

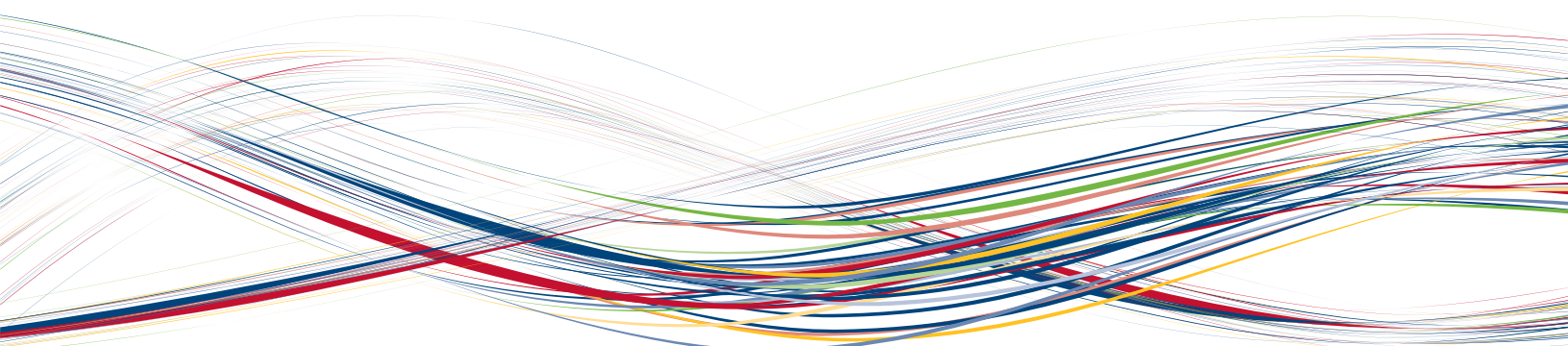
YOUTH

PERCEPTIONS OF IT

A Research Study by the AIM Institute
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Executive Summary

It is commonly understood in the information technology (IT) field that the supply of trained professionals is not adequate to meet the demand. An important goal of the AIM Institute (AIM) is to develop the “workforce pipeline” regionally, helping schools and colleges attract and educate young people who might be interested in a career in IT. This study is part of that effort; exploring youth perceptions of the field of IT as a career may contribute to the improvement of existing programs and suggest new initiatives.

In the first months of 2011, AIM conducted a focus group-based study intended to discover how area students in middle and high schools perceive the field of IT as a potential career. The research design is based on existing knowledge about youth and IT, including knowledge acquired by AIM staff over many years of working with youth in school programs that help prepare students for college.

The primary research question asked by this study is: How do youth perceive the information technology (IT) field? There are three secondary research questions as well: What do youth think IT is?; What do youth think of IT careers?; and, What can be done to encourage youth to enter careers in IT?

157 students in 16 focus groups participated in the study. These discussions produced a rich body of narrative, which has been organized into six topical areas with 23 specific findings. The topical areas are: interest in IT; knowledge of IT jobs; current personal career interests; perceptions

of IT careers; IT and school; and what it would take to change attitudes about IT careers. The study’s findings can be summarized in three key areas, shown below.

Student knowledge of the IT field. Middle and high school students are surrounded by technology and many are knowledgeable about consumer electronic devices such as cell phones, tablets, laptops, video games, and so on. Most students are familiar with information technology careers that are about repairing electronic devices and some know about careers in design of websites, applications, and systems. Few students think of IT careers in management of organizations with many people working cooperatively—most students think of IT as mostly an individual enterprise.

...exploring youth perceptions of the field of IT as a career may contribute to the improvement of existing programs and suggest new initiatives.”

Interest in IT careers. Only a few students are actively interested in a career in IT and most are attracted to more traditional careers. Though we did not assess whether students know more about other careers than they do about those in IT, from the focus group responses

it appears that a number of students would become more interested in an IT career given exposure to useful information and coursework.

IT in school. Availability of IT courses varies considerably from school to school. Some students do well in IT courses from first exposure and for some it takes time and effort to succeed. For others, often female students, the nature of the subject matter and sometimes the way IT courses are taught make them unattractive.



Introduction

It has been understood for some time that the supply of trained technicians and professionals to work in the information technology (IT) field in the U.S. is not adequate to meet the demand. Writing about technical fields broadly, authors of a report from the Association for Career and Technical Education summarized the problem in this way:

For the last several years, concern has been growing about America’s underinvestment and underperformance in the fields collectively known as STEM (science, technology, engineering and mathematics). These concerns have been heralded in several high-profile books, reports and policy proposals from groups ranging from U.S. business leaders to the National Governors Association. (ACTE, 2009, p. 1)

Part of the mission of the AIM Institute is to develop the “workforce pipeline” regionally, helping schools and colleges attract and educate young people who might be interested in a career in IT. AIM has undertaken a “Youth in IT” initiative to raise awareness of and interest in IT careers. This initiative includes current and planned research projects designed to explore and describe existing conditions so that educators, business leaders, and others might take appropriate action.

The *Youth Perceptions of IT* study is the first of these research projects. The primary research question asked by the study is: How do youth perceive the information technology (IT) field? There are three secondary research questions as well: What do

youth think IT is?; What do youth think of IT careers?; and, What can be done to encourage youth to enter careers in IT?

The issue of early engagement with IT is related to youth perceptions of IT as a career field. In 2009, the CIO Executive Council published a survey of youth knowledge of IT (64% were ages 13-17 and 24% were ages 18-21). Some of the 313 survey participants were acquaintances of those conducting the survey and it was not a randomly chosen group. Nevertheless, the findings were interesting and relate to AIM’s project on youth perceptions of IT. Overall, the respondents displayed a “general lack of knowledge about IT careers” (p. 2) even though many had relatives and acquaintances who work in the field.

Forty percent of those surveyed had no interest in an IT career, 28% were interested and 32% were undecided. Parents, relatives, teachers and friends were influential in shaping youth attitudes about the IT field. Respondents

mentioned areas of career interest in IT such as graphics design, computer engineering, software development, and computer repair, industries such as video games, military/aerospace, health care, and energy, and specific companies such as Apple, Dell, Google, Microsoft, Sony, and Sprint.

Money was an important motivator for 50.8% of respondents (and for 63.6% of those undecided about an IT

career), followed by “making the most of your natural skills” (39.6%), helping people and making friends/work environment (30.7% each), “opportunity to invent or innovate” (16.2%), and prestige/power (11.6%).

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The authors of the CIO Executive Council report found it encouraging that 60% of the 313 people surveyed were open to considering an IT career. They wrote:

Overall, we have a population of 60% who are either inclined toward a career in technology and perhaps just need some convincing, or are at least open to the possibility. This outweighs the 40% who are negatively disposed toward technology, and provides some real hope for the IT profession. It's a target well worth going after. (p. 6)

An important dimension of the problem of drawing new people into IT as a career is gender, and we may assume there are ethnic and socio-economic dimensions as well. Miliszewska and Moore (2010, p. 144) described the gender issue as follows (the acronym "ICT" means "Information and Communication Technology"):

Despite extensive research and numerous practical interventions designed to address the relative dearth of females in ICT, the problem persists. Evidence from around the world suggests that female predominance in undergraduate enrollments notwithstanding (59% in Australia, 55% in America, and greater than 50% in many European Union countries), girls are reluctant to pursue ICT study at tertiary level (Rees, 2001) accounting for 10% to 30% of students in ICT courses and under 20% of employees in ICT-based careers. The under-representation of females in ICT studies and careers results not only in a massive loss of talent for ICT companies and economies, but also in a technology divide that perpetuates disadvantage

...youth knowledge of IT careers is often poorly developed, and many young people do not think of an IT career as an interesting or viable option.

among women in general and women of low socio-economic status in particular.

As part of a research project on women's careers in IT, the AIM Institute reviewed several national research studies on women in STEM career fields. We summarized findings from these studies as follows:

Overall, this earlier research has found that the careers paths of women in science, technology, engineering, and mathematics begin to be shaped at an early age. Teenage girls are often discouraged from pursuing technical fields by their male peers and by the expectations of adults and society generally. Those who persist may find the college learning environment in technical fields less than welcoming and they may turn to other areas of study that seem more connected to human relationships. Women who graduate with technical degrees often experience barriers and expectations in the workplace their male counterparts do not experience. Finally, many women who work in technical fields prefer to do so in areas such as sales, marketing, and management rather than in core technical occupations. (AIM, 2011, p. 3)

AIM's study of women's careers in IT involved interviews with women and men in senior IT positions. Those who commented on early engagement with IT emphasized its importance to the role of women in IT and to the field generally. They thought efforts to engage everyone, and especially girls, should begin before college and high school, in middle school and even earlier. The findings of this current study of youth perceptions of IT support this thought. Gender and early engagement are important in youth attitudes about IT as a field and as a potential career choice.



This introduction summarizes the broad context of AIM's research project on youth perceptions of IT in the Omaha Metro region. Available information suggests that private, public and nonprofit organizations need qualified IT staff, youth knowledge of IT careers is often poorly developed, and many young people do not think of an IT career as an interesting or viable option. On the positive side, some young people know about IT careers that might appeal to them and some young people become engaged with technology early in life. Research on groups of people who often are not interested in IT suggests that offering them information and opportunities to engage may help attract them to IT as a career field. Given this context, AIM researchers set out to answer—specifically for the local region—the primary research question, “How do youth perceive the information technology (IT) field?”

Methodology

Focus groups in middle and high schools were used to examine youth perceptions of IT. Focus group data are not as easily tabulated and measured as survey data, nor are they representative in the same way as a random sample. However, they allow for interaction and discussion of complex ideas and the collection of informative and illustrative quotations. In contrast with interviews, which also provide in-depth information, focus groups make it easier to involve a large number of respondents (157 students participated in this study).

Students from 15 schools participated, along with students from an AIM program, Youth Ambassadors (these high school students come from several schools). There were six middle schools (four with 7th and 8th grades, one with grades 6-8, and one with grades 5-8) and nine high schools in the study, chosen for geographical distribution and for a range of socio-economic characteristics. Four of the schools were private; of these, one was a coed middle school, one was a coed high school, one was a girls-only high school, and one was a boys-only high school.

Staff at each school were asked to assemble a group of 8 to 12 students who would be broadly representative of the overall population of the school. The idea of broad representation was successful in some schools and not in others—in some schools participants were members

of a convenience group, such as students staying late for sports practice, rather a representative group. Though this variation in group composition makes it more difficult to generalize about results, it also provided useful information that would not have been available otherwise. For example, the focus group in the private girls high school consisted of the IT club, students who took advanced courses and helped maintain the school's computer network. Their perspectives were fascinating.

Many of the groups were assembled in a last-minute, random fashion, with teachers asking students if they would be interested in participating. AIM Institute staff members involved in conducting focus groups in the schools were not involved in recruiting students and no names or other forms of identification were used that could connect the participants in school focus groups to the assembled data.

There were six middle schools and nine high schools in the study, chosen for geographical distribution and for a range of socio-economic characteristics.

Four two-person AIM staff teams conducted the focus groups in January through March, 2011. In each team, one member served as moderator and one member as recorder. Sessions were audio-recorded and each team prepared detailed notes of their sessions. Analysis was based on the team notes, supplemented with quotations taken from the audio files. Themes were drawn from the aggregated notes and used to draft this report's findings, described in the section below.

Findings

Interest in IT

- 1. Depth and breadth of information.** *Many students in the focus groups expressed wonder at the variety of information and the number of functions that can be put inside their electronic devices.*

It is common to hear adults marvel at how technology has changed since the time of daisy-wheel printers and word processors the size of a desk. Though the young people who participated in this study have grown up with amazing technology, they nevertheless shared this sense of wonder. Across age, gender, and school locations students commented on the amount of information that can be stored and accessed on their devices and how they allow users to be connected to the rest of the world.

A middle school boy expressed appreciation at “how so much can fit in so little,” a sentiment shared by a high school girl who said her phone is as big as her hand and it can do what a computer can accomplish. A high school girl said, “I use my cell phone and I think the biggest thing is. . .I always wonder how. . .it comes in such a small package but it has so much stuff, like apps and iPhones. . .how you can still have it all work and fast.” People become attached to the sense of connection with a broader world—a middle school girl said that, “I always like to have an iPod or cell phone or iPad to stay connected.”

- 2. Early interest.** *Participants observed that some kids are interested in technology from an early age, taking devices apart to see how they work and doing creative things with software.*

Published research on women in the fields of science, technology, engineering, and mathematics (STEM) suggests that girls often feel either disinterested in technology or excluded from what seems to be a male-dominated field. However, though it may be true that more boys than girls in the focus groups were especially interested in technology, there were girls as well as boys who had been interested since they were quite young.

A high school boy expressed a more traditionally male view, using an automotive metaphor to say that it is “fascinating when you see how things work. I have the natural ‘guy thing’ going on where when I see a car I think a lot about the gas tank, air conditioner and how they work.” A male high school student was interested in going beyond using electronic devices, to improving them. He said,

“I like to take things apart, so when I have a cell phone, I take it apart.”

I use a laptop every day, car stereo, iPod, all that stuff. . .that’s the one thing that really fascinates me about all those things. . .how can I make this better, how is it made in the first place, how can I improve on it or create something to help it?

Males like to take things apart and put them back together again. A high school student noted that he had “taken things apart before just to see how they work”; he has taken apart an Xbox and laptop and he can put them back together so that they work again. There were girls in the study, too, who enjoyed learning about electronic devices by tinkering with them. A high school student said that, “I like to take things apart, so when I have a cell phone, I take it apart. I was also just kind of wondering how they get all that information in that little thing. . .there is something inside the cell phone. . .it’s just really interesting to me.”



A middle school girl was not “interested in technology until I was about 8 or 9 and I was watching this show of ‘How it’s Made,’ and that’s when I really started getting interested in technology because it shows the very first steps of it through the end.”

3. Early exposure to IT as a subject. *Focus group members thought it important to introduce children to technology as a subject of learning and study early in life, before middle school age. Kids are familiar with IT lifestyle gadgets, but often they know little about IT as a field and potential career.*

“I think that IT should be introduced at an early age, like second grade. So that way the sooner they are exposed to it, the more likelihood they will be interested.”

A theme that can be found in this research and AIM’s research on *Women in IT Leadership* (2011) is the importance of involving young people with IT as early as possible. In a high school focus group, a teacher asked whether more time spent on IT in elementary school would make students more interested. A female student responded that, “Probably at a younger age, I would question more and be more interested in it.” A boy added the comment that, “I think it goes back to what we said early, about getting kids in grade school more computer classes and more in depth in what they are doing with the computers.”

Students thought the earlier people could study IT, the better. In response to the moderator’s question, “Is high school too soon to teach about technology, a female high school student said that high school “is not soon enough. . .I know right now they are starting in elementary school by using smart boards, overhead projectors, stuff like that.” A female middle school student wanted study of IT to begin early in the elementary grades:

I think that IT should be introduced at an early age, like second grade. So that way the sooner

they are exposed to it, the more likelihood they will be interested. I know second graders hardly have phones, but most of them know how to work a computer or get on their parents’ phone.

I probably would start on a computer and setting up word documents and functions and work through that.

However, students recognized that people may move into IT as a career later in life. In response to being asked whether high school is too late to interest people in an IT career, a high school boy said:

I don’t think so, people change degrees in college, I mean, I don’t think there is ever a time that it is too late. . .you can be 40 and still have a career change. . .I don’t think you’re ever too late to interest someone in some sort of technology.”

Knowledge of IT Jobs

4. Range of knowledge. *Student knowledge of IT careers ranged from slight to complex. Most have had contact with people (and some have relatives or friends) who fix computers and programs—the repair/maintenance role in IT was known to most everyone. A number of participants were also aware of jobs involving design of new products.*

The extent of student knowledge of IT jobs is a key issue. A primary purpose of this research is to assist with attracting new people to the IT field—if students know little about IT as a career field, they aren’t likely to find it attractive. We did not gather data on student knowledge about careers other than IT, so we cannot say much about whether focus group participants know more or less about IT than they do about other careers. However, many students expressed interest in careers that are established and well known in a way IT is not.

In focus groups that seemed to be representative of the overall population of a school, it was common to have one or two students, often male, who were especially knowledgeable about IT and IT jobs. Virtually all students were familiar with school staff who repair computers and with the concept of IT as a field in which people fix computer problems. A high school boy said, "There's people who fix computers if they've got an error or something. . . . Someone in tech services who will help you fix your device. . . .that's all I really know about it."

Beyond that, some students were aware of IT jobs in web design, creation of games and new applications, and programming. A male high school student said, "I think it would be cool to design something for Apple." Students also knew that not all programming is about games, cell phones, and related consumer products. A female high school student could envision IT careers in automotive design, since there are computers and GPS systems in cars.

Notably, there were few students whose knowledge of IT jobs included managers in large organizations who oversee a variety of complex technological functions and supervise the work of many people. IT, for most of the focus group participants, is an individual, hands-on experience. This limits their view of the variety and career potential of IT jobs.

5. Influencers. *Some focus group members have relatives or friends who work with computers in roles such as software or website design, teaching, and network and data administration, so they were familiar with these jobs. Other IT jobs mentioned included programmer and game designer.*

A number of students whose knowledge of IT careers went beyond the school IT technician or Steve Jobs of the Apple Corporation have adults close to them who work in IT. These relationships fill in the information gap left by minimal exposure to the field of IT from other sources.

As an example, a middle school girl said: "My brother-in-law used to work for the Geek Squad and now he's a supervising manager and he used to deliver technology stuff and put it together and that has made me more interested in technology. He showed me how to take my phone apart and put it back together and that has made me more interested."

The impact of contact with influencers such as this girl's brother-in-law can be considerable, but it is also random and fragmentary. There is clearly much to be done in educating youth about IT as a potential career field. A girl from a high school focus group said that she was not too familiar with these kinds of jobs; this lack of knowledge was not uncommon among focus group participants.

Current Personal Career Interests

6. Some IT careers. *Some students were considering careers in IT, such as computer design, systems engineering and management, computer graphics, and computer science and business management. Overall, this was a small percentage of focus group participants. Many students do not have a clear idea what IT jobs are about or why they might want to consider IT as a career.*

7. Related careers. *Some high school students were not interested in careers that are primarily about IT, but they recognize that IT will be important in their work. For girls, these included health and medicine, engineering, TV and broadcasting, and graphic design. For boys, they included engineering, construction engineering and business management.*

8. Traditional careers. *Most middle school students were interested in traditional career roles such as hair stylist, nurse, veterinarian, or lawyer. The range of career interests broadened at the high school level for*

girls, to include: archaeology, fundraising, biological sciences, and special education. On the list for high school boys were jobs in: law, law enforcement, neuroscience, actuarial science, sports analysis, psychology, and anthropology.

Discussion in the focus groups generated lists of careers that students thought interesting. The results are not surprising—students who are considering IT-related careers expressed interest in areas such as computer design and graphics, while students not thinking of IT as a personal career path were interested in health and medicine, education, business management, law enforcement, and so on. The carry-away message for those who want to communicate the value of IT careers to youth is that the competition from established fields is formidable and that many students form ideas about possible careers at an early age.

Perceptions of IT Careers

9. Good career choice. *Middle school student's positive perceptions of IT careers included thinking of IT people as "smart" and "modern" and regarding IT as enjoyable and a good career choice.*

These positive perceptions of IT careers are good news. Along with the perception described immediately below, that being an IT "nerd" is a good thing, it suggests the potential for changing youth perceptions of IT.

10. Trendy nerds. *High school students added to the list of positive perceptions the ideas that IT people are brilliant, they fix things, and they can be creative. One participant noted that being a nerd has become trendy,*

saying that "Nerds aren't picked on like before. Nerds take it above and beyond and others see it as, 'Wow.'"

11. Technology as anti-social, frustrating, or difficult. *Negative perceptions of IT careers were more common than positive perceptions at the middle school level and some were found in high school as well. They included the stereotypical view of the geek-in-a-dark-cubicle, a solitary, anti-social job lacking in human contact. Another view heard in focus groups was that technology can be frustrating or difficult.*

Typical of the view that IT is anti-social is a female high school student who thought that when you say you're into computers, there is a stigma, because others think you can't talk to people. A female high school student who was interested in fundraising said that if you are working with computers, you aren't working with people as much; she preferred to work more with people. A male high school participant noted that "I would rather work with my hands than on a computer" (he was interested in being a police officer). An extreme version of this negative view of technology was expressed by a middle school girl who said:

I've never pictured myself in a technology-like job. I'm more kind of a words person and I'd like to get involved in languages. But another thing about technology is like my parents say this all the time, that the TV rots your brain and there's also some really bad messages put out by technology. I don't think I want to be a part of that.

The carry-away message for those who want to communicate the value of IT careers to youth is that the competition from established fields is formidable and that many students form ideas about possible careers at an early age.

Concern about technology as frustrating or requiring lots of patience was heard in several groups. A male high school student said it would be hard to sit behind a computer all day. High school students from one group said it would be frustrating to work with broken computers. One of the girls in that group said it would be frustrating to work

with code—if it is not entered correctly, you have to go back and figure it out, which would be time consuming. A female middle school student said that, “technology frustrates me because if it’s too slow I get very impatient so you know if I would be a video game designer and I’m working on one person [a character in the video] for 3 hours, I don’t think I could do it for 10 minutes.”

A middle school girl in one group thought IT is hard and computers are complex. A female high school student said she would be more interested in studying IT if it wasn’t so hard; in particular, she said that math problems are not enjoyable.

12. Finding an IT job. *Some students wondered about the difficulty of finding an IT job and whether IT jobs are moving overseas.*

There was a sophisticated discussion of the question of IT jobs moving overseas in one focus group. One student said, “We hear concerns about IT jobs being outsourced. I don’t know how to respond to that; don’t know what I’m going to do. I hope this doesn’t keep people from going into IT.” Another commented that computer programming is declining in the U.S. and going to India, but creative people, leaders, are still in demand in the U.S. Another followed that comment by saying that products are developed and created here, then repetitive production is outsourced.

13. Gender and IT careers.

Some middle school students thought IT suitable for females as well as males. Though high school students also thought of IT as suitable for females, they identified significant differences between females and males in interest and learning styles.

Typical of the middle school view that gender is not an issue in IT were comments from one middle school

group. A boy said “I don’t think there’s a difference” (though he followed this comment by observing the “difference being on whether you like taking things apart versus programming, but other than that no difference”). A boy said, “The only thing you need is brains!” and a girl responded, “I think everyone has that.”

High school students saw clear gender distinctions in IT. Several students in one group (both male and female) indicated that there is a definite stereotype of more males than females in IT careers. A female student recalled a statistic on how there is a fairly even split among students who take Advanced Placement (AP) testing in other subjects, but for computer science tests, only 17% of the testers are girls. Another female student said, “You don’t see that many girls interested”; she thought this was because of the dark atmosphere of working on computers. In contrast, one girl commented, “I’m not sure why it is male dominated, but actually I would enjoy something like that.” As a reason for her interest, the student said her mother is a web designer. Nevertheless, the student also indicated that she has experienced the male-dominance side of IT as well.

“I’m not sure why it is male dominated, but actually I would enjoy something like that.”

One high school focus group produced a fascinating discussion of gender and perceived learning styles in relation to IT. This is an all-girls school and the participants were not representative of the school population—instead, they were members of the IT club, a group that among other things

helps maintain the school’s computer systems. The discussion began with a comment that, “Boys and girls approach technology differently,” followed by exploration of differences. One student said, “Girls learn better from being shown examples,” while another said that, “Boys are better at step-by-step learning and abstract thought.” The observation that, “Boys try to learn one skill; they’re not interested in why this may or may not do

it; girls are multi-taskers," was followed by the comment that, "Girls think about it more; guys don't worry about consequences, they just do it."

Another topic emerged in this focus group that did not appear in other schools—the students discussed their role in helping older people adjust to technology. One girl said, "We can help the older generation learn about technology" and another said, "Technology is in all parts of our lives; we have grown up with technology; we can help others get used to it; it is natural for a lot of us." Whether this concern for helping others work with technology is related to gender or a service orientation is a matter for further research, but it stands out in the focus group notes as an interesting and unusual insight.

IT and School

14. Smartboards. *Some middle and high school students mentioned the use of "smartboards" in their classrooms. They thought this added to the educational experience and made learning fun.*

This technology integrates the functions of a whiteboard with those of a computer, so the display in front of the class incorporates touch, writing, operation of computer programs, use of the Internet, and the ability to save materials. Students in several focus groups noted how much they like smartboards as a learning tool. They are used in classes in a variety of subject areas, such as languages, math, and science.

15. Classroom uses of IT. *A variety of technologies and programs have been used in classes to make movies, maps, and presentations, and for projects like robotics.*

16. Course topics. *IT course topics mentioned by high school students include: Office Suite, computer-aided design, web design, graphic design, programming, Cisco networking, and computer repair.*

17. Preparatory courses. *Students were aware that courses in math, science, engineering and programming would be useful in preparing for an IT career.*

In some schools, students were aware of a wide range of available courses relating to IT. In some other schools, students wished they had more options. A boy from a middle school said, "I wish we had more technology classes. . . I wish we could do like more websites and use Excel." About becoming more involved with IT studies, a girl from the same school said, "I don't think I could because I've never been introduced to technology like programming and stuff, just simple Internet stuff." This may be a matter of availability of courses or student awareness of options. A teacher sitting in on another focus group heard students comment that there were few IT courses available to them; the teacher said there were several courses the students did not seem to know about.

18. Negative experiences with IT in school. *At the high school level, those students who related negative experiences with IT coursework were often girls rather than boys. These experiences were related to course availability, few girls in a field dominated by boys, poor understanding of the content of IT courses or thinking IT is too difficult, having insufficient preparation to take courses, or the style of teaching used in some IT courses.*

A female high school student said that because she attends an all-girls school, they don't have a lot of technology classes available to them. Whether or not this is the real reason for the perceived lack of courses, it is interesting the student would draw a connection between insufficient courses and an all-girls school.

The theme of male dominance in IT emerged in more than one focus group. A girl in a high school group said she had attended a math day event at the University of Nebraska at Omaha with some of her classmates but there were

mostly boys there from the other schools. Asked why females don't go into IT, a female student from another high school said, "I think it is about a lot of those classes don't attract girls as much as they should. It just looks like it's an all-guy's class."

A number of female students felt left out of IT because they don't know enough about it to be comfortable taking courses or the subject matter is too difficult. A high school girl said, "I'm not sure, it's not that I don't take these classes because I don't want to be the only girl, it's just not stuff that I understand." Another student thought she didn't know enough to keep up in an IT course: "I feel that everyone who is taking it already has so much background knowledge, whereas I'm clueless." Another student echoed this sentiment: ". . . a lot of technology I don't understand. . . . So I think there is definitely a misconception about those [IT courses] because I have always thought that you had to completely understand the makings of a computer to be in those classes, that's why I have never actually taken those classes."

Feeling this way about IT can result in disengagement. A female middle school student said that "technology is just too hard for me to learn," and a high school girl had decided, "I know they have computer classes, but I'm not taking any, they're just not for me." How IT courses are taught can impact what female students think of IT as a field of study. Asked what could be done to attract females to IT courses, a high school student suggested,

. . . maybe make it more like something they would understand. Like in my manufacturing processes class there's like two girls in there, me and another girl and the rest of it was guys, so it felt kind of

uncomfortable sometimes. The teacher didn't really respond much to us, but paid more attention to them and I think they just need to be open to all students and so should all schools. . . like have a woman come speak from the field.

A female high school participant from one group liked the content of an IT course she took and thought the technology was interesting, but overall, "My experience with computer science was not that great." She disliked sitting in a darkened room working on computers and there were many more males than females. Negative responses to IT courses were not limited to female focus group participants. A male student in the same group took an IT course in which the instructor stood over students and criticized when code was entered incorrectly; he would be interested in technology if it were taught differently but was not pleased with this exposure to IT.

"So I think there is definitely a misconception about those [IT courses] because I have always thought that you had to completely understand the makings of a computer to be in those classes, that's why I have never actually taken those classes."

What it Would Take to Change Attitudes About IT Careers

- 19. More teaching.** *Several middle school students said it would be helpful for schools to teach them more about technology.*
- 20. Exposure to IT practice.** *Some middle school respondents would like more exposure to technology workplaces and professionals; field trips and guest speakers were mentioned as interesting options.*
- 21. Make IT fun.** *More than one participant suggested it would help to make technology seem fun, exciting. Though this sounds superficial, one middle school*



focus group member said, "I would want it to look fun because a career is something you love to do and are very interested in."

22. Kids convention. *A large-scale group event appealed to a middle school respondent who said, "They could have a convention where kids could come and see like all the jobs that IT has and let them try some of it. . .hands on."*

23. Practical students. *Some high school students were particularly practical in stating what would make them more interested in IT careers: more money, guaranteed openings and positions, good benefits, and not working in a cubicle.*

Conclusion

The findings of this study paint a varied, complex picture of youth perceptions of IT. Young people are surrounded by information technology in their daily lives and many of them find it interesting. Despite this technological saturation, knowledge of IT careers is often limited to key examples of leading figures in technology, jobs that involve fixing computers and network systems, and jobs such as programming that involve one individual's skill set. There is little awareness of larger-scale group task environments in different types of industries and organizations, involving many people and challenging, dynamic settings managing staff and projects. In addition, youth perceptions of IT as too difficult to learn, anti-social, or gender-biased are barriers to youth entering IT careers that should be addressed.

Given student feedback in this study, there are excellent opportunities to expand youth knowledge of IT careers and educational options. Especially during difficult economic times, making people aware of viable career options is good for individuals and good for the economy. According to the National Center for Women & Information Technology:

The U.S. Bureau of Labor predicts that IT jobs will be among the fastest-growing and highest-paying over the next decade. These jobs typically offer higher salaries than other jobs requiring similar levels of education. Plus, students can obtain these high-demand positions through a range of educational pathways, including military experience, professional certifications, and 2-year, 4-year and graduate degrees.... IT jobs are available in nearly every industry, even some that may surprise you, such as art, finance, healthcare, and entertainment.... Many

IT careers offer flexible hours or telecommuting, making it easier to blend career and personal life. And IT professionals have skills that are useful in many different jobs. (2011, http://www.ncwit.org/pdf/TPSeries_YoungPeople_2011_PRINT.pdf)

A relatively small percentage of students who participated in focus groups have chosen to learn about IT in depth and possibly pursue an IT career.

A relatively small percentage of students who participated in focus groups have chosen to learn about IT in depth and possibly pursue an IT career. Since there continues to be demand for trained professionals in the IT field, it is important to explore ways to spread useful information about IT careers.

The AIM Institute goal of developing the "workforce pipeline" regionally was stated at the beginning of this report. Solving the issue of "filling the pipeline" with young people seeking a career in information technology is a major issue for the AIM Institute going forward. Among other potential actions, this involves helping schools and colleges attract and educate young people who might be interested in a career in IT. There are many organizations involved in educating young people for, and informing them about, careers in information technology.

It is not the intent of this report to inventory these efforts or to suggest how they might be improved or expanded. Instead, the intent is to document youth perceptions of IT so that educators and program managers can focus on the most promising opportunities to create change. For example, AIM's youth programs have adopted the three-part headline, "Learn IT! Experience IT! Achieve IT!" as a quick way to capture the need to inform youth about IT, get them involved, and help them achieve educational and career success in the field. We hope this report assists those involved in IT education in our region with these important tasks.



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Appendices

Appendix A

Focus Group Participant Characteristics

	Total	Female	Male	White	Black	Hispanic	Asian
Middle Schools	59	34	25	36	19	3	1
High Schools	98	46	52	62	13	19	4
Total	157	80	77	98	32	22	5
Percentage		51.0	49.0	62.4	20.4	14.0	3.2

Appendix B

Focus Group Discussion Instrument

Focus Group Introduction and Questions

Thank you so much for participating in our focus group.

Introduce the moderator and recorder (Ms./Mr.).

We're from the AIM Institute in downtown Omaha. AIM is a nonprofit membership organization that supports effective and creative applications of information technology to strengthen the region's workforce and economy.

We are conducting a study of what young people think about possible careers in information technology, or IT.

You were selected randomly to represent your school.

Show the digital recorder, explain it is for accuracy in writing up the report.

Emphasize confidentiality: no participant names will be used in our records or in the final report.

Give the discussion rules:

- One person talks at a time.
- No side conversations.
- No cell phone calls or texting.
- Everyone gets a chance to speak.
- Please be respectful of everyone in the room.
- There are no right or wrong answers and everyone's ideas are valuable.

I have seven questions to ask you about; we should be finished by _____.

As you leave, you will receive a thank-you gift from the AIM Institute.

Ask whether anyone has questions so far.

Begin the discussion as follows:

"Let me talk briefly about what Information Technology (IT) is. Then, we can explore your thoughts about it. Information technology is all about creating, studying, or taking care of computers or electronic gadgets like iPhones and iPads. It's also about designing the applications that run on these tools that help us do our work, entertain us, and help us connect with each other."

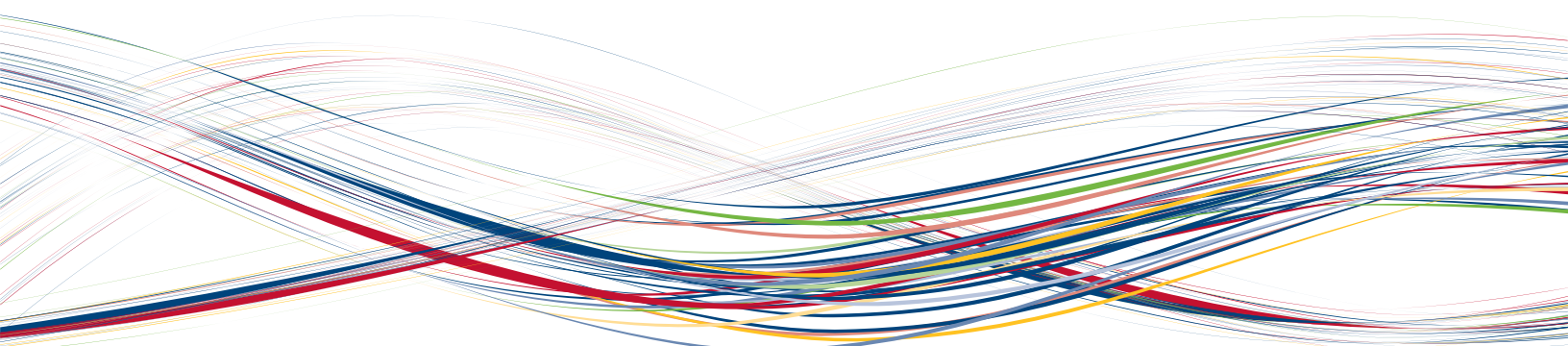


Focus Group Questions

1. As you use your electronic tools, do you ever wonder how they were made or how they work?
 - What electronic tools or gadgets do you use?
2. What kinds of jobs do you think people have who work in IT?
 - Have you heard of people who:
 - Create and design websites, games, or iPad and smart phone applications?
 - Keep computer systems and networks running?
 - Sell technology products?
 - Manage the work of other IT professionals?
 - Do you know anyone who has one of these jobs?
3. At home or here at school, are there friends, family members, teachers, or other students who are really into computers and technology? Are you one of them?
 - What kinds of things do they do with technology?
 - Does watching them make you more, or less, interested in technology?
 - What might help you become more interested?
4. Are there learning opportunities available to you in information technology?
 - [If not] Would you like to have IT courses here at school?
 - [If yes] What are they?
 - Have you taken any IT courses? Are you planning to?
5. Are you planning to go to college?
 - What sort of coursework or college training do you think is needed to prepare for a career in IT?
 - Would you consider studying information technology?
 - Probe whether the girls and the boys see this differently.
6. Would you be interested in a career in information technology?
 - [If not] Why not?
 - [If yes] What IT careers do you think would be especially interesting?
 - What could you picture yourself doing in your IT job? Would you build programs, repair complicated systems, manage other people's work?
 - Probe whether the girls and the boys see this differently.
7. If an IT career doesn't sound that interesting today, what might change your mind?
 - Probe whether the girls and the boys see this differently.



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