

What is Computing? The perceptions of university computing students'

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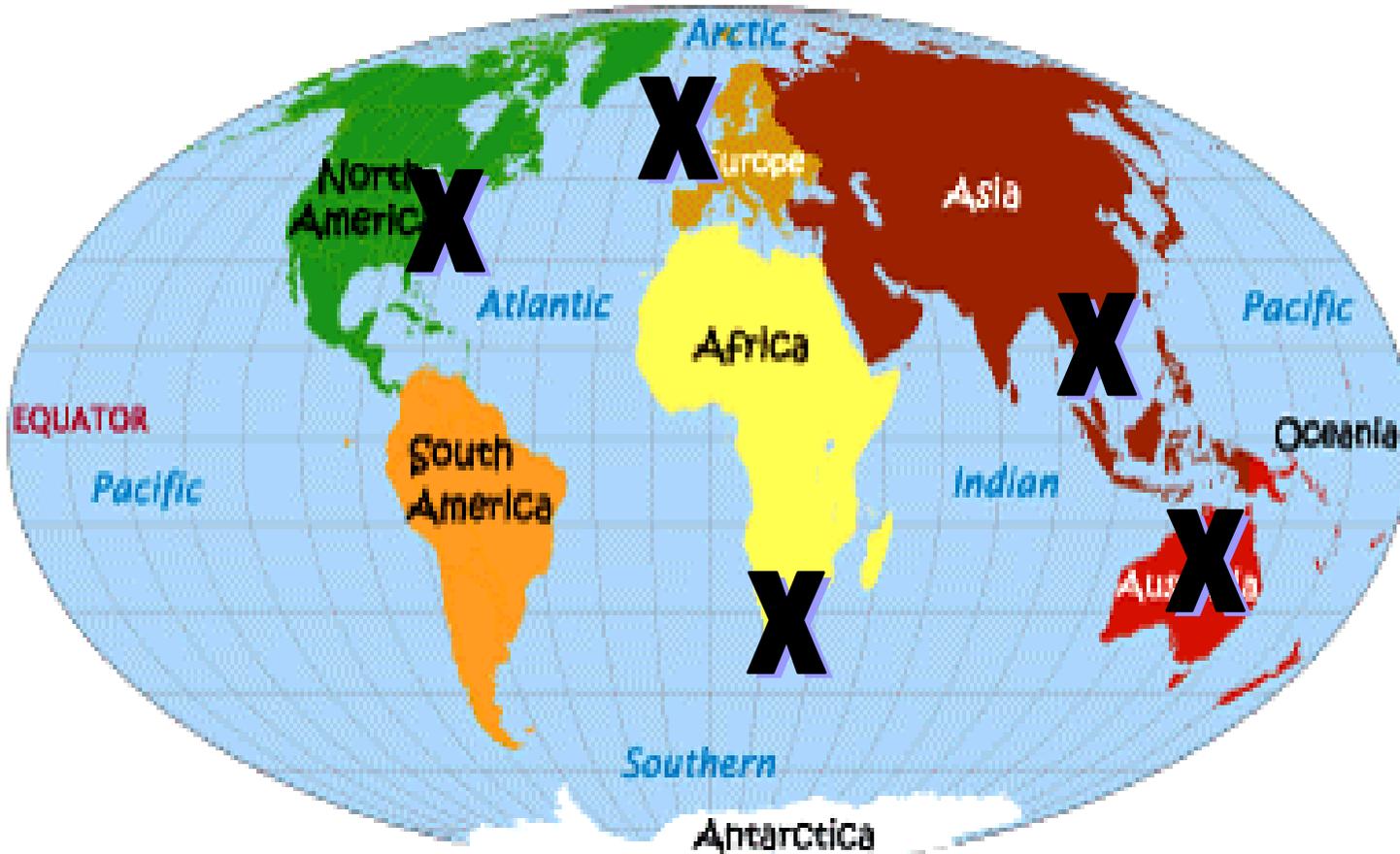
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Research

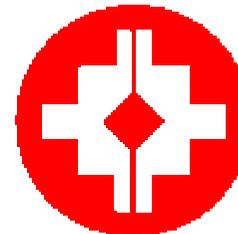
- to gain an insight into the perceptions future computer professionals hold on the category of employment loosely defined under the term of "a computer professional".
- difference between female and male students regarding their view of computer professionals.
- if there was any difference between female and male students in different parts of the world,
- as well as who or what most influences the students to undertake their courses in computing.

Our Universities and Colleges



263 Responses

Country	Institution	Women	%	Men	Total
America	Ithaca & Hartwick Colleges	10	26.3%	28	38
Australia	Victoria University	12	24.0	38	50
England	Uni. of East London	22	36.1	39	61
Hong Kong	Chinese University	25	49.0	26	51
South Africa	Uni. of the Witwatersrand	12	19.0	51	63
		81	30.7	182	263





Programming Compulsory

America	Bachelor of Science/Bachelor of Arts in Computer Science/Information Systems Survey conducted in first Programming course
Australia	Bachelor of Computer Systems Support/Bachelor of Ecommerce Survey conducted in first year Programming course
England	Single Honours in Computing Science or major in Computing Science Survey conducted in first year Programming course
Hong Kong	Bachelor of Computer Systems Support Survey conducted in first year Programming course
South Africa	Bachelor of Science (3 men studying BEconSci) Survey done in second year Applications of Algorithms course

Background

	Born	Sec. educ.	Age		Access to computers		not working
			18-24	25-30	Home	Work	
America	81.6%	86.8%	94.7%	5.2%	97.3%	100.0%	28.9%
Australia	72.0%	96.0%	90.0%	4.0%	100.0%	82.0%	50.0%
England	49.2%	57.4%	63.9%	18.0%	90.2%	53.7%	32.8%
Hong Kong	88.2%	94.1%	31.0%	49.0%	100.0%	100.0%	0.0%
South Africa	88.2%	94.1%	90.5%	7.9%	73.0%	88.9%	55.6%

Who wants to be a Computer Professional?

we do!!!!

Who wants to be a Computer Professional?

	Women	Men	Total
America	100%	88%	89%
Australia	92%	90%	90%
England	100%	100%	100%
Hong Kong	84%	92%	88%
South Africa	91%	92%	92%
All	89%	92%	91%

America

Who coached them to go into Computer Science?

60% of women made the decision on their own

Only 45% of men did – most of the men had either a parent, friend or counsellor that advised them



America

Programming experience

No women but 57% of the men had some kind of prior programming experience.

60% of the men and 68% of the women said programming was an important skill for a computer professional

Most women's pre-experience to college was either the internet, games or word processing



America

Will working as a computer professional be important?

All women thought working as a computer professional would be important.

36% of men were neutral or did not think it would be important



America

Who are the computer professionals?

All women agreed that most computer professionals were men.
60% of the women also thought that more men didn't matter

86% of men thought that most computer professionals were men
90% of the men thought that more men didn't matter



America

Are men more adept at programming than women?

18% of men said that men were better at programming than women.

All women were neutral or disagreed with that statement.

Only 29% of the men disagreed with that statement



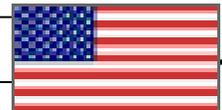
America

Is the “Computer Science” field masculine or feminine ?

All men said that CS was masculine or neutral

All women said that CS was neutral

The only field from our list that was considered mostly
“feminine” was visual programming



America

Typical employment categories

Mostly all fields were seen by men and women as being done by a man

The only fields that were viewed as being done by women were:

- computer teacher (not computer professor, which was seen as mostly male),
- sales assistant,
- help desk person,
- secretary,
- high school principal and
- receptionist.



America

Special Qualities

Women said that *women* bring to the field:

- Communications skills
- Creativity
- Attention to detail

Men said that *women* bring to the field:

- Distractions
- Appearance
- Aesthetics



America

Special Qualities

Women said that *men* bring to the field:

- More technical skills
- Objectivity
- Aggressiveness

Men said that *men* bring to the field:

- Logic
- Analytical skills
- Aggressiveness



America

- Mostly men are enrolled in the programs at Ithaca and Hartwick Colleges, and most of these men are in the 18-24 age group.
- Over 200 questionnaires were handed out – survey requirements did not allow instructor to be in the room during the survey and surveys were optional
- Only 38 surveys were turned in.
 - Some men believed that the survey was “a trick to trap them into being sexist or racist” and were very vocal and upset
 - Some men did not think it was interesting or important enough to fill it out.
 - Almost all of the women in the programs filled out the questionnaires



Australia

- Decision to take course
 - Get a good job: women 17%, men 21%
 - Interest in the area: women 75%, men 42%
- Person who helped with decision
 - no-one: women 58.0%, men 63.2%
 - family/friends: women 33.3%, men 29.0%
 - counselor/teacher: women 0.08%, men 0.05%

Australia

- Prior experience
 - All had some computer experience except for 2 males
 - Games / WP / chat / internet
- What does a computer professional do?
 - Blank: women 41.6%, men 0.03%
 - develops software, networks etc: women 33.3%, men 40.0%
 - works with computers: women 16.6%, men 18.4%
 - works in the *IT industry*: women 0%, men 16.0%
 - makes good money: women 0%, men 10.5%

Australia

- Style of work, skills and type of discipline
 - strong agreement with the need to continually enhance their skills
 - agreement with
 - » high salary, exciting, important, not boring
 - » importance of communication, programming and technical skills
 - » likely to have to make ethical decisions
 - ambivalence about
 - » mostly team work,
 - » travel,
 - » management skills,
 - » whether it was multidisciplinary
 - » whether maths was required

Australia

- Gender issues

- *computing is solitary:* agreed 25% women, 26% men
- *most computer professionals are men:* agreed 25% women, 42% men
- *it doesn't matter that there are more men than women:*
agreed 50% women, 68% men
- *women make better programmers than men:*
disagree 0.08% women, 45% men
- *men are more adept at programming tasks than women:*
disagree 42% women, 24% men

Australia

- Gender issues

- *women prefer documentation to programming:* neutral
- *women prefer multimedia :* neutral
- *men prefer programming:* neutral
- *women involved since beginning:* neutral
- *women played an important role:* neutral

Australia

- What are the tasks done by computer professional?
 - many responses (> 80%)
 - » undertakes system analysis and design, designs computer programs, uses computers in their work,
 - » creates, administers and maintains databases
 - » maintains hardware
 - » works with Ecommerce
 - » creates internet/web pages
 - few responses (< 20%)
 - »
 - women had more responses for
 - » writes documentation
 - *Plays computer games* (women 58%, men 55%)

Australia

- What is included in “The Computer Industry”?
 - many responses (>80%)
 - » software production, hardware production,
 - » Company selling hardware and software
 - » Company providing software training
 - few responses (<20%)
 - » large hospital
 - » the national newspaper
 - women had more responses for
 - » Company of computer specialists
 - men had more responses for
 - » Business using an internal LAN
 - » Electrical/ Elect component manufacturing
 - » The cyber bookshop Amazon
 - » Technical writing

Australia

- Inclination to gender
 - 1 woman choose masculine for all fields
 - 7 men choose neutral for all fields
- Only a few fields were associated with a gender type
 - *feminine*:
 - » word processing (50% women, 58% men)
 - *masculine*:
 - » Software engineering (75% women, 71% men)
 - » Game production (75% women, 58% men)
 - » Robotics (83% women, 68% men)

England

Reasons for studying computing related degree

	<u>men%</u>	<u>women%</u>
interest & increase knowledge	47	59
need for a job	33	18
both reasons / (no answer)	0 / (20)	18 / (4.5)
<hr/>		
own idea	51	55
advise from family or friend	31	45
advise from career adv. / teacher	8	0

England

What a computer professional does

Area	Women %	Men%
Unspecific: works with or makes computers; "specialises in certain field"	9	23.5
help individuals, people or business	27.5	8
controlling/power	0	8
Programming, creates systems, networking	59.5	38
Big money	0	8
Solves problems	4.5	17.5
Negative - "works under pressure meets deadlines"	0	1
No answer given	9	10



England

- Most students believed :
 - high salary
 - important exiting and not boring
 - will involve travel
 - **did NOT have a firm idea of a range of existing career choices**
- Women believed stronger than men:
 - computing is multidisciplinary
 - work will be solitary
 - will not work in teams
 - in need of communication as well as technical, mathematical and programming skills
 - women restricted choices of careers to hardware and software companies



England

- **Gender Stereotypes**

- Men believed stronger than women that *most computer professionals are men* and agreed stronger that *it does not matter*.
- Both disagreed that *men are adept to programming*, but men believed *they make better programmers*
- Women disagreed, men agreed that *women prefer documentation to programming*
- Most students were ambivalent to ethical issues (understandable)



England

Inclination to Gender

- 48% of men ticked neutral for all fields
- 9% of women ticked neutral for all fields
- Men viewed most disciplines as masculine
- Disciplines that both genders viewed as feminine:
 - Multimedia, desktop publishing, multimedia, word processing
- Women viewed the following disciplines as masculine:
 - Robotics, systems architecture, Game production, software engineering and OO programming



Hong Kong

- Decision to take course
 - Increase my knowledge: women 36.0%, men 34.6%
 - Want a degree: women 20.%, men 19.2%
- Person who helped with decision
 - no-one: women 60.0%, men 76.9%
 - family/friends: women 40.0%, men 23.1%
 - counselor/teacher: women 0.0%, men 0.0%



Hong Kong

- Prior experience
 - all had some computer experience
 - Games / WP / chat / internet
- What does a computer professional do?
 - Blank: women 27%, men 20%
 - develops software, networks etc: women 15.4%, men 12%
 - solves problems with a computer: women 27%, men 24%
 - solves computer problems: women 12%, men 0.04%
 - gives professional advice: women 0.04%, men 20%



Hong Kong

- Style of work, skills and type of discipline
 - strong agreement with importance, the need for technical skills and the need to continually enhance their skills
 - agreement with
 - » high salary, exciting, mostly team work, ethical decisions being likely
 - » importance of communication and programming skills
 - » work in front of a computer most of the day and as part of teams
 - ambivalence about
 - » travel, management skills,
 - » whether it was multidisciplinary
 - » whether maths was required



Hong Kong

- gender issues

- *Computing is solitary:* agreed 46% women, 24% men
- *most computer professionals are men:* agreed 42% women, 16% men
- *it doesn't matter that there are more men than women:*
agreed 58% women, 68% men
- *women make better programmers than men:*
disagree 15% women, 56% men
- *men are more adept at programming tasks than women:*
agree 46% women, 32% men



Hong Kong

- What are the tasks done by computer professional?
 - Many responses (> 80%)
 - » undertakes system analysis and design, designs computer programs, evaluates inform. technologies
 - Few responses (< 20%)
 - » does mainly word processing, plays computer games,
 - Women had more responses for
 - » Purchases computer equipment, performs IT research
 - Men had more responses for
 - » Maintains programs



Hong Kong

- What is included in “The Computer Industry”?
 - Many responses (>80%)
 - » software production, hardware production,
 - Few responses (<20%)
 - » Technical writing
 - » Specialized computer recruitment agency
 - » large hospital, the Ford car factory, the national newspaper
 - Women had more responses for
 - » Business using electronic commerce
 - Women and men were in agreement on most suggestions



Hong Kong

- Inclination to gender
 - 28% of women and 7% of men chose neutral for all fields
- Only a few fields were associated with a gender type
 - *feminine*:
 - » word processing (52% women, 39% men)
 - *masculine*:
 - » game production (40% women, 35% men)
 - » technical support (56% women, 27% men)
 - » Robotics (56% women, 35% men)



South Africa

- Decision to take course
 - interest in area: women 50.0%, men 64.7%
 - to get a good job: women 33.3%, men 25.5%
- Person who helped with decision
 - no-one: women 25.0%, men 60.8%
 - family/friends: women 66.7%, men 19.6%
 - counselor/teacher: women 8.3%, men 7.8%



South Africa

- Prior experience
 - all have one year of computer science:
 - » algorithms and data structures
 - » basic computer organization
 - » limits of computing
(social aspects and ethics, AI, theory of computation)
 - at least 13 had no experience prior to first year:
 - » women: 33.3%, men: 17.6%
- What a computer professional does
 - develops software, networks etc: women 41.7%, men 27.5%
 - solves problems with a computer: women 33.3%, men 35.3%
 - solves problems: women 16.7%, men 17.6%
 - uses computers: women 8.3%, men 11.8%



South Africa

- style of work, skills and type of discipline
 - agreement with
 - » high salary, exciting, important, not boring, team work mostly, ethical decisions being likely, multidisciplinary
 - » importance of communication, management, programming and maths skills,
 - strong agreement on need to continually enhance skills
 - limited agreement with travel
 - ambivalence about
 - » solitary, working in front of computer all day, importance of technical skills



South Africa

- Gender issues
 - *most computer professionals are men:*
mostly agreement, more disagreement from women
 - *it doesn't matter that there are more men than women:*
ambivalent, men more in agreement
 - *women make better programmers than men:*
women more neutral, more disagreement from men
 - *men are more adept at programming tasks than women:*
more disagreement from women, men more neutral



South Africa

- What are the tasks done by computer professional?
 - many responses
 - » undertakes system analysis and design, designs computer programs, creates databases
 - few responses
 - » plays computer games, writes documentation, creates spreadsheets, does mainly word processing
 - women had more responses for
 - » creates web pages,
 - men had more responses for
 - » manages a large computer department, assembles computers, plays computer games, writes documentation
 - Conclusion: a reasonable understanding, but role of documentation not understood



South Africa

- what is included in “The Computer Industry”?
 - many responses
 - » software production, hardware production, company selling hardware and software
 - few responses
 - » technical writing, large hospital, the Ford car factory, the national newspaper
 - women had more responses for
 - » company selling hardware and software, electrical/electronic component manufacturing
 - men had more responses for
 - » business using an internal LAN, the national newspaper, the Ford car factory, large hospital
 - Conclusion: reasonable understanding, men have broader definition



South Africa

- Inclination to gender
 - 11 men chose neutral for all fields, no women did this
 - *computer science*
 - » mostly neutral, more men chose masculine
 - *feminine*:
 - » word processing (58% women, 41% men)
 - » ethics (92% women, 37% men)
 - *masculine*:
 - » game production (75% women, 63% men)
 - » technical support (58% women, 47% men)
 - » robotics (58% women, 45% men)
 - » systems arch (50% women, 43% men)



All Countries

	Person who helped students to decide to go into "Computer Science"									
	Parent		Friend		Counselor/Teacher		No One or Myself		Other Family	
	M	F	M	F	M	F	M	F	M	F
America	18%	10%	7%	10%	7%	20%	57%	60%	11%	0%
Australia	18%	17%	11%	17%	5%	8%	66%	58%	3%	0%
England	10%	18%	8%	9%	3%	0%	64%	68%	15%	5%
HongKong	4%	0%	15%	20%	0%	0%	77%	68%	0%	8%
SouthAfrica	10%	17%	10%	50%	8%	8%	67%	33%	4%	0%
All	12%	11%	10%	20%	5%	5%	66%	60%	7%	4%

All Countries

	Why student decided to study Computer Science											
	Increase Knowledge		Want Degree		Get Good Job		Interest In Area		Other		Blank	
	M	F	M	F	M	F	M	F	M	F	M	F
America	11%	0%	7%	0%	29%	20%	61%	80%	11%	20%	0%	0%
Australia	13%	42%	0%	0%	34%	58%	42%	75%	3%	0%	11%	8%
England	26%	32%	10%	14%	8%	23%	15%	32%	0%	9%	5%	0%
HongKong	12%	8%	15%	8%	12%	4%	73%	20%	0%	0%	0%	0%
SouthAfrica	6%	0%	2%	8%	20%	17%	59%	58%	8%	17%	4%	0%
All	13%	17%	6%	7%	20%	21%	48%	44%	4%	7%	4%	1%

All Countries

28.5% of men chose neutral for all Inclination to Gender questions

7% of women chose neutral for all also

	% All Neutral
America	29%
Australia	16%
England	30%
HongKong	20%
SouthAfrica	19%

What have we learned?

Where do women think computing will lead them?

To a well-paying, exciting job

To a job where they would continually need to enhance their skills

What have we learned?

Who influenced the development of the perceptions held by students?

Counselors and teachers are NOT influencing students decisions to enter the field

Why?

Could it be that elementary and high school teachers and counselors are unfamiliar with technology and not prepared to recommend it ?

Where next?

How can we best confront and broaden those perceptions?

Can we identify new ways to promote computing to increase its appeal to women?



Questions

What perceptions of computing do you think the general public has?

What are the realities of computing?

- higher pay???
- important???
- exciting???

What can be done to change perceptions to match reality?

Where should research on this topic go next?