANOVAs (analyses of variance), planned independent *t*-tests and Mann-Whitney U tests were used as appropriate inferential statistics based on the analysis of independent variable and dependent variable in this research.

The researchers reported that the number of required credit hours to complete a bachelor's degree in electronics at universities in China was substantially more than the number of required credit hours at the universities in the United States. In addition to the total number of credit hours, the undergraduate electronics curriculum in China required more credit hours for its mathematics/science courses and social science/humanity courses than the electronics curriculum in the United States required.[1] These important factors may provide explanations to the findings from this research that electronics students sampled in China spent significantly more time on attending classroom lectures/scheduled laboratories and on studying outside the classroom than their counterparts in the United States.

The researchers also reported that there was a substantial difference in unversity expenditures between the two countries. In addition to this subtantial difference, historically in China college students and their families were paying a small percentage of the total educational expenditure.[2] Although in recent years university tuition and fees are increasing drastically, culturally most students in China consider that they do not share the responsibility of paying the cost of their university education, and that this responsibility either belongs to the government (as it has been for many years), or to their parents. Contrarily, much larger percentage of college students in the United States are paying their own tuition and fees for their higher education.[3] Although U.S. government provides all kinds of financial aid and educational loans for eligible college students to finance their education, the repayment of the educational loans are still the responsibilities of the students themselves. The tuition burden, marital status, and family responsibilities might be the factors contributing to the differences between electronics students sampled in China and electronics students sampled in the United States in regard to their average time spent on paid-jobs and leisure activities.

Finally the researchers discussed the implications for the educational policy makers and educational administrators in both countries to seriously consider how to optimize the total number of hours required for completing bachelor's degrees, and the reasonable expectations for undergraduate students in regard to their work-load on paid-jobs.

Research Questions

There were four specific research questions based on the same target population and research sample as being listed as follows.

Research question 1 included the following four parts:

(1a) Was there a statistically significant difference between electronics students in China, and electronics students in the United States, in regard to the average number of hours they spent weekly attending classroom lectures and scheduled laboratories?

(1b) Was there a statistically significant difference between female electronics students and male electronics students in regard to the average number of hours they spent weekly attending classroom lectures and scheduled laboratories?

(1c) Was there an *interaction* of students in either country (China versus the United States) and their gender difference (female versus male) in regard to the average number of hours they spent weekly attending classroom lectures and scheduled laboratories?

(1d) For each gender group studied in this research, was there a statistically significant difference between students in China and students in the United States in regard to the average number of hours they spent weekly attending classroom lectures and scheduled laboratories?

Research question 2 included the following four parts:

(2a) Was there a statistically significant difference between electronics students in China, and electronics students in the United States, in regard to the average number of hours they spent weekly studying outside the classroom on reading, researching, doing homework, catching up projects, etc.?

(2b) Was there a statistically significant difference between female electronics students and male electronics students in regard to the average number of hours they spent weekly studying outside the classroom on reading, researching, doing homework, catching up projects, etc.?

(2c) Was there an *interaction* of students in either country (China versus the United States) and their gender difference (female versus male) in regard to the average number of hours they spend weekly studying outside the classroom on reading, researching, doing homework, catching up projects, etc.?

(2d) For each gender group studied in this research, was there a statistically significant difference between students in China and students in the United States in regard to the average number of hours they spent weekly studying outside the classroom on reading, researching, doing homework, catching up projects, etc.?

Research question 3 consisted of the following four parts:

(3a) Was there a statistically significant difference between electronics students in China, and electronics students in the United States, in regard to the average number of hours they spent weekly on paid-jobs?

(3b) Was there a statistically significant difference between female electronics students and male electronics students in regard to the average number of hours they spent weekly on paid-jobs?

(3c) Was there an *interaction* of students in either country (China versus the United States) and their gender difference (female versus male) in regard to the average number of hours they spent weekly on paid-jobs?

(3d) For each gender group studied in this research, was there a statistically significant difference between students in China and students in the United States in regard to the average number of hours they spent weekly on paid-jobs?

Research question 4 had the following four parts:

(4a) Was there a statistically significant difference between electronics students in China, and electronics students in the United States, in regard to the average number of hours they spent weekly on leisure activities (watching sports, movies, sightseeing, chatting, playing games, etc.)?

(4b) Was there a statistically significant difference between female electronics students and male electronics students in regard to the average number of hours they spent weekly on leisure activities (watching sports, movies, sightseeing, chatting, playing games, etc.)?

(4c) Was there an *interaction* of students in either country (China versus the United States) and their gender difference (female versus male) in regard to the average number of hours they spent weekly on leisure activities (watching sports, movies, sightseeing, chatting, playing games, etc.)?

(4d) For each gender group studied in this research, was there a statistically significant difference between students in China and students in the United States in regard to the average number of hours they spent weekly on leisure activities (watching sports, movies, sightseeing, chatting, playing games, etc.)?

Methodology

Population. The population for this research was intended to target at all electronics students both in China and in the United States. The students were across all grade levels (first-year freshmen through fourth-year seniors) in the pursuit of their Bachelor's degree in electronics. The actual sample was limited to the students in electronics program at a four-year university campus at Chicago, and the students in a comparable electronics program at a four-year university campus at Beijing. Both programs were selected from atypical engineering schools in both countries (one was from an engineering technology school and the other from a technology school). The sample selection was based on the consideration of the factors of cost, time, and effectiveness.[4]

Variables and Inferential Statistical Tools. In this research, there were two independent variables. The first independent variable, the student nationality, had two categories. The first category was the group of students who were in China, while the second category was the group of students in the United States. Two categories were mutually exclusive by definition. The second independent variable, student gender, had two categories: female students and male students.

There were multiple dependent variables (DV) describing student learning and leisure characteristics: (1) the average number of hours students spent weekly attending classroom lectures and scheduled laboratories; (2) the average number of hours students spent weekly studying outside the classroom on reading, researching, doing homework, catching up projects, etc.; (3) the average number of hours students spent weekly on paid-jobs; and (4) the average number of hours students spent weekly on leisure activities (watching sports, movies, sightseeing, chatting, playing games, etc.).

Due to the nature of independent and dependent variables, the nature of research questions, and the normality of data distributions, two-way ANOVAs (analyses of variance), planned independent *t*-tests, and Mann-Whitney U tests were used as appropriate inferential statistics accompanied by descriptive statistics.

Instrument. The primary instrument used in the research was the survey questionnaire developed by the researchers of this study. The survey questions in the questionnaire were identical to the research questions listed previously in this paper. The questionnaire was first developed in English for students sampled in the United States; it was then translated into Chinese for students sampled in China.

Findings

Research Question 1 Findings. The first research question contained two independent variables. The first independent variable, the student nationality, had two categories. The first category was the sample of students in China, while the second category was the sample of students in the United States. The second independent variable, student gender, also had two categories: female students and male students. The dependent variable (DV) was the average number of hours students spent weekly attending classroom lectures and scheduled laboratories.

A two-way ANOVA (analyses of variance) was executed to determine whether there were significant differences and/or a significant interaction among the two gender groups (females versus males) and two nationality groups (China versus the United States). Planned independent *t*-test and Mann-Whitney U test were also run to identify if there was significant difference between nationality backgrounds (China versus the United States) for the same gender group (female or male) in regard to the average number of hours students spent weekly attending classroom lectures and scheduled laboratories.

Table 1 indicates that there was not a significant interaction between gender groups and nationality ($p = .22$). Although there was no significant difference between two gender groups, there was a significant difference between the electronics students sampled in China and the

electronics students sampled in the United States, in regard to the average number of hours students spent weekly attending classroom lectures and scheduled laboratories, F (1, 97) = 98.8. On average, electronics students sampled in China spent significantly more time (mostly 28 to more than 30 hours weekly) on attending classroom lectures and scheduled laboratories than their counterparts (approximately 18 - 20 hours weekly) in the United States. Eta for nationality backgrounds (China versus the United States) was about 0.71, which according to Cohen (1988) was large effect size.[5]

Table 1

Two-Way Analysis of Variance for Average Number of Hours Students Spent Weekly Attending Classroom Lectures and Scheduled Labs as a Function of Gender and Nationality Backgrounds

Variance and Source	*df*	*MS*	*F*	η^2
Average Hours Attending Lectures and Labs				
Gender background	1	.27	.25	.003
National background	1	106.12	98.80*	.505
Genbgrd × Natlbgrd	1	1.66	1.54	.016
Error	97	.452		

*$p < .01$

Further investigations were performed to identify if there was significant difference between nationality backgrounds (China versus the United States) for the same gender group (female or male) in regard to the average number of hours spent weekly attending classroom lectures and scheduled laboratories. The t-test indicated that there was a significant difference between the female electronics students sampled in China and the female electronics students sampled in the United States, in regard to the average number of hours spent weekly attending classroom lectures and scheduled laboratories. On average, female electronics students sampled in China spent significantly more time on attending classroom lectures and scheduled laboratories than their female counterparts in the United States, t (47) = 8.65, $p < 0.01$. Since the mean difference (MD) was 2.31 and the pooled standard deviation was approximately .93, which resulted in a large effect size according to Cohen (1988).[5] Due to the violation of homogeneity and non-normality of the data, Levene = 1.92, p < .01, the Mann-Whitney U test was used to examine whether there was a significant difference between the male electronics students sampled in China and the male electronics students sampled in the United States, in regard to the average number of hours spent on lectures and scheduled labs. The Mann-Whiney U test indicated that there was a significant difference, U = 111, $p < .01$. Male electronics students sampled in China spent significantly more time on lectures and scheduled labs (Mean Rank = 35.56) than their male counterparts in the United States (Mean Rank = 18.11). Since in this situation it was a practice to run both the t-test and the Mann-Whitney U test, the accompanying t-test was run and supported the Mann-Whitney U result. The t-test also showed that the mean difference (MD) was 1.80 and the pooled standard deviation was approximately 1.12, which resulted in a large effect size according to Cohen (1988).[5]

Research Question 2 Findings. The second research question contained the same independent variables as the first research question contained. The dependent variable (DV) was the average number of hours students spent weekly studying outside the classroom on reading, researching, doing homework, catching up projects, etc.

The same statistical analysis (factorial ANOVA) was executed to determine whether there were significant differences and/or a significant interaction among the two gender groups (females versus males) and two nationality groups (China versus the United States). Planned independent *t*-test and the Mann-Whitney U test were then performed to determine if there was significant difference between nationality backgrounds (China versus the United States) for either the female or male gender group in regard to the average number of hours students spent weekly studying outside the classroom.

Table 2 indicates that there was not a significant interaction between gender groups and nationality ($p = .80$), nor was there significant difference between two gender groups. However, there was a significant difference between the electronics students sampled in China and the electronics students sampled in the United States, in regard to the number of hours they spent weekly studying outside the classroom on reading, researching, doing homework, catching up projects, etc., $F(1, 97) = 35.13$. On average, electronics students sampled in China spent significantly more time (approximately 15-18 hours weekly) on studying outside the classroom than their counterparts (approximately 6-10 hours weekly) in the United States. Eta for nationality backgrounds (China versus the United States) was about 0.52, which according to Cohen (1988) was large effect size.[5]

Table 2

Two-Way Analysis of Variance for Average Number of Hours Students Spent Weekly Studying Outside the Classroom as a Function of Gender and Nationality Backgrounds

Variance and Source	*df*	*MS*	*F*	η^2
Average Hours Studying Outside the Classroom				
Gender background	1	1.02	.49	.005
National background	1	73.95	35.13*	.266
Genbgrd × Natlbgrd	1	.17	.08	.001
Error	97	2.11		

*$p < .01$

The planned independent *t*-test indicated that there was a significant difference between the female electronics students sampled in China and the female electronics students sampled in the United States, in regard to the average number of hours spent weekly studying outside the classroom. On average, female electronics students sampled in China spent significantly more time on studying outside the classroom than their female counterparts in the United States, *t* (47)

= 4.14, $p < 0.01$. The calculated effect size was large size according to Cohen (1988).[5] Again due to the violation of homogeneity, the Mann-Whitney U test was executed and indicated that there was a significant difference, U = 140, $p < .01$. Male electronics students sampled in China spent significantly more time studying outside the classroom (Mean Rank = 34.40) than their male counterparts in the United States (Mean Rank = 19.19). The accompanying *t*-test supported the result of the Mann-Whitney U test and showed that the effect size was large.

Research Question 3 Findings. The third research question had same independent variables as the first and second research questions contained. The dependent variable (DV) was the average number of hours students spent weekly on paid-jobs.

Table 3 indicates that there was not a significant interaction between gender groups and nationality ($p = .37$), neither was there significant difference between two gender groups. On the other hand, factorial ANOVA showed that there was a significant difference between the electronics students sampled in China and the electronics students sampled in the United States, in regard to the number of hours they spent weekly on paid-jobs, F (1, 96) = 133.75. On average, electronics students sampled in the United States spent significantly more time (approximately 18 - 22 hours weekly) on paid-jobs than their counterparts (approximately 0 - 3 hours weekly) in China. Eta for nationality backgrounds (the United States versus China) was about 0.76, which according to Cohen (1988) was large effect size.[5]

Table 3

Two-Way Analysis of Variance for Average Number of Hours Students Spent Weekly on Paid-jobs as a Function of Gender and Nationality Backgrounds

Variance and Source	*df*	*MS*	*F*	η^2
Average Hours on Paid-jobs				
Gender background	1	6.55	3.88	.039
National background	1	225.80	133.75*	.582
Genbgrd × Natlbgrd	1	1.35	.80	.008
Error	96	1.69		

*$p < .01$

Due to the violation of homogeneity and non-normality of the data, Levene = 47.29, p < .001, the Mann-Whitney U test was used to examine whether there was a significant difference between the female electronics students sampled in China and the female electronics students sampled in the United States, in regard to the average number of hours spent weekly on paid-jobs. The Mann-Whiney U test indicated that there was a significant difference, U = 59, $p < .01$. Female electronics students sampled in China spent significantly less time on paid-jobs (Mean Rank = 15.36) than their female counterparts in the United States (Mean Rank = 34.43). The accompanying independent *t*-test also indicated the same result. The calculated effect size was large.

Since the homogeneity was not violated, the *t*-test was run and demonstrated that there was also a significant difference between the male electronics students sampled in China and the male electronics students sampled in the United States, in regard to the average number of hours spent on paid-jobs. Male electronics students sampled in the United States spent significantly more time on paid-jobs than their male counterparts in China, $t\ (50) = 9.48$, $p < 0.01$. The effect size was again large.

Research Question 4 Findings. The fourth research question had the same independent variables as the previous research questions did. The dependent variable (DV) was the average number of hours students spent weekly on leisure activities (watching sports, movies, sightseeing, chatting, playing games, etc.).

Table 4 indicates that there was not a significant interaction between gender groups and nationality ($p = .30$), neither was there significant difference between two gender groups. However, factorial ANOVA showed that there was a significant difference between the electronics students sampled in China and the electronics students sampled in the United States, in regard to the average number of hours students spent weekly on leisure activities, $F\ (1, 97) = 21.06$. On average, electronics students sampled in China spent significantly more time (approximately 16 - 18 hours weekly) on leisure activities than their counterparts (approximately 6-10 hours weekly) in the United States. Eta for nationality backgrounds (the United States versus China) was about 0.42, which according to Cohen (1988) was upper-medium effect size.[5]

Table 4

Two-Way Analysis of Variance for Average Number of Hours Students Spent Weekly on Leisure Activities as a Function of Gender and Nationality Backgrounds

Variance and Source	*df*	*MS*	*F*	η^2
Average Hours on Paid-jobs				
Gender background	1	1.21	.59	.006
National background	1	43.52	21.06*	.178
Genbgrd × Natlbgrd	1	2.26	1.09	.011
Error	97	2.07		

*$p < .001$

The planned independent *t*-test demonstrated that there was a significant difference between the female electronics students sampled in China and the female electronics students sampled in the United States, in regard to the average number of hours spent on leisure activities. On average, female electronics students sampled in China spent significantly more time on leisure activities than their female counterparts in the United States, $t\ (47) = 4.21$, $p < 0.01$. The calculated effect size was large. Meanwhile, the *t*-test demonstrated that there was also a significant difference between the male electronics students sampled in China and the male electronics students

sampled in the United States, in regard to the average number of hours spent on leisure activities. Male electronics students sampled in China spent significantly more time on leisure activities than their male counterparts in the United States, t (50) = 2.4, $p < 0.05$. The effect size was medium.

Discussion

In conclusion, this research found that (1) electronics students sampled in China spent significantly more time (mostly 28 to more than 30 hours weekly) on attending classroom lectures and scheduled laboratories than their counterparts (approximately 18 - 20 hours weekly) in the United States; (2) electronics students sampled in China spent significantly more time (approximately 15-18 hours weekly) on studying outside the classroom than their counterparts (approximately 6-10 hours weekly) in the United States; (3) electronics students sampled in the United States spent significantly more time (approximately 18 - 22 hours weekly) on paid-jobs than their counterparts (approximately 0 - 3 hours weekly) in China; and (4) electronics students sampled in China spent significantly more time (approximately 16 - 18 hours weekly) on leisure activities than their counterparts (approximately 6-10 hours weekly) in the United States.

The research did not find any significant difference between two gender groups for any research question investigated.

Differences in the Average Number of Hours on Attending Lectures/Scheduled Labs and on Studying Outside the Classroom. According to a comparative study conducted by Lan & Lee (2005), typically the number of required credit hours to complete a bachelor's degree in electronics in China was substantially more than the number of required credit hours in the United States.[1] This factor alone provided explanations, to a certain extent, to the findings that electronics students sampled in China should spend significantly more time on attending classroom lectures and scheduled labs, and on studying outside the classroom than their counterparts in the United States.

Lan & Lee (2005) found that, by comparing Tsinghua University at Beijing, and the University of Illinois at Urbana-Champaign, the typical electronics curriculum in China required 171 - 176 credit hours, which resulted in an average of 22-23 credit hours per semester to pursue a bachelor's degree in four years.[1] However, the typical electronics curriculum in the United States required 128 - 132 credit hours to complete a bachelor's degree, which corresponded to an average of 16 -17 credit hours per semester to complete the degree in four years. This calculation supported the findings in this research that electronics students sampled in China spent significantly more time on attending classroom lectures and scheduled laboratories, and consequently on studying outside the classroom, than their counterparts in the United States.

In addition to the total number of credit hours required to complete a Bachelor's degree in electronics, Lan & Lee (2005) also indicated in their research that the electronics curriculum at Tsinghua University required approximately 10 more credit hours for its mathematics and science courses than UIUC required; and at Tsinghua University, students are required to take approximately 9 more credit hours in social science/humanity courses than students at UIUC being required.[1] These were important factors contributing to the findings of this research that electronics students sampled in China spent significantly more time on attending classroom

lectures/scheduled laboratories and on studying outside the classroom than their counterparts in the United States, due to the fact that mathematics, science, and some humanity classes demanded more time outside classroom to study, review, write papers, and conduct research projects than classes of other natures.

Differences in the Number of Hours Spent on Paid-Jobs and on Leisure Activities. The findings that electronics students sampled in China spent much less time on paid-jobs and much more time on leisure activities than their counterparts in the United States might be due the factors that (1) historically university education in China was at much lower cost than the cost of university education in the United States; and (2) who (students, their parents, or the government) were culturally believed to be responsible for paying the cost of university education.

Postigliong (2002) summarized a survey conducted to 1200 households in Wuxi city near Shanghai and reported that the average education expenditure from kindergarten to university was typically 63,000 yuan (almost US$8,000) around that area, where the education expenditure was relatively higher than other parts of the country.[6] The average expenditure per student per term was 1,540 yuan (almost US$200); and the average expenditure per college student per term was 3,949 yuan (almost US$400) around that area.[6]

In a research report, Li & Min (2001) reported that in 1997, the China's national average tuition in regular higher education institutions was 1,620 yuan while the average institutional recurrent cost per student was 8,350 yuan (total expenditure approximately equaled to $1040).[2] In 1998, the tuition datum increased to 1,974 yuan while the average institutional recurrent cost increased per student to 11,020 yuan (approximately $1340 in total). In 1999, the national average reached 2,769 yuan and the average institutional recurrent cost per student reached to 14,400 yuan (approximately $1752 in total).[2]

According the the News Release published by the Collegeboard (2005), for 2004 academic year, at four-year private nonprofit institutions, tuition and fees averaged $20,045, with a total charge averaged $27,465. For the same academic year, at four-year public institutions, tuition and fees averaged $5,126 with total charges averaged $11,376.[3]

Although the above data indicated a substantial difference in unversity expenditures between the two countires, it did not necessarily imply that Chinese families assumed lighter tuition burdens since the average household income in China was subtentially lower than the average household income in the United States.

Traditionally higher education institutions in China were totally funded by the government before the implementation of opening-up and reform policy.[2] From the middle of 1980s to early 1990s, the two-track of tuition-paying enrollment and no-tuition-paying enrollment were coexisted in Chinese higher education systems. Even up to then, the majority of students did not need to pay tuition and boarding fees; only small percentage of students needed to pay tuition and fees for their enrollment in higher education.

In recent years, with the fast development of market economy and the expending in higher education, colleges and universities have substantially increased the cost for their educational services. However, despite the fast tuition-increase and its impact on Chinese families, parents and students alike seldom consider the cost of education would be a shared responsibility between them. It has been becoming a culture that parents are spending their life-savings to afford for their children to complete their higher education, as their only hope is to help their children to acquire college credentials leading to decent employment.[6] They deeply believe that their children should spend all their time during college years concentrating on academic studies instead of seeking any kind of paid-jobs or off-campus employment. Meanwhile, very few students in China have developed the concept that paying tuition for their higher education should also be the responsibility that they share.

Contrarily, much larger percentage of college students in the United States are paying their own tuition and fees for their higher education. Although U.S. government provides all kinds of financial aid and educational loans for eligible college students to finance their education, the repayment of the educational loans are still the responsibility of the students themselves. These students must work on paid-jobs to pay their tuition bills.

The conceptual difference between cultures regarding whether the students or their parents should be the ultimate responsible party for paying the cost of university education might cause the difference between two student samples in regard to their time spent on paid-jobs.

Another possible contributing factor was that there were much more college students sampled in the United States who were married than the students sampled in China. Within the research sample, more than 10% electronics students sampled in the United States were married, while 0% electronics students sampled in China was married. The marriage, child support, and other family responsibilities might require these students to work substantially more hours than students who did not have such responsibilities.

The tuition burden, marital status, and family responsibilities might be the factors contributing to the differences between electronics students sampled in China and electronics students sampled in the United States in regard to their average time spent on paid-jobs and leisure activities.

Policy Implications. This research provided implications for the educational policy-makers and educational administrators in both countries to seriously consider the following:

1. *The optimization, standardization, and the globalization of the requirements for completing bachelor's degrees.* This research found that electronics students sampled in China spent significantly more time on attending classroom lectures/scheduled labs, and on studying outside the classroom than their counterparts in the United States. The previous studies also indicated that typically the number of required credit hours to complete a bachelor's degree in China was substantially more than the number of credit hours required to complete the similar degree at the universities in the United States. With the current trend of increasing international exchanges, more and more universities and colleges from the United States are collaborating with Chinese partners to offer joint degree programs in China; and more and more students from China are going outside to pursue their undergraduate and graduate degrees in the United States and *vice versa*.

Meanwhile, the accreditation standards are becoming increasingly international.[7] The globalization of the academia presents an urgent need for "standardization" or streamlining the degree requirements, both qualitatively and quantitatively, among different countries and educational systems, while maintaining the uniqueness of the cultural differences.

2. *The reasonable work-load on paid-jobs for undergraduate students.* Family issues and other factors including too much work-load on paid-jobs for undergraduate students may cause lack of concentration on academic work and absenteeism at school. The absenteeism at school (which could be caused by too much work-load on paid-jobs) would negatively impact students' academic performance.[8-10] On the other hand, appropriate amount of work experience will develop students' technical skills, customer service skills, and their well-rounded capability in their employment immediately after graduation, and therefore would enhance students' employability and their future professional career. This research found that students sampled in the United States spent substantial amount of time on paid-jobs, while students sampled in China literally spent no time on paid-jobs. The infrastructure of tuition systems, the means of student financial assistance, and other family factors may play important roles in the difference between undergraduate students in both countries for their time-investment on paid-jobs. Both extremes need to be scrutinized; and the improved policies and practices should be developed by the educational policy-makers in both countries.

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