Assessment Report: Part Two

The Maui County High School Technology Survey

January 2001

Funding provided by the U.S. Department of Labor

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Executive Summary

The Women in Technology Project of the Maui Economic Development Board, Inc. is funded by the U.S. Department of Labor to address Maui County's workforce development needs for a science, engineering and technology ("SET") workforce. The mission of the Women in Technology Project is to address the existing national shortage of skilled SET workers by increasing the participation of women in these professions. To accomplish this, the Women in Technology Project has undertaken aggressive, focused intervention efforts targeting women at the high school level, in postsecondary education, and in the workforce.

In order to best target such intervention efforts in Maui County, the Women in Technology Project, with the cooperation of the Hawaii Department of Education, administered a survey to all junior and senior students at Maui County high schools. The goal of the survey was to assess the educational and occupational aspirations of students, their interest and participation in math, science and computer education, and their access to, and usage of, computer and Internet technology. The results highlight a number of differences between the genders as to educational and occupational expectations, as well as their perception of math, science and computer education and technology. These differences must be addressed if all Maui County students are to have equitable access to the math, science and computer education that will prepare them for SET careers.

Occupational and Educational Goals and Influences

Ninety-three percent of female students and 79 percent of the male students will continue their education after high school. Equal numbers of females and males indicated they would work upon finishing high school (40% females, 39% males). Females were slightly more likely to indicate that they would travel (16% to 12%), and that they would care for children or family (5% compared to 3%).

Asked what type of work they would do, female students chose stereotypically female careers such as hotel/tourism, clerical, retail, health care and teaching. Technology was the top choice of males, who were five times more likely to choose it than females (15% to 3%). When asked if they knew there were many technology and science jobs in Maui County, only 30 percent of Maui high school females and 38 percent of males indicated that they did. When told there was a shortage of skilled SET workers, 63 percent of females and 73 percent of males indicated they would consider such jobs.

Asked what type of degree they hoped to pursue, females more often indicated the intent to pursue degrees in arts and humanities, while males more often indicated the intent to pursue degrees in the sciences. When asked what was most important to them in selecting careers, the sharpest gender-based distinction was in the students' response indicating the influence of the cost of education for the job. While this was the third-highest priority for females, with 41 percent of them indicating it was most important, it was only the seventh-highest priority for males, of whom only 24 percent indicated it was important. The top consideration for both female and male students when thinking about jobs after high school was finding a job they like (67% females, 63% males), followed by good salary (59% females, 58% males). Students

placed a high priority on time for self (41% females, 37% males), and time for family (35% females, 32% males).

When asked where they got career ideas, their own interests were most important to both female and male students (63% females, 54% males). Mom was the next most influential, with 47 percent of females and 46 percent of males indicating their mothers gave them career ideas. Father was third for the males (43%), but was only fifth for females (33%). Teachers play an important role, with 37 percent of females and 41 percent of males turning to them, while guidance counselors influence only 31 percent of females and 29 percent of males.

Asked to indicate whether they had ever thought about a job in technology or science, the majority of students surveyed indicated that they had, although females were about 10 percent less likely to have done so (54% females, 64% males). The inherent interest of the field was the top reason given for considering a science or technology career (59% females, 65% males). Next highest was the good pay affiliated with these fields (36% females, 55% males) The third-highest consideration for entering a science or technology job was the good work environment (18% females, 26% males), followed by flexible hours (12% females, 22% males) and flexible location (10% females, 19% males).

The most significant gender differences are in the students' answers indicating why they have not thought of a job in technology or science. Twenty-one percent of female students indicated that they did not think they were good at technology or science, doing so at almost twice the rate of male students, at 12 percent. Female students were more than twice as likely as males to answer that they never learned about jobs in technology or science (12% to 5%), and more than twice as likely to indicate that they did not think these jobs were interesting (16% to 8%).

Participation in Science, Math and Computer Classes

Students were surveyed regarding their participation in math, science and computer classes during their junior and senior years. They were first asked whether they had taken a class in the subject while a junior or senior, and then asked their reasons for taking or not taking the subject. Finally, the students were asked what changes would make them want to take the subject.

Asked why they took science classes, most students said they did so because the course was required (67% females, 63% males), to get into college(35% females, 32% males), to prepare for college (46% females, 36% males), and because they plan to pursue a degree or career in the subject area (14% females, 13% males). Females were less likely to indicate they took science class because of interest in the subject (28% to 36%) or because they enjoy hands-on projects or labs (16% to 27%).

When asked why they took math classes, most students said they did so because it was required (73% females, 70% males). Females were more almost three times more likely to indicate they took math to get into college (44% to 16%). Females were 6 percent more likely to say they took math to prepare for college (48% to 42%). Males were more likely than females to indicate they took math because they were interested in the subject (28% vs. 21%), they enjoy hands-on projects and labs (10% vs. 1%), and to pursue a degree or career in the subject area (16% to 9%).

The question whether they had taken a computer class during their junior or senior year yielded the most interesting results, because the class was not required. Half of the female students, but only 29 percent of male students, had taken a computer class. The apparent over representation of women in high school computer classes can be accounted for by the fact that many "computer" classes at the high school level are actually software proficiency classes focusing on business software applications, more appropriately used in a career in clerical work than in computer engineering.

Asked why they took computer classes, females were significantly more likely to take computers because they were interested in the subject (36% vs. 20%). Females were almost twice as likely as males to indicate they took computer classes to get into college (19% vs. 10%). They were more than twice as likely as males to take computer classes to prepare for college (31% vs. 13%), and to prepare for work (25% vs. 11%). Asked why they did not take computers, females were more than seven times more likely to indicate that they did not take the subject because they were not interested in it (15% vs. 2%). Females were over ten times more likely to indicate that they did not take the class because it takes too much time (22% vs. 2%). The number one reason given by males, and the number two reason given by females, for not taking computer classes was because the class did not fit into their schedule (23% males, 16% females).

What Can Be Done to Encourage Students to Want to Take Science, Math and Computer Classes?

When asked what changes would make them want to take science, response rates were similar across genders, with one significant exception. Females were more than twice as likely as males to indicate that making science more relevant to their lives would make them want to take science (37% vs. 16%). Students of both genders indicated that they would want to take science if there were more interesting projects (41% females, 42% males), more team projects (20% females, 24% males), and more hands-on activities (37% females, 39% males). Ironically, 23% of females and 21% of males indicated that they would take science if it would help them get a good job, demonstrating that students are not aware of science and engineering job opportunities in Maui, Hawaii and the nation.

Responses were slightly different when students were asked what changes would make them want to take math. Math was the only subject where females more indicated that more encouragement from teachers would help, and they did so at a rate almost twice that of male students (17% vs. 9%). Only 9 percent of female students identified more encouragement from teachers when asked regarding science, and only 7 percent of female students identified more encouragement from teachers when asked regarding computers.

While better teachers was the fifth place answer for both male and female students discussing science, the need for better teachers was the third rated answer for female and the fourth rated answer for male students discussing math. Males were more than twice as likely as females to indicate that more hands-on projects would generate interest (39% vs. 19%) in math. The top three responses for males were: more hands-on activities (39%), more interesting projects (34%), more team projects (24%), and if it would help getting a good job (20%). The top three responses for females were: more interesting projects (27%), if it was made more relevant to life (24%), and better teachers (23%).

Responding regarding what would make them want to take computer classes, "nothing" was the top answer for males (27%) and the second highest for females (22%). By comparison, only 14 percent of males and 9 percent of females so indicated when asked the same question about science, and only 19 percent of males and 17 percent of females so indicated when asked about math. More interesting projects got the highest response from female students (23%). This was the second-highest response from male students (20%). The third-highest ranking response for males and females was "if it would help me get a good job" (16% females, 18% males).

Computer and Internet Access and Usage Patterns

Maui County high school students are well-exposed to computer technology. Over 90 percent of students surveyed use a computer (99% of females, 93% of males). Slightly more males than females have computers at home (78% to 75%).

When asked about where they use computers, males were slightly more likely than females to use them at home (76% to 73%). At 76 percent, home is where males were most likely to use computers, while at 79 percent females were most likely to use them at school. By comparison, only 66 percent of males use computers at school. Females and males were next most likely to use computers at a friend's house (44% females, 42% males). Students also used computers at the homes of other family members (33% females, 28% males). Females were about 8 percent more likely to use computers at public libraries (30%), than males (22%).

Female students were also almost 8 percent more likely than male students to indicate that they had difficulty using a computer for the time they wanted (43% to 36%). While both females and males indicated they had the most difficulty because the computers were being used by other students at school, females were 6 to 8 percent more likely to have this problem than males. Nineteen percent of female students indicated problems because boys were using the school computers, while only 13 percent of the boys had the same problem. Twenty percent of female students indicated problems because other girls were using the school computers, while only 14 percent of the boys had this problem. Females were slightly more likely to have their computer use limited to a set amount of time (16% to 13%).

Seventy-eight percent of female and male students indicated that they spent at least 1-2 hours a week on a computer. More impressive, 43 percent of females and 47 percent of males indicated that they spent at least 1-2 hours a day on a computer. The largest single category for both female and male students were in the 1-2 hours a day category, with 20 percent of females and 25 percent of males spending 1-2 hours a day on a computer. A large group of students, 20 percent of females and 21 percent of males indicated that they only used a computer for a few hours a month or less.

Students of both genders were both most likely to use computers for school work, (88% females, 91% males). There were a number of gender-based differences in computer use. Females were about 8 percent more likely to use computers for email (67% vs. 59%), and 6 percent more likely to use computers for word processing (69% to 63%). Males were almost 12 percent more likely to use computers for graphics/animation (38% to 27%), and were almost twice as likely to use computers for web design (22% to 12%). There was negligible gender difference in the use of

computers for entertainment (58% female, 56% male), general interest (62% female, 64% male), personal finance (6% female, 7% male), and work (13% female, 12% male). Males were almost 20 percent more likely to use computers for games (77% to 58%).

Eighty-eight percent of females and 86 percent of males use the Internet. Asked what they use the Internet for, females and males use the Internet for general research (70% female, 66% male), shopping (19% female, 19% male), chat rooms (51% female, 48% male), and newsgroups (7% female, 9% male) in about equal numbers. Females were about 6 percent more likely to use the Internet for school (78% to 72%), and 9 percent more likely than males to use Internet for email (64% to 55%). Males were about 6 percent more likely than females to use the Internet for web surfing (55% to 49%), and 15 percent more likely than females to use the Internet for games (50% to 35%).

In order to address the gender differences revealed by this survey, and to encourage all students to take math, science and computer classes, the Women in Technology Project has reviewed best practice models for implementation. One such model is Future Scientists and Engineers of America, an after-school or curricular hands-on, objective-oriented, community-based program to engage students in science and engineering through team projects. Future Scientists and Engineers of America is designed for grades 4-12, and the Women in Technology Project is sponsoring chapters at Baldwin, King Kekaulike, Lahainaluna, Lanai and Maui high schools and promoting the introduction of this model at the elementary and middle school level.

The Women in Technology Project has also worked to educate students, parents, teachers and administrators about existing inequities in math, science and technology education, and provided training and resources. Reference materials are available at the Women in Technology Project website at www.hightechmaui.com/womenintech.

1. Introduction

The Women in Technology Project *Assessment Report: Part One* documented that the nationwide shortage of skilled science, engineering and technology ("SET") workers is reflected in the State of Hawaii and the County of Maui. The report concluded that women and girls represent an untapped resource to meet employer demand for technology workers in Maui County.[1] The findings of the report are supported by the conclusions of the Report of the Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development ("CAWMSET"), released in September, 2000.

While women represented 46 percent of the general U.S. workforce in 1997, they made up only 19 percent of the SET labor force.[2] Ironically, while jobs in the information technology ("IT") sector have been experiencing strong job growth, the percentage of women earning computer science degrees has dropped from 37 percent in 1984 to 28 percent in 1994.[3] Studies indicate that if the number of women in the IT workforce were raised to the level of men, the enormous shortage of IT workers that currently exists in the United States could be filled.[4]

Currently in the United States, the SET workforce consists mainly of white males, with women and certain minorities dramatically underrepresented (except Asians, who are over-represented). Given the existing shortage of skilled SET workers in the United States, many businesses are recruiting foreign engineers and scientists and bringing them to the United States on visas. In 1999, Congress increased the availability of such visas from 65,000 to 115,000. Notwithstanding almost doubling the number of visas permitted, all available visas were used up by June.[5]

The shortage of U.S. citizens in the domestic SET workforce is mirrored by the shortage of U.S. citizens in SET programs at U.S. universities. In 1997, just 44 percent of doctorates in engineering and 52 percent of doctorates in physics awarded by U.S. universities were awarded to U.S. citizens.[6] Non-U.S. citizens are 37 percent of full-time graduate enrollment in science and engineering, and almost 50 percent of enrollment in engineering alone.[7] U.S. universities actually provide a greater degree of graduate financial support to foreign students than to U.S. citizens. While only 61 percent of U.S. citizens, and 73 percent of students with permanent visas received financial support in graduate engineering programs, 76 percent of students with temporary visas did.[8]

According to CAWMSET, "unless the SET workforce becomes more representative of the general U.S. workforce, the nation will undercut its own competitive edge in the future. That is, the competition for SET workers has already become global, and American companies that depend on importing talent will become increasingly vulnerable."[9] While women, underrepresented minorities, and persons with disabilities represent approximately 70 percent of the U.S. workforce, SET educators and employers are failing to attract and retain these potential members of the SET workforce. Every American citizen must be given an equal opportunity to acquire the skills necessary to compete in the technology economy if SET jobs in the United States are to be filled by the domestic workforce.[10]

Diversification of the SET workforce is not necessary merely for the purpose of equity, there is factual evidence that businesses see a significant return on their investment when diversity is achieved. A recent survey by the American Management Association found that workplace diversity correlated with superior corporate performance as measured by annual sales, growth revenues, market share, shareholder value, net operating profit, worker productivity, and total assets.[11] In addition, corporations with policies that support diversity are more likely to succeed in recruitment of SET workers. For example, policies that support family life, mentoring, and career development have been shown to be successful in the recruitment and retention of female scientists and engineers.[12] Since women continue to shoulder the majority of responsibility for family and home care, support of working women through policies and benefits such as extended parental leaves, part-time work options, on-site child care facilities, and greater scheduling flexibility are needed. In fact, access to quality, reliable, affordable child care is key to the retention of all working parents.[13]

According to CAWMSET, the current educational system does not provide women, underrepresented minorities or persons with disabilities equal access to educational resources in SET.[14] "Efforts to increase the flow of skilled U.S. workers must begin with the reform of preK-12 education, which has failed to adequately prepare students – especially women, underrepresented minorities, and persons with disabilities – in science, mathematics, and technology."[15]

A recent report, *Tech-Savvy: Educating Girls in the New Computer Age*, found that girls and women have been labeled computer-phobic. Girls surveyed for the report asserted a "we can, but I don't want to" attitude toward computer technology. While they insisted on their computing skills and abilities, they vividly described their disinterest with the field, its careers and social contexts.[16]

> Girls' rejection of mathematics and science interests may be partially driven by teachers, parents, and peers when they subtly, and not so subtly, steer girls away from the kind of informal technical pastimes (working on cars, fixing bicycles, changing hardware on the computer) and science activities (science fairs, science clubs) that too often are still thought of as the province of boys. Data show that girls are indeed less likely than boys to be involved with informal science and mathematics activities outside of school, from using meters and playing with electromagnets to fixing machines and reading about technology. Additionally, media and real-life images of women in scientific and technical careers are still rare (as are female role models and mentors, in general), sending an unspoken message to girls that a SET career is not for them.[17]

In order to address the shortage of skilled SET workers in the United States by increasing the participation of women in these professions, CAWMSET recommendsd aggressive, focused intervention efforts targeting women at the high school level, at the transition into postsecondary education, and at the community college transition into four-year colleges and universities.[18]

In order to best target such intervention efforts in Maui County, the Women in Technology Project, with the cooperation of the Hawaii Department of Education, administered a technology

survey to all junior and senior students at Maui County high schools in December, 1999 and January, 2000. This was the first comprehensive survey of Maui high school students regarding technology. The goal of the survey was to assess the educational and occupational aspirations of these students, to assess their interest and participation in math, science and computer education, and to assess their access to, and usage of, computer and Internet technology. The results highlight a number of differences between the genders as to educational and occupational expectations, as well as their perception of math, science and computer education and technology.

In evaluating the response of students participating in this survey, recommendations as to best practice models, and the relevance of these models to the Hawaii Content and Performance Standards of the Hawaii Department of Education will be provided. In addition, relevant national data will be provided for comparison as relevant. While the survey instrument captured data regarding ethnicity, school attended, and community of residence, comparisons based on these characteristics will not be explored. The focus of this report is on gender-related distinctions among survey respondents.

2. Occupational and Educational Goals and Influences

Students were asked what their plans were upon finishing high school, and were not limited to a single response. Ninety-three percent of the female respondents and 79 percent of the male respondents indicated they would continue their education. The response rate for students indicating they would work upon finishing high school were almost identical, with 40 percent of the females and 39 percent of the males so indicating. Females were slightly more likely than males to indicate that they would travel (16% to 12%), and that they would care for children or family (5% compared to 3%).

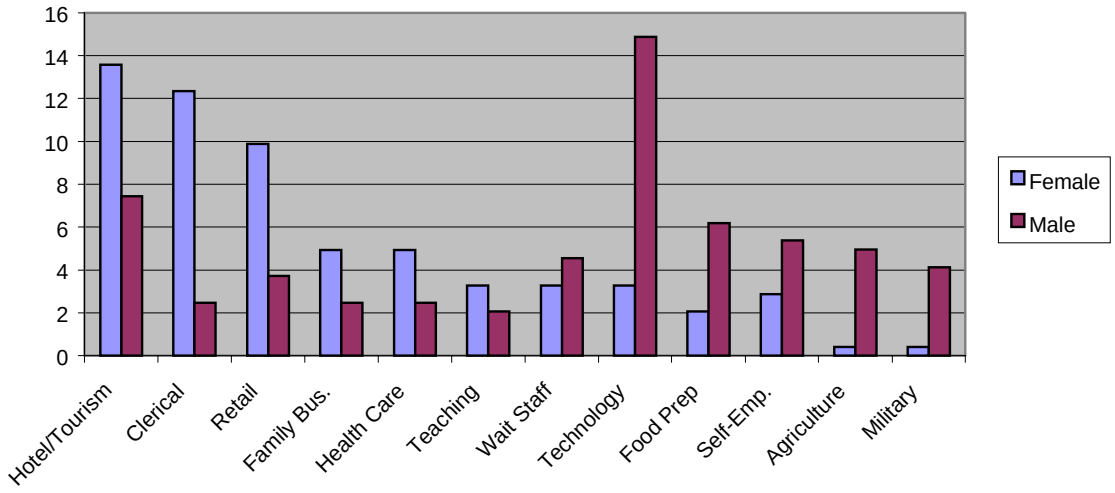
2.1 Career Goals

When asked what type of work they would do, the responses indicated strong gender-differentiated career goals that are reflected in the level of participation in the different career fields by females and males in the workforce. The occupational expectations of the female students were in stereotypically female careers such as hotel/tourism, clerical and retail, health care and teaching. According to the U.S. Department of Labor, women comprised 98 percent of secretaries, 78 percent of cashiers, 93 percent of registered nurses, 89 percent of nursing aides, 84 percent of elementary school teachers, and 78 percent of waiters and waitresses in the United States in 1998.[19] While hotel/tourism was also strongly represented among males, in every other way there was a strong dichotomy between career choices along gender lines. Occupational expectations among Maui's high school students reflected strong gender differentiation and traditional job expectation.

The responses of female and male students are provided in Chart One below. The most significant gender differentiation is clear in the responses of female and male students regarding work in technology or computers, with only 3 percent of females indicating the intent to pursue that career path, compared to 15 percent of the males. Technology was the top choice of males, who were five times more likely to choose it than females. This response by Maui high school

students is similar to the responses of high school students in Silicon Valley, Boston, and Austin, Texas to another survey. In that survey, 50 percent of both males and females felt that the discipline of computer science was "geared toward men." When asked about technology careers, girls in the mainland study were concerned that computer science careers would stunt their intellectual growth, and that the work is tedious and antisocial.[20]

Chart One - Occupational Expectations



When asked if they knew there were many technology and science jobs in Maui County, only 30 percent of Maui high school females, compared to 38 percent of males, indicated that they did. When told there was a shortage of skilled SET workers, 63 percent of females and 73 percent of males indicated they would consider such a job.

Other areas of strong differentiation were in the area of clerical and office work, with 12 percent of females and no males indicating they would enter that field. Females were almost twice as likely as males to indicate an intention to work in hotel or tourism, with 14 percent of females so indicating, compared to 7 percent of the males.

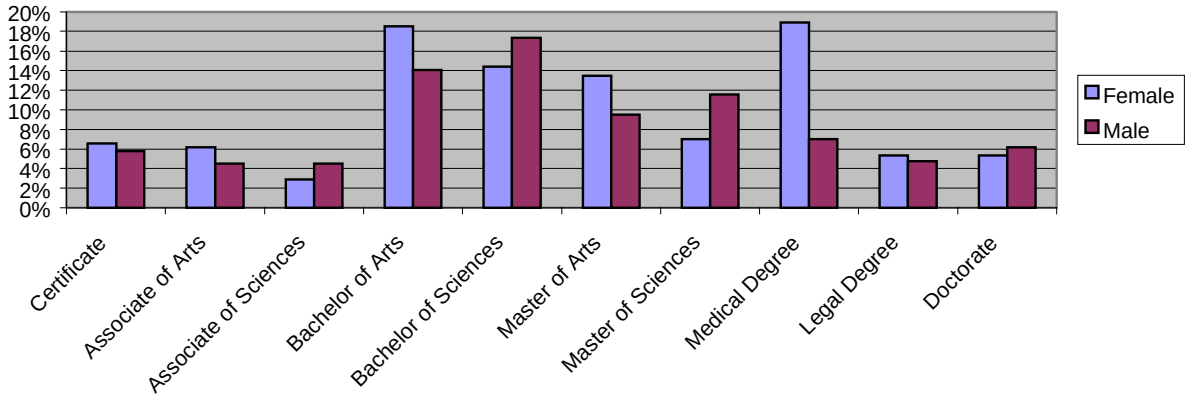
The findings of the survey are consistent with the findings of the Women in Technology Project *Assessment Report: Part One*, which documented the under-representation of women in math, science and technology education and employment. The report found that while females represented 54-56 percent of enrollment at the University of Hawaii at Manoa from Fall 1997 to Fall 1999, they represented only 25-27 percent of information and computer science students.[21] The report also found that women represent only 0-13 percent of technical employees in the emerging high technology industry on Maui.[22] According to the U.S. Department of Labor, nationwide women comprised only 17 percent of electrical and electronic technicians, 11 percent of engineers, and 5 percent of mechanical engineering technicians in 1998.[23]

Research has indicated that women are underrepresented in math, science, engineering and technology education and employment. This is reflected among Maui high school students through the dramatic gender difference that appears regarding technology as a career choice.

2.2 Educational Goals

Students were asked what type of degree they hoped to pursue. In reviewing Chart Two below, females more often indicated the intent to pursue degrees in arts and humanities, while males more often indicated the intent to pursue degrees in the sciences. This is consistent at all degree levels where arts and sciences are differentiated.

Chart Two - Educational Goals



The national data suggests that while girls are now taking the upper level mathematics and science courses required to enter SET college majors at the same rate as boys, and although the ability and basic academic background needed to continue in SET careers exist for many girls, their interest in these careers is not maintained. Among U.S. SAT-takers, over three-fourths of students wishing to major in engineering and computer science are boys. The only science field attracting more girls than boys is the biological sciences. By the eighth grade, twice as many boys as girls show an interest in SET careers.[24]

According to the national data, the picture does not change once students leave high school. Female first-year college students, regardless of race, ethnicity, or physical ability, are significantly less likely than men to intend a SET major. At the start of their college careers, women opt out of the education they need to succeed as scientists or engineers.[25] While women are already underrepresented in SET higher education, even those women who do choose an SET major are less likely than men to stay in that major through graduation. More women switch out of SET majors than men relative to their representation in the SET major population. Explanations for this higher attrition rate among female SET students include: the poor quality of SET teaching; an inflexible curriculum; lack of female role models; the stereotyping of science and engineering as "male" fields; experiences of gender bias; distaste for the competitive nature of science and engineering education; psychological alienation; an inability to obtain adequate academic guidance or advice; and low faculty expectations.[26] These barriers notwithstanding, women who do remain in their SET major are six percent more likely than men to graduate within five years.[27]

In Chart Two, it appears quite dramatic that female Maui County high school students indicated an intent to pursue a medical degree at an exceptionally higher rate than males (19% to 7%).

This is not surprising, given that women are not underrepresented in life sciences such as medicine. Most of the underrepresentation of women in SET is limited to the physical and engineering sciences. Nationally, while women constituted 36 percent of life scientists in 1997, they were only 22 percent of physical scientists and 9 percent of engineers. Across all racial/ethnic groups, a higher percentage of men than of women were computer scientists (73% versus 27%).[28] The Women in Technology Project *Assessment Report: Part One* provides local documentation of the underrepresentation of women in SET education and employment in Maui County and Hawaii.

Maui's female high school students were more likely than males to indicate that they would attend community college (29% to 25%). In fact, approximately 44 percent of all U.S. undergraduates enroll in two-year colleges and women were 57 percent of the total community college enrollment in 1996. Given the large number of U.S. students whose first attempt at higher education is at a two-year college, these colleges provide the foundation for college degrees and entry into the skilled workforce. Nationally, 26 percent of all students at two-year colleges, regardless of major, who begin their undergraduate careers in a two-year college transfer to four-year institutions. These transfer students complete their bachelor's degrees at a rate of more than 70 percent. Of persons who earned science and engineering bachelor's degrees in 1995 and 1996, 14 percent of women and 13 percent of men had started with an associate degree.

For this reason, policies that eliminate barriers for potential SET majors to transfer to four-year institutions are especially fruitful.[29] On the other hand, poor articulation between two-year and four-year colleges impedes the smooth transition of SET students to four-year institutions of higher education.[30] Poor articulation existed until this year between the Electrical and Computer Engineering Technology (ECET) Program at Maui Community College and the Computer Science Program of the University of Hawaii at Hilo, available on Maui through the UH Center Maui. Working together, faculty and administrators at Maui Community College and UH Center Maui worked to reform the curricula of these two programs to improve the continuity between the two-year ECET Program at Maui Community College and the Computer Science Bachelor degree program available at UH Center Maui. CAWMSET recommended comprehensive and systemic institutional changes to strengthen SET education at two-year colleges and to facilitate transition of SET students from two-year colleges into four-year colleges.[31] These changes are already underway at Maui Community College, which is not only improving the educational options and programs in SET, but which has already undertaken reforms to facilitate transition of its SET students to four-year degree programs.

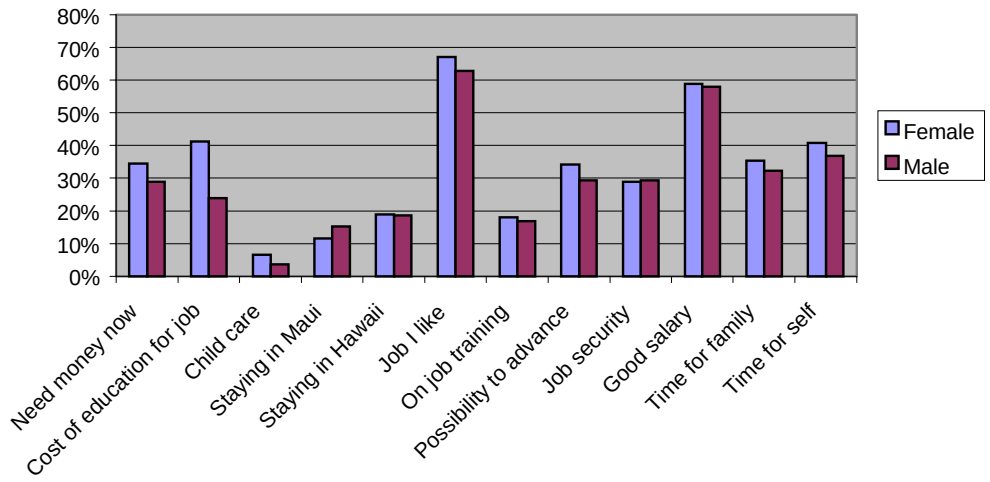
2.3 Influences on Career Goals

When asked what is most important to them when thinking about jobs after finishing school, the sharpest gender-based distinction was in the students' response indicating the influence of the cost of education for the job. This was the third highest priority for females, with 41 percent of them indicating it was most important. This was only the seventh highest priority for males, for whom only 24 percent of respondents indicated it was important. CAWMSET discussed the importance of meeting the financial needs of underrepresented students as a key factor in helping students achieve their educational goals by acquiring the desired degree.[32] Providing students

with scholarship aid (as opposed to loans, which must be paid back), has a dramatic impact on the retention of low-income students in higher education. Among low-income students, a shift of just $1,000 worth of assistance from scholarship to loan reduces the probability of graduation by 17 percent. Unfortunately, over the last ten years, the federal government has been offering less aid in the amount of grants, and more in the form of loans.[33] To help address the economics of SET education, the Women in Technology Project has compiled information about scholarships, grants, fellowships, and internships available for students in SET fields and posted it to the Project website at www.hightechmaui.com/womenintech. In addition, the Project provides email announcements of such opportunities to faculty, guidance counselors and administrators at local high schools, community colleges and universities.

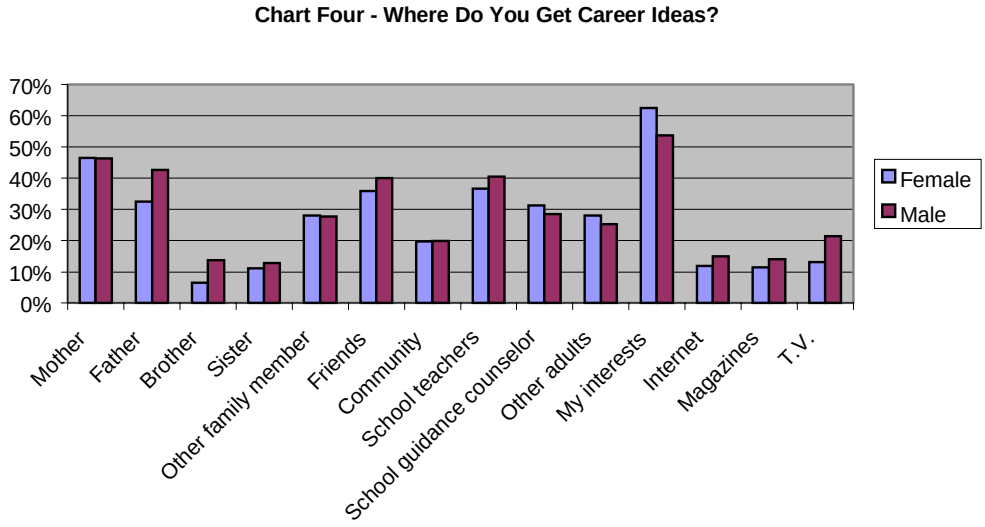
Returning to the Maui survey, the top consideration for both female and male students when thinking about jobs after high school was finding a job they like (67% females, 63% males), and the next biggest consideration was good salary (59% females, 58% males). Students also placed a high priority on time for self (41% females, 37% males), and time for family (35% females, 32% males).

Chart Three - What Is Most Important When Thinking About Jobs After You Finish School?



When asked where they got career ideas, their own interests were most important to both female and male students (63% females, 54% males). Mom was the next most influential, with 47 percent of females and 46 percent of males indicating their mothers gave them career ideas. While Father was next for the males, 43 percent of whom count on him, he was only fifth for females, who cited him at a rate of almost 10 percent lower than their male counterparts, or only 33 percent. School teachers play an important role, with 37 percent of females and 41 percent of males turning to them. Teachers are actually more important in shaping job or career ideas than school guidance counselors, who influence only 31 percent of females and 29 percent of males. While their peers may seem to be the most influential, they ranked fourth for females, at 36 percent and fifth for males at 40 percent. When it comes to career ideas, students of both genders rely mostly upon themselves, their parents, teachers and guidance counselors to help guide them. The Women in Technology Project has focused on raising the awareness of students, parents and educators regarding the opportunities available on Maui in SET fields as a

means of addressing the underrepresentation of women in these careers. These efforts have involved presentations to hundreds of students, teachers and community members throughout Hawaii.

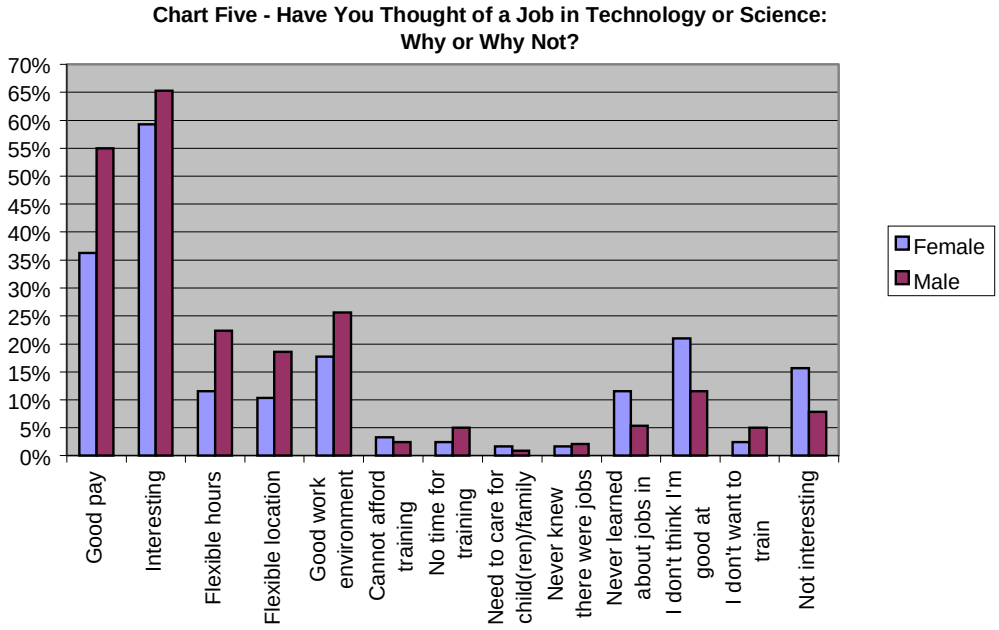


2.4 Technology as a Career

Students were asked to indicate whether they had ever thought about a job in technology or science. A majority of students surveyed indicated that they had, although females were about 10 percent less likely than males to do so (54% females, 64% males). The order of reasons given for considering technology or science jobs was the same for the genders, though the females responded at a lower rate to each selection than the males. The inherent interest of the field was the top answer, with 59 percent of females and 65 percent of males so answering. The next consideration was the good pay affiliated with these fields, with 36 percent of females and 55 percent of the males indicating the good pay scale was a factor. The third highest consideration for entering a science or technology job given by the students was the good work environment, with 18 percent of females and 26 percent of males noting it. The fourth choice was flexible hours, with 12 percent of females and 22 percent of males responding. Fifth was flexible location, with 10 percent of females and 19 percent of males responding.

The most significant gender differences are in the students' answers indicating why they have not thought of a job in technology or science. Twenty-one percent of female students indicated that they did not think they were good at technology or science, doing so at almost twice the rate of male students, of whom only 12 percent so responded. Female students were more than twice as likely as males to answer that they never learned about jobs in technology or science (12% compared to 5% of males), and more than twice as likely to indicate that they did not think these jobs were interesting (16% compared to 8% of males).

A study of mainland girls found that their views of computer careers, and of the entire computer culture, reproduced stereotypes about computer users as male and anti-social.[34] In that study, the girls discussed technology careers as a waste of intelligence, materialistic and shortsighted. Interestingly, they did not see these careers as too difficult.[35]



The evidence suggests that active discouragement and the absence of out-of-school experiences and role models in SET contribute to girls' lack of interest in technology careers. This, in addition to social pressure resulting from the negative social image of scientists serves to divert females from interest in SET careers.[36] The Women in Technology Project has worked to reverse this trend, by promoting programs such as Future Scientists and Engineers of America, a co-ed after-school program for grades 4-12 that uses hands-on activities to stimulate students' interest in SET, as well as providing training for teachers, business leaders and community members on what can be done to encourage girls into these fields.

3. Participation in Science, Math and Computer Classes

The students were surveyed regarding their participation in math, science and computer classes during their junior and senior years in high school. The students were first asked whether they had taken a class in the subject while a junior or senior, and then their reasons for taking or not taking the subject. Finally, the students were asked what changes would make them want to take the subject.

3.1. Science Classes

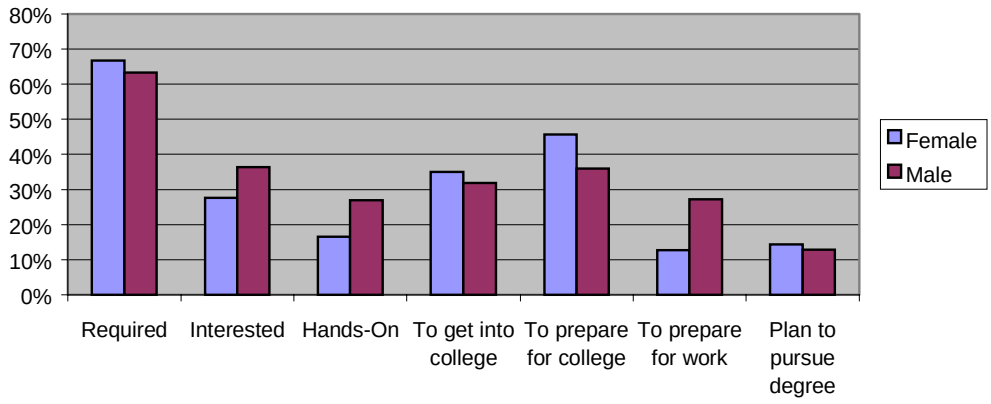
When asked if they had taken a science class during their junior or senior years, 97 percent of females and 96 percent of males indicated they had. The participation rate is not surprising, since these courses are required.

When asked why they took science classes, females more than males indicated they did so because the course was required (67% to 63%), to get into college(35% to 32%), to prepare for college (46% to 36%), and because they plan to pursue a degree or career in the subject area (14% to 13%). However, females were less likely than males to indicate that they took science

class because of interest in the subject (28% to 36%) or because they enjoy hands-on projects or labs (16% to 27%).

Student responses indicating why they did not take a class were not significant, since almost all students did take science class. No questions received a response rate of greater than 2%.

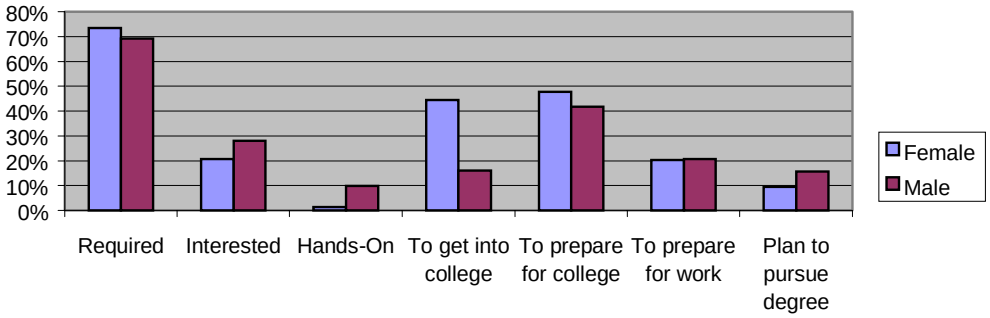
Chart Six - Why Take Science Classes?



3.2 Math Classes

Students were asked whether they took a math class during their junior or senior year. Again, the responses were not surprising since math is required. Ninety-seven percent of female and 95 percent of male students indicated that they took math. There are some interesting differences between the responses of female and male students for math, as compared to science and computers. Females were more likely than males to indicate they took math because it was required (73% vs. 70%), to get into college (44% to 16%) and, to prepare for college (48% to 42%). Males were more likely than females to indicate they took math because they were interested in the subject (28% vs. 21%), they enjoy hands-on projects and labs (10% vs. 1%), to prepare for work (21% vs. 20%), and to pursue a degree or career in the subject area (16% to 9%).

Chart Seven - Why Take Math Classes?



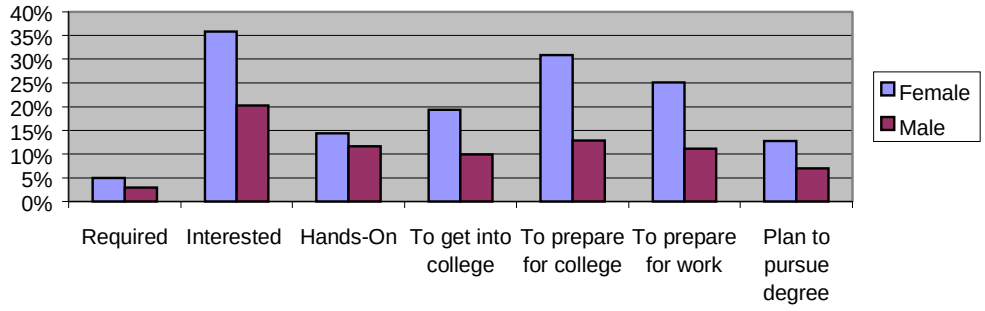
3.3. Computer Classes

Students were asked whether they had taken a computer class during their junior or senior year. This question yielded the most interesting results, because the class was not required. It is

perhaps surprising that half of the female students indicated that they did take a computer class, while only 29 percent of males had taken a computer class. The apparent over representation of women in high school computer classes can be accounted for by the fact that many "computer" classes at the high school level are actually software proficiency classes focusing on business software applications, more appropriately used in a career in clerical work than in computer engineering. As the *Tech-Savvy* report noted, "When girls do take computer classes at the high school and community college level, they are significantly more likely than boys to enroll in clerical and data-entry classes."[37]

Courses on productivity software, such as page layout programs and databases, are common entry points for girls into the computer world. However, mastery of office software is not the same as computer or technological literacy. The current standard of computer literacy requires the use of abstract reasoning to apply information in sophisticated and innovative ways to solve problems across disciplines and subject areas, to understand the basics of programming, and to adapt new technology as it develops.[38] According to the AAUW Educational Foundation, "Fluency is best acquired when students do coherent, ongoing projects to achieve specific goals in subjects that are relevant and interesting to them."[39] One way this is being accomplished for students at Maui High School and Lahainaluna High School is through the Environmental and Spatial Technology (EAST) Program. In this class, students work together in teams, with a teacher facilitator, to use cutting edge technology to address community needs. One recent project had students using global positioning technology and imaging tools to map Maui's coastline areas to measure coastal erosion.

Chart Eight - Why Take Computer Classes?

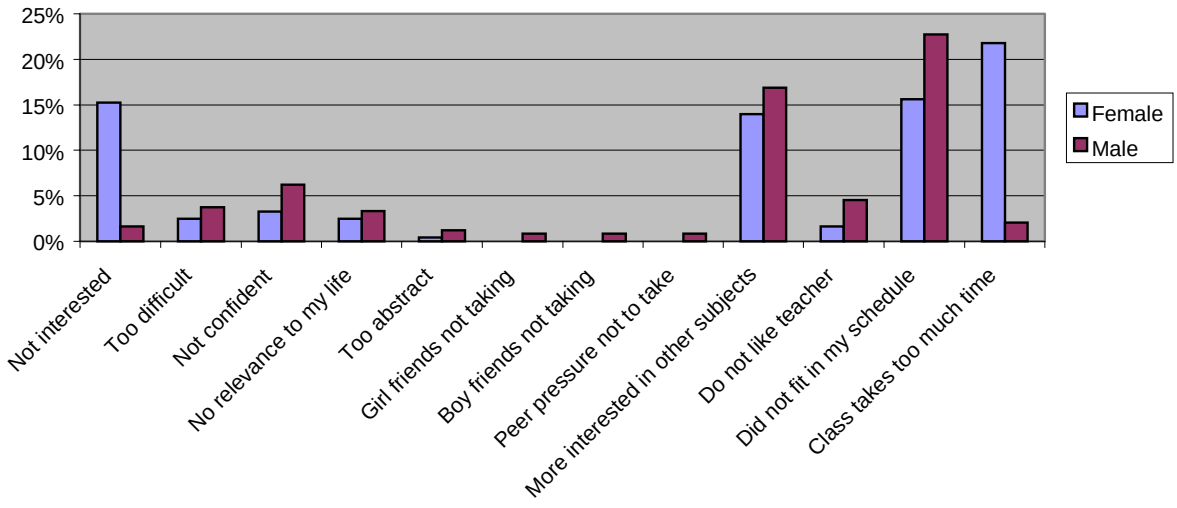


Even with the recent addition of the EAST Program at Maui and Lahainaluna high schools, there are limited offerings in more advanced computing applications such as networking, system administration, web design, programming, or A+ certification for most students at the high school level. In 1999, only seven students from Maui County took the Advanced Placement exam in Computer Science A, and six of these students were from a private school.[40] While females were 43 percent of these test-taking students, ahead of the national average of 17 percent[41], this only represents a total of three female students in the county. Clearly, if Maui County students are to be prepared to take advantage of opportunities in the technology economy, more public schools in the county must offer these types of classes and more students must be encouraged to participate in them.

In the computer category, females responded very strongly as to why they took the classes, and did so to a far greater degree than the male students, as Chart Eight illustrates. Females were significantly more likely to take computers because they were interested in the subject (36% vs. 20% for the males). This was especially so when compared to female responses indicating they took the class because of interest in the subject for math and science (36% for computer, 21% for math, and 28% for science). Females were almost twice as likely as males to indicate they took computer classes to get into college (19% vs. 10%). They were more than twice as likely as males to take computer classes to prepare for college (31% vs. 13%), and to prepare for work (25% vs. 11%).

Females were almost twice as likely as male students to indicate they plan to pursue a degree or career in the subject (13% vs. 7%). This seems to contradict the students' responses earlier in the survey when they noted their occupational expectations. The response to that question, portrayed in Chart One, only 3 percent of the females, compared to 15 percent of the males indicated they expected to enter a technology career. Therefore, it is unclear what the expectations of the females are in the responses given here as to pursuing a degree in the subject. It is possible to infer that they plan to work in the clerical field, since 12 percent of females indicated the intent to enter clerical work, a number similar to those studying the subject for the purpose of pursuing a degree in the field. It is possible that females understand the computer subjects they are taking to be good preparation for clerical work, without understanding the potential of computer technology as a professional occupation, such as computer engineering.

Chart Nine - Reasons for Not Taking Computer Classes



When asked why they did not take science or math, no response rated higher than 5 percent among all students, which is understandable since the classes are required. As Chart Nine illustrates, students gave a number of reasons why they did not take computer classes, and a number of the responses were very different for females as compared to males. Females were more than seven times more likely than males to indicate that they did not take the subject because they were not interested in it (15% vs. 2%). Females were over ten times more likely to indicate that they did not take the class because it takes too much time (22% vs. 2%). This was the greatest reason given by females for not taking computer classes. Teachers and

administrators would be well advised to take note of this if they are to ensure equal opportunity to participate in computer classes for both female and male students.

The number one reason given by males, and the number two reason give by females, for not taking computer classes was because the class did not fit into the student's schedule (23% of males and 16% of females so indicating). Therefore, the greatest barrier for female and male students to taking computer classes was not lack of interest in the subject, but rather administrative difficultly with the class: scheduling conflicts and the fact the class took up too much time. Again, teachers and educators can take the lead in resolving these administrative barriers to access to computer technology education for high school students of both genders. On recommendation would be to schedule computer science classes to minimize scheduling conflicts with classes popular with girls, and increasing the number of electives students can take, since computer science is not often a first choice for girls.[42]

4. What Can Be Done to Make Students Want to Take Science, Math and Computer Classes.

The research indicates that not enough students, and particularly not enough female, non-Asian minority and disabled students, are taking math, science and computer classes at the high-school level, the most significant level of the K-12 educational pipeline. Educators, industry, government and communities must work together to encourage all students to exploit opportunities for education in math, science and technology at the high-school level, particularly in our public school system. In order to accomplish this goal, students were asked what changes could be made to make them want to take science, math and computer classes.

4.1 Science Classes

When asked what changes would make them want to take science, response rates were very similar across genders, with one significant exception. Females were more than twice as likely as males to indicate that making science more relevant to their lives would make them want to take science (37% vs. 16%). Students of both genders indicated that they would want to take science if there were more interesting projects (41% of females, 42% of males), more team projects (20% of females, 24% of males), and more hands-on activities (37% of females, 39% of males). Ironically, 23% of females and 21% of males indicated that they would take science if it would help them get a good job, demonstrating that students are not aware of job opportunities in Maui, Hawaii or the nation, in the science and engineering fields.

The students' responses, calling for more relevance, interesting projects, team projects and hands-on activities reflect the pedagogical priorities of the Hawaii Department of Education's Science Content Standards. Describing the "Rationale for Science", the Introduction to the Standards states, "A sound grounding in science strengthens many of the skills that people use every day, for example: solving problems creatively, thinking critically, working cooperatively in teams, using technology effectively, and valuing life-long learning."[43]

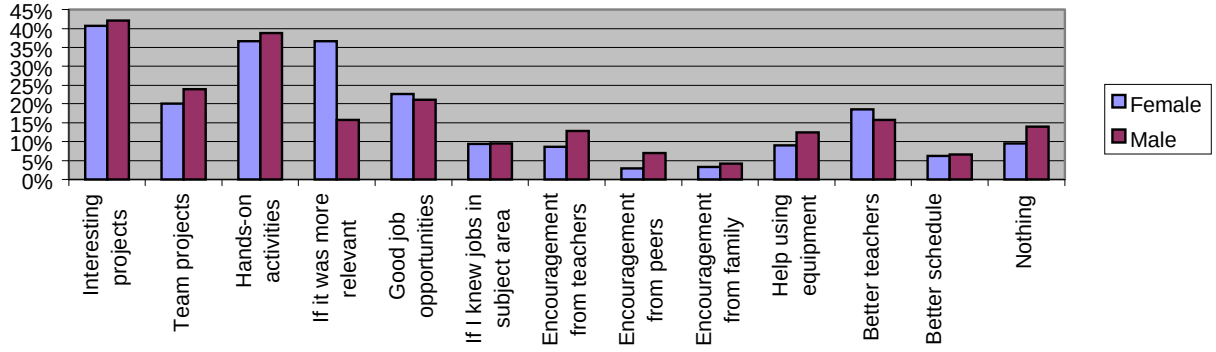
Programs such as the Environmental and Spational Technology (EAST) Project at Maui and Lahainaluna high schools, and Future Scientists and Engineers of America (FSEA) at Baldwin,

Maui, Lahainaluna, King Kekaulike and Lanai high schools, offer students positive, engaging experiences with science. These programs encourage the natural curiosity of student through the process of scientific inquiry. According to the Science Content Standards:

> Scientific inquiry is a central part of learning and doing science. When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others. They identify their assumptions, use critical and logical thinking and consider alternative explanations. Thus, students actively develop their understanding of Science by combing Scientific knowledge with reasoning and thinking skills.[44]

The research points to the need for female role models in SET if female students are to be engaged in the subjects. Without female role models, girls tend to view science and technology as unsuitable careers and, as the Maui County girls seemed to say quite explicitly, personally irrelevant to their lives. Unfortunately, even educational science programs on television offer few images of female scientists. A study of scientists in *Beakman's World*, *Bill Nye - The Science Guy*, *Mr. Wizard's World*, and *Newton's Apple* found that these shows had three times as many male as female characters and twice as many adult male scientists as female scientists. Even the few female characters who were observed had secondary roles as students, lab assistants, or science writers.[45]

Chart Ten - What Changes Would Make You Want to Take Science?



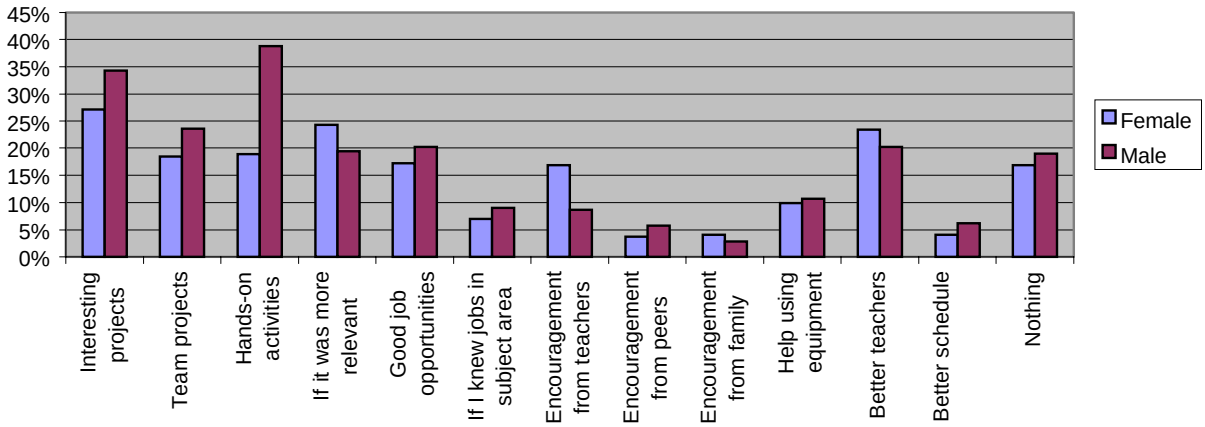
The absence of female role models, especially in educational programming, perpetuates the stereotype that girls do not excel at math, science or computers. Studies have shown that exposing girls to images of female scientists, either through field trips or by bringing guest speakers into classrooms, can help offset the impact of such stereotypes.[46] A recent article in "Scientific American Explorations" offered suggestions for parents to help them keep their daughters engaged with science. The suggestions also included exposing girls to successful women scientists, as well as visiting a science museum, praising girls for their accomplishments in math or science, and building or dismantling something.[47]

To help expose girls to female role models, the Women in Technology Project has compiled a list of female scientists and engineers in Hawaii who are interested in providing classroom visits. The Project has also encouraged female engineers to participate in "Introduce a Girl to Engineering Day", held in February, by visiting classrooms or inviting a girl to her workplace. The Project has worked with the Maui High Performance Computing Center, the Maui Research and Technology Park, Maui Space Surveillance System, and the Institute for Astronomy to promote their existing site-visit programs and make them more engaging for female, and male, students.

4.2 Math Classes

The responses were slightly different when the students were asked what changes would make them want to take math. Most significantly, math was the only arena where females more than males indicated that more encouragement from teachers would help, and they did so in the subject of math at a rate almost twice that of male students (17% vs. 9%). Only nine percent of female students identified more encouragement from teachers when asked regarding science, and only seven percent of female students identified more encouragement from teachers when asked regarding computers.

Chart Eleven - What Changes Would Make You Want to Take Math?



The response of Maui County female high school students highlighting the need for more encouragement from teachers reflects a national trend. Unfortunately, while the Hawaii Mathematics Content Standards are based on the principles of equity, stating that "All students can learn and want to learn important mathematics,"[48] research suggests that, nationally, 34 percent of high school aged girls actually report being advised by a faculty member NOT to take senior math[49]. The responses of high school girls in Maui County seem to reflect this. Clearly, while the goals of the Hawaii Mathematics Contents Standards are that "All student should have equal access to important and meaningful mathematics,"[50] Maui County girls do not perceive such equal access. The accessibility of high-quality mathematics instruction is vital for all students, and may be one of the keys to success in higher education. A recent study showed that the highest level of mathematics studied in high school had the strongest continuing influence on undergraduate degree completion for all students, demonstrating that students can succeed, given high-quality preparation in high school.[51]

Unfortunately, recent research into stereotypes, such as the stereotype that "girls can not do math" provides evidence that even subtle stereotyping by teachers, or society as a whole, can have a devastating effect, particularly on the best and brightest students. This research suggests that it is the targets of a stereotype who are most affected by it, since stereotypes make people so aware of how society views them that knowledge of the stereotype can affect how well they actually perform on intellectual tasks.[52] In one study, a group of 46 Asian-American female undergraduates at Harvard University took a difficult math test. Before one group took the test, they were asked written questions emphasizing their ethnicity. Another group's questionnaire included subtle questions regarding gender, such as "Do you live on a co-ed or single-sex dorm floor?". The study found that women who took the math test after being reminded of the Asian heritage, and the stereotype that Asians excel at math, scored the highest with 54 percent right. The women whose questionnaire implicitly reminded them of their gender, and the stereotype that women cannot do math, scored lowest, with only 43 percent correct.[53] The result that those reminded of the negative stereotype scored nine percent lower on the test than those reminded of the positive stereotype helps demonstrate how, all other things being equal, the existence of stereotypes does not allow for a level playing field.

The research suggests that you do not have to believe a negative stereotype to be hurt by it. In fact, stereotypes seem to affect the best and brightest. Only if you are female and care about math will you care if society thinks you are bad at it. In Maui County, the subtle affects of stereotypes in the classroom may be what led so many female students to call for more encouragement from teachers. Fortunately, if no one reminds students of negative stereotypes, their performance does not suffer. Teachers can actually help reverse the affects of stereotyping. For example, if female students are told that a difficult math test reveals no gender differences, they perform as well as men on the test. Otherwise, the females score much lower.[54]

Unintentional bias in the classroom takes place when teachers allow boys to dominate the classroom by calling out and interrupting. One study showed that boys spoke out eight times more often that girls did.[55] While boys usually receive praise for the intellectual quality of their work, girls' work is more often praised for qualities such as neatness. Studies even show that girls are not asked the same kind of complex, abstract and open-ended questions than are asked boys.[56] The evidence demonstrates that teachers play a role in encouraging, or discouraging, girls from taking, and excelling at, math. Teacher should encourage all students in math classes, and be aware that their unconscious behavior could be hurting their students.

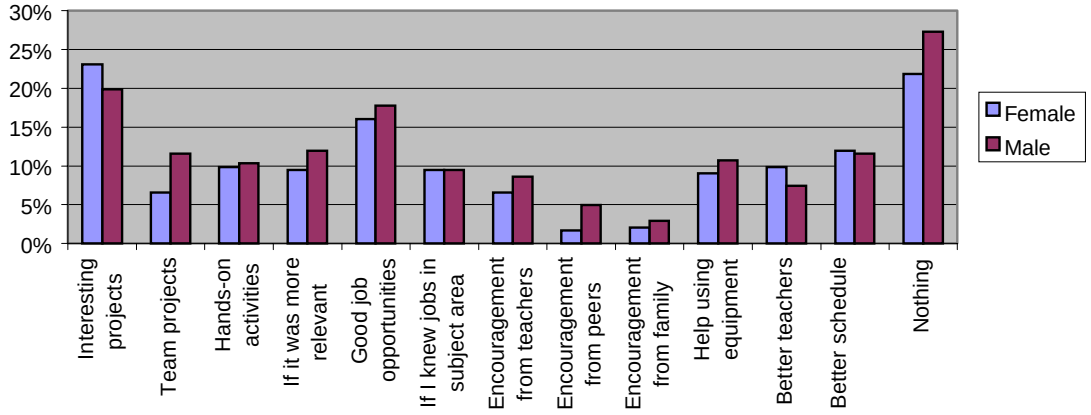
Returning to the Maui County survey, while better teachers was the fifth place answer for both male and female students discussing science, the need for better teachers was the third rated answer for female and the fourth rated answer for male students discussing math. Males were more than twice as likely as females to indicate that more hands-on projects would generate interest (39% vs. 19%) in math. The top three responses for males were: more hands-on activities (39%), more interesting projects (34%), more team projects (24%), and if it would help getting a good job (20%). The top three responses for females were: more interesting projects (27%), if it was made more relevant to life (24%), and better teachers (23%). Females may have been less likely to indicate a need for more hands-on projects based upon their experiences with such activities in the classroom. Research suggests that boys are more often provided with

detailed instructions for working on projects, and that if girls are having problems, teachers more readily show them how to do the work or even take over and finish it.[57] Another example of how teacher conduct can unwittingly discourage students.

4.c. Computer Classes

When asked what changes would make them want to take computers, the students reacted differently in responding than they did when asked regarding science and math. One of the obvious differences is that this subject is not required. Even accounting for the fact that it is not required, it was interesting that students responded much more strongly that "nothing" would make them want to take computers than they did as to math and science. In fact, "nothing" was the top answer for males and the second highest for females as to computers, with 27 percent of males and 22 percent of females indicating that "nothing" would make them want to take computers. By comparison, only 14 percent of males and 9 percent of females so indicated when asked the same question about science, and only 19 percent of males and 17 percent of females so indicated when asked about math.

Chart Twelve - What Changes Would Make You Want to Take Computer?



More interesting projects got the highest response from female students, with 23 percent responding. This was the second highest response from male students, with 20 percent. An effort to engage students should include the 'tinkering' aspects of computers. These activities are especially important for girls since they empower them to be designers and builders, not mere users, of technology. The misperception of math, science and computer technology as uncreative can be deconstructed in the classroom with tinkering activities that emphasize the pleasures of experimentation and creative play using computers.[58] If they are to attract girls to computer technology and other technologies, schools must allow students to engage in serious undertakings in ways that are attractive to a diverse range of learners.[59] Computer science courses should have students use technology to design and build. This not only is more engaging for students, but enables students to apply technology to problems and areas of interest to them.[60] The new definition of technology literacy is the ability to understand technology broadly enough to apply it in everyday life by looking at complex problems and designing ways technology can provide solutions.[61]

One way this is being accomplished at Maui High School and Lahainaluna High School is through the Environmental and Spatial Technology (EAST) Project. Through this program, students work with local organizations to address community needs through the use of advanced technologies like global positioning and 3-D imaging. The Women in Technology Project, in cooperation with Maui Mayor Kimo Apana and the Tech Ready Initiative, is working to bring this program to all Maui County high schools.

The third-highest ranking response for males and females was "if it would help me get a good job" with 16 percent of females and 18 percent of males so responding. According the AAUW Educational Foundation, in educating students about the application of technology in the workplace, schools need to make students aware that all jobs, in the arts, medicine, design and literature, will involve more use of computing technology. Similarly, technology careers continue to draw on the humanities, social science and interpersonal skills.[62]

A lot of educational priority at the policy level has been placed on integrating technology into the school system. Teachers, most of whom are women, have criticized the quality of educational software and the apparently competing needs of the curriculum, the classroom, and the expectations of administrators. Teachers are often blamed for not adapting to the introduction of computer technology. However, in order to realistically integrate technology into the curriculum, teachers need professional development that focuses not on the mastery of hardware and software, but on the design of classroom materials, curricula, and teaching styles that complement computer technology. Teachers also need opportunities to design instruction that utilizes technology across disciplines in ways that promote critical thinking and lifelong learning.[63]

In the process, teachers need to be cautious about the role they play in shaping equitable access to information technology. Male and female teachers tend to view students' interest in computers differently. While 71 percent of male teachers answered that male students were "more interested in the mechanics of computer technology", only one percent answered that female students were. A full 36 percent of male teachers also felt that the male students "enjoy applied uses and experiences with computers" more than female students do. Female teachers, on the other hand, were more likely to view the interests of males and females students equally.[64] One way such stereotypes play out is when male students are allowed to dominate computer classes and projects. To prevent group tasks from encouraging sex segregation, teachers might want to assign and frequently alternate roles in group work, as well as integrate oral and written communication skills into computer science assignments.[65]

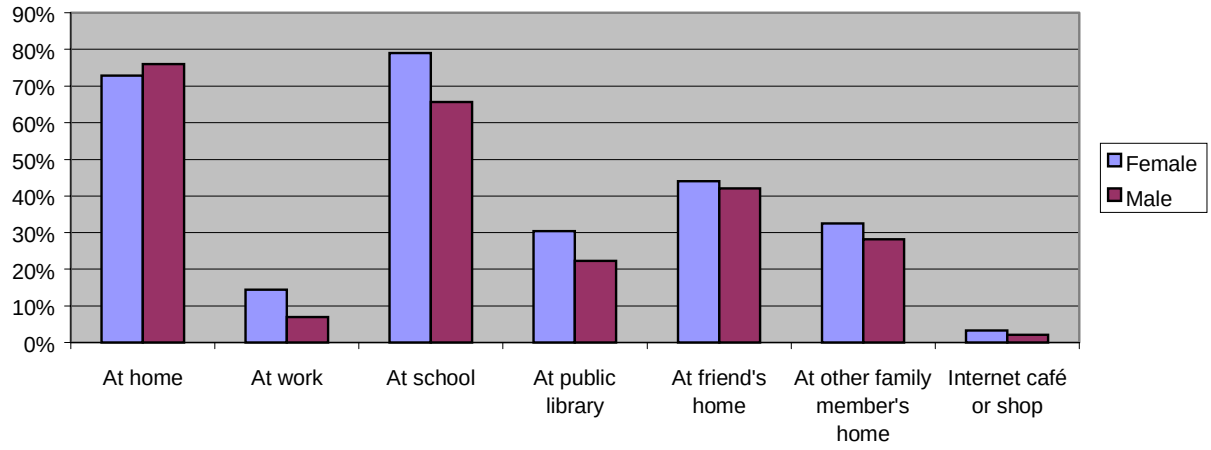
Inequity in the computer science classroom also takes place when teachers do not acknowledge or address prior inequities in experience with computers. It is not unusual for girls to come to computer science classes with less prior exposure than male students. When disparity in prior experience is not acknowledged, the less experienced students feel that they are not good at computer science, although their perceived failure is based on lack of prior exposure, not lack of talent.[66]

5. Computer and Internet Access and Usage Patterns

According to the survey data, Maui County high school students are well-exposed to computer technology. Over 90 percent of junior and senior students surveyed use a computer, 99 percent of females indicated they use computers, slightly ahead of the males' 93 percent. Their positions reversed when asked if they have a computer at home, with males slightly ahead of females 78 percent to 75 percent. This places Maui students slightly ahead of students on the mainland, where a November 1999 report found that 69 percent of children reported having a computer at home.[67]

5.1. Where Students Use Computers

Chart Thirteen - Where Do You Use Computers?



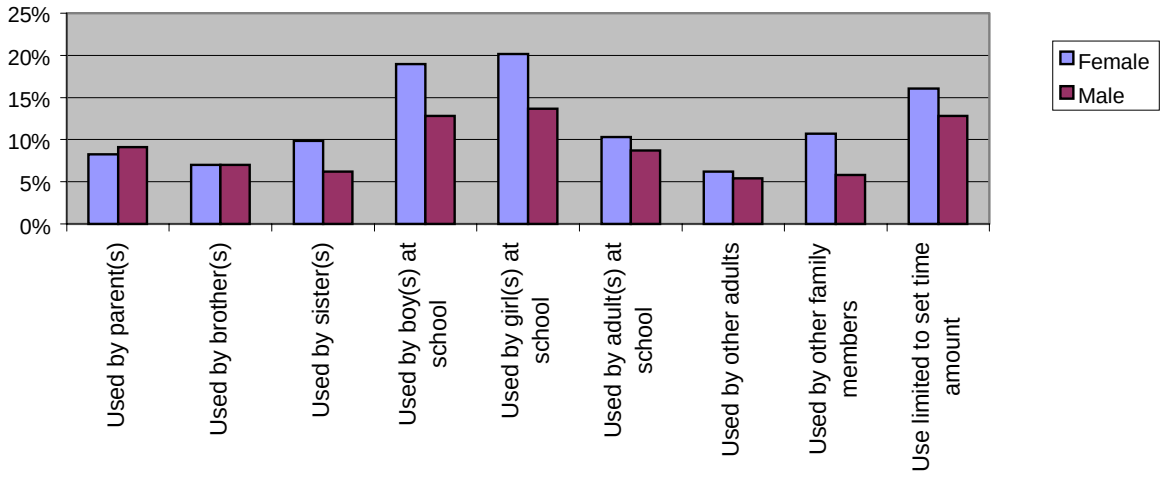
When asked about where they use computers, males were slightly more likely than females to use them at home, with 76 percent of males and 73 percent of females indicating that is where they used computers. In fact, at 76 percent home is where males were most likely to use computers, while at 79 percent females were most likely to use them at school. By comparison, only 66 percent of males used computers at school. Other than at school or at home, males and females were next most likely to use computers at a friend's house, with 44 percent of females and 42 percent of males indicating that they did so. Students also used computers at the homes of other family members, with females slightly more likely to do so (33%) than males (28%). Females were also more about eight percent more likely to use computers at public libraries (30%) than males (22%).

5.2 Access Difficulties

Female students were also almost eight percent more likely than male students to indicate that they had difficulty using a computer for the time they wanted (43% of females and 36% of males). While both females and males indicated they had the most difficulty because the computers were being used by other students at school, females were six to eight percent more likely to have this problem than males. Nineteen percent of female students indicated problems because boys were using the school computers, while only thirteen percent of the boys had the same problem. Twenty percent of female students indicated problems because other girls were

using the school computers, while only fourteen percent of the boys had this problem. Females were slightly more likely to have their use limited to a set amount of time than males (16% to 13%).

Chart Fourteen - Why Do You Have Difficulty Getting Time on a Computer?



Maui County high school males are both more likely to have computers at home, and to use them predominantly at home, than girls, who are more likely not to have a computer at home and to use computers at school. Since girls are more likely to use computers at school, it is important to address issues of their access to computers in the school setting. While computer labs and clubs can provide students without home access to computers an opportunity to use them, unstructured use actually tends to exaggerate gender and racial differences. Simply having students sign up for time on the computer can make a difference. Teachers should be vigilant that the use of computers at their school does not allow one group of students to so dominate that other students are made to feel awkward or unwelcome.[68] Schools can take the lead in opening up access to computers, and the Internet, by creating school-home-community partnerships to make school computer labs open to the community as a learning center after school hours. Such learning centers have been successful in expanding access to computers for female-headed and low-income families, especially when female students are encouraged to bring their female relatives to the centers.[69]

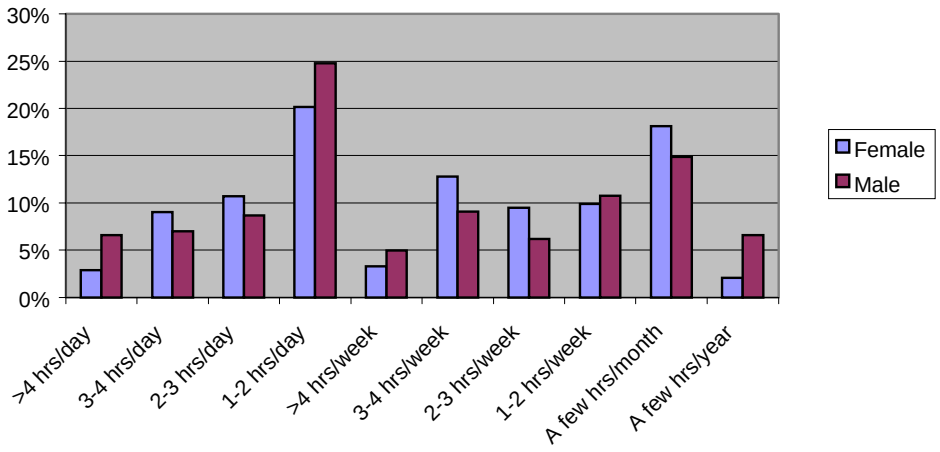
Another solution for families with computers is to work to ensure that all members of the family get equal access to the computer. The computer should be in a space accessible for all family members, not in a male child's room or the parents' home office space. The computer should be used for family-centered activities as well, not only solitary activity.[70]

Nationally, girls report that their fathers are more comfortable with computers than their mothers are. Girls perceive that their mothers have limited computer skills, while their fathers know "everything" about computers. These types of parental example reinforce gender stereotypes about computer proficiency. As role models for their daughters, mothers should learn how to use computers and spend time using computers with, and learning from, their daughters. [71]

5.3 Time Spent on Computers

Reflecting their social context as members of the Digital Generation, 78 percent of female and male students indicated that they spent at least 1-2 hours a week on a computer. More impressive, 43 percent of females and 47 percent of males indicated that they spent at least 1-2 hours a day on a computer. The largest single category for both female and male students were in the 1-2 hours a day category, with 20 percent of females and 25 percent of males spending 1-2 hours a day on a computer. A large group of students, 20 percent of females and 21 percent of males indicated that they only used a computer for a few hours a month or less.

Chart Fifteen - How Much Time Do You Spend on a Computer?

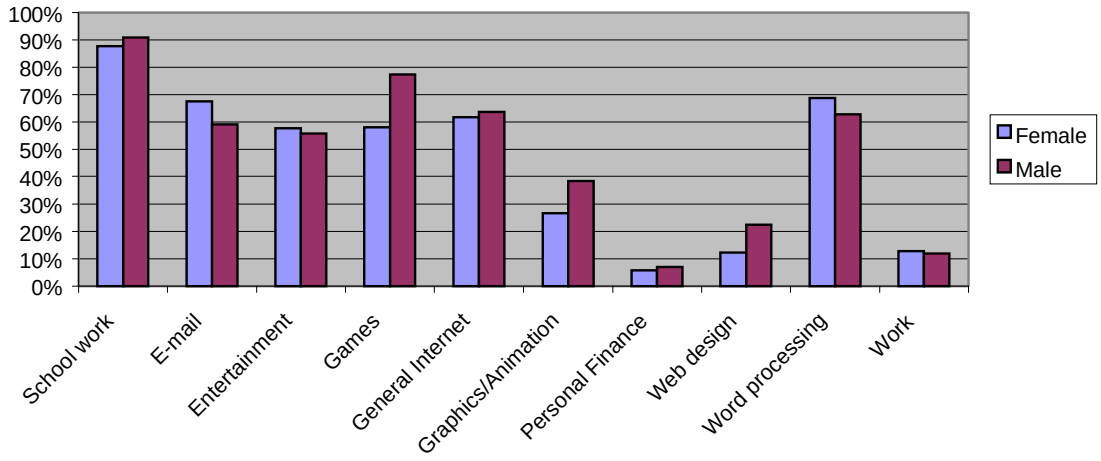


A national survey found that 57 percent of female and 63 percent of male Internet users are online each day.[72] According to the survey, 38 percent of users who go online on any given day spend an hour or more online during all their online sessions; 36 percent said they spent a half hour to an hour; and about 25 percent said they spent a half hour or less.[73]

5.4. Computer Use Patterns

When asked regarding their computer usage, students of both genders were both most likely to use computers for school work, with 88 percent of females and 91 percent using computers for this purpose. There were a number of gender-based differences in computer use. Females were about eight percent more likely than males to use computers for email (67% vs. 59%), and six percent more likely than males to use computers for word processing (69% to 63%). Males were almost twelve percent more likely than females to use computers for graphics/animation (38% to 27%), and were almost twice as likely as females to use computers for web design (22% to 12%). There were smaller gender differences in use of computers for entertainment (58% female and 56% male), general interest (62% female and 64% male), personal finance (6% female and 7% male), and work (13% female and 12% male).

Chart Sixteen - What Have You Used Computers For?



Maui County high school males were almost twenty percent more likely than females to use computers for games (77% to 58%). This gender difference in computer game-playing is greater than that in a 1997 national study that found 86 percent of boys played games on the computer compared to 79 percent of girls, a difference of only seven percent.[74] Recent research has pointed to the absence of computer games designed appropriately for girls. In fact, a review of popular math computer games for grades kindergarten through six showed that only twelve percent of the gender-identifiable characters were female, and that these few female characters played passive stereotypically female roles, such as "princess".[75]

Unfortunately, while for many girls playing computer games are their first experiences with computers, this experience is often a negative one since games are designed for a male market. In fact, research shows that female buyers purchase only twelve percent of multimedia games.[76] In contrast to boys, girls do not play games only to win, and they are bored by repetitive games that require a player to start over each time he or she "dies". Girls are more interested in creating and prefer games requiring thought and puzzle-solving skills. Girls find the repetitive music of typical male-oriented games monotonous.[77] In focus groups, girls said that wanted games that allow role playing, identity experiments, and simulations to work through real-life problems.[78] While violent games are marketed to, and popular among, boys, boys also prefer games that challenge them mentally, suggesting that nonviolent games may appeal to both genders.[79]

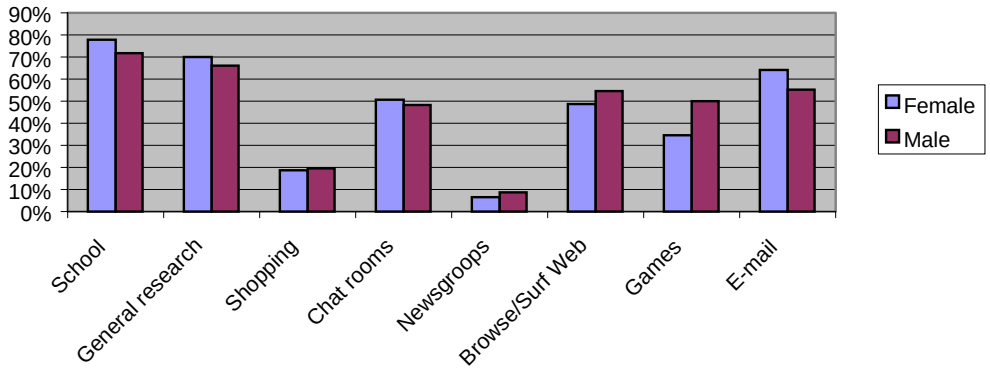
Providing a positive indication of things to come from the computer game industry, five of the ten top-selling computer games during the 2000 Christmas season were the kind of nonviolent simulation games girls prefer. Three of the top ten titles were in the Sim series: The Sims, The Sims: Livin' Large, and SimTheme Park. The other two titles were in the RollerCoaster Tycoon series: RollerCoaster Tycoon and RollerCoaster Tycoon: Loopy Landscapes.[80] The Sims is an open-ended game involving "people management". In the game, the player creates simulated people, including appearance and personality, and manages their lives. To succeed in the game, the player must balance a number of factors, such as eating, sleeping, and learning career-building skills, to sustain the community of created people.[81] The remaining titles in the Sim series are variations on this theme. The RollerCoaster Tycoon series is a similar simulation

vehicle, in which players create a simulated theme park. Players not only construct roller coasters, but also design other types of rides, set ticket prices, employ workers, and lay out paths to keep guests moving through the park. Players can read their simulated guests' thoughts about the park through a telepathic window for instant feedback. This game is described by reviewers as a "whimsical, joyous exercise to create something bright and colorful and watch tiny simulated people enjoy it."[82] The success of these non-violent games provides a window into what types of gender-neutral computer games, appealing to girls and boys, can appeal to a broad market.

6. Internet Access and Use

When asked regarding their use of the Internet, 88 percent of females and 86 percent of males responded that they use it, with only ten percent of females and males indicating that they do not. Nationwide, 46 percent of women and 51 percent of men have Internet access.[83] When asked what they use the Internet for, there were some differences along gender lines, while some uses were rather uniform between the genders. Females and males use the Internet for general research (70% female, 66% male), shopping (19% female, 19% male), chat rooms (51% female, 48% male), and newsgroups (7% female, 9% male) in about equal numbers. Females were about six percent more likely than males to use Internet for school (78% to 72%), and nine percent more likely than males to use Internet for email (64% to 55%). Males were about six percent more likely than females to use the Internet for web surfing (55% to 49%), and more than fifteen percent more likely than females to use the Internet for games (50% to 35%).

Chart Seventeen - What Do You Use Internet For?



A March, 2000 national survey found that women now make up half of all Internet users. In the survey, 39 percent of users reported going online within the previous six months, demonstrating the rapid growth of the Internet community. The new users in 2000 were mostly young women and they were more enthusiastic about the Internet than men who were new to the Internet.[84] The national survey asked respondents whether they had ever engaged in certain Internet activities. The responses showed that: 91 percent had used email, 76 percent had searched for information on a hobby, 63 percent had gone online "just for fun", 47 percent had viewed a video or audio clip, 45 percent had used instant messaging, 36 percent had listened to or downloaded music, 35 percent had checked sports scores, 35 percent had played a game, 28

percent had used a chat room, 55 percent had done research for school, 48 percent had used it for work, and 47 percent had bought something on-line.[85]

A May, 2000 study documented gender differences and similarities in Internet use among adult users. The study found that women and men use chat rooms and instant messaging, browse the Web for fun, and use the Internet for school- or job-related research in equal proportion. There was also no gender-based difference in the use of the Internet for downloading music, arranging travel and banking.[86] Interestingly, the study found that young women and men with Internet access play games on the Internet at about the same frequency. One half of those ages 18 to 24 in the survey had played a game online.[87] There are some differences between the online and offline computer gaming populations. While women now make up the majority of the online gaming population, at 50.4 percent, men are the majority of the combined online and offline gaming population, at 55 percent.[88] The study found that women still prefer less violent games than men, preferring online gambling, card games, quizzes and trivia games. According to the survey, men are still three times more likely than women to play first-person shooter games and sports games.[89]

Finally, contrary to girls' common misperception of computer and Internet users as socially isolated, research indicates the opposite. In particular, online women have reported that using email has helped them improve their connections to relatives and friends. In fact, internet broadens the users' social worlds. In general, Internet users have more robust social lives than non-users, and millions have used the Internet to rekindle relationships, locate lost relatives and friends, and learn about their families.[90]

7. Math, Science and Computer Skill Self-Assessment

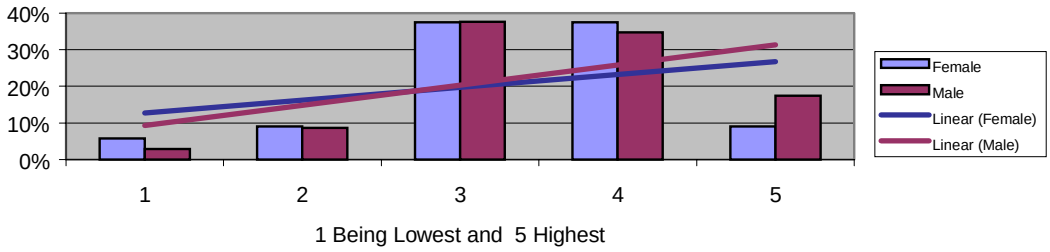
While there are now only small differences between girls' and boys' science and mathematics scores on the National Assessment of Educational Progress (NAEP) tests, when asked to rank their skills themselves, girls consistently rank themselves lower than boys.[91] By the eighth grade, girls' interest in mathematics and confidence in their mathematics abilities have eroded, even though they perform as well as boys. Research documents that, nationally, fewer girls than boys enroll in computer science classes, feel self-confident with computers, and use computers outside the classroom.[92] To measure the impact of this lower self-confidence among Maui County high school girls, students in the Maui survey were asked to do a self-assessment by rating their perceived skill level in math, science and computers on a scale from "1" (lowest) to "5" (highest). As discussed previously in this report, new research on stereotyping may prove key to understanding why girls, even when they perform as well as boys, are less confident about their skills than boys are.

7.1. Math Self-Assessment

In response to the self-assessment regarding math skills, the students' responses reflected national data regarding gender differences in self-efficacy in math. As the linear trend-line helps to demonstrate, the females were more likely to consider themselves in the lowest categories "1" and "2", and were less likely to consider themselves in the top category, "5". Females rated themselves lowest, "1", at the rate of six percent, more than twice that of males at three percent.

Females and males rated themselves "2" at the rate of nine percent. Students of both genders rated themselves "3", or average, at about equal rates, 37 percent of females and 38 percent of males so rating. Females rated themselves "4" at a slightly higher rate than males, 37 percent to 35 percent. However, males were almost twice as likely as females to rate themselves highest, "5", with seventeen percent of the males so ranking themselves, compared to only nine percent of the females.

Chart Eighteen - How Would You Rate Your Math Skill?

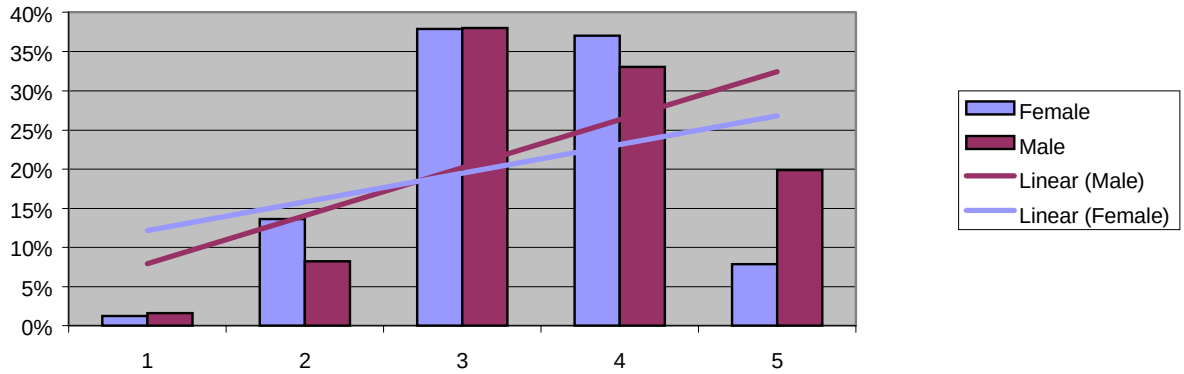


1 Being Lowest and 5 Highest

7.2. Science Self-Assessment

When asked the same question regarding their science skills, females on average rated themselves lower than the males, as the intersection of the trend-line illustrates. Students of both genders were less likely to rate themselves at the lowest skill level of "1", with only one percent of females and two percent of males so doing. Females rated themselves a "2" at a higher rate than males, with fourteen percent of females and only eight percent of males so rating. Again, the genders were pretty evenly represented in the average rating, "3", at 38 percent of females and 38 percent of males so rating. Females rated themselves a "4" at a higher rate than the males, 37 percent to 33 percent. However, males rated themselves in the highest category, "5" at a rate almost three times that of the females, with 20 percent of the males so ranking themselves, compared to eight percent of the females.

Chart Nineteen - How Would You Rate Your Science Skills?

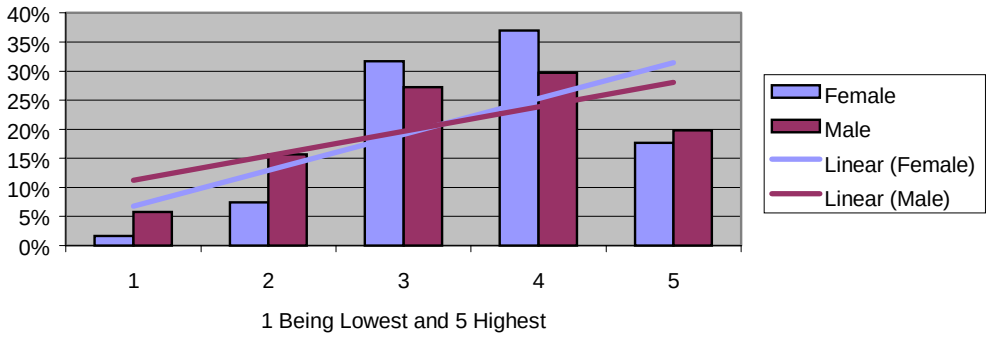


7.3. Computer Self-Assessment

The self-assessment regarding computer skills held some surprises. In this field, males were much more likely to rate themselves in the lowest categories ("1" and "2"), and did so at a much

higher rate than they did for either math or science. Six percent of males, and only two percent of females rated their computer skills a "1", while sixteen percent of the males and seven percent of females rated their computer skills a "2". A much lower percentage of both females and males rated their computer skills "3", or average, with only 32 percent of females and 27 percent of males so ranking themselves. The difference seems to have shifted between the other categories, since students of both genders rated themselves a "4" at the highest rate (37% of females and 30% of males rated themselves a "4"), while the highest response rate in math and science had been "3". The higher level of self-efficacy in computers may be a natural result of their exposure and facility with computer technology as members of the Digital Generation. In addition, while only nine percent of females rated themselves a "5" at math, and only 8 percent rated themselves a "5" at science, females closed the gap with males, with eighteen percent of them rating themselves a "5" in computers. This is only slightly lower than the males' rate of self-assessment in computers at the "5" level at the rate of twenty percent.

Chart Twenty - How Would You Rate Your Computer Skills?



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