“To Teach Is to Touch Lives Forever”
Agenda

- Opening Remarks
- Teaching and teachers
- University – Teaching vs. Research
- Computer Science High-School Curriculum
- Computer Science Education Research
- Gender Issues in Computer Science
- Closing Remarks
To Teach Is to Touch Lives Forever

"To Teach Is to Touch Lives Forever"

S.M. Scott,

Keynote SIGCSE, March 2007
“If anything is going to happen
teachers have to make it happen”

Sandy Lenning,
teacher in Denali Elementary Fairbanks, Alaska
“If you plan for a year, plant a seed. If you plan for ten years, plant a tree. If for hundred years, teach the people. When you sow a seed once, you will reap a single harvest. When you teach people, you will reap a hundred harvests.”

Kuan Chang
מהדור ל"ה טשא

בית הספר "تلكנורדות" תל אביב

 Sheridan's Children School
Errata

“Errata an examined life”

Yale University Press
1997.

George Steiner

Keynote SIGCSE, March 2007
Ideally, major scholarship and philosophy can arise out of the business of teaching. I am persuaded that they should. Teaching and the companionship of mutual provocation in a seminar have been my oxygen.

I cannot imagine my work – even, to a vivid extent, my fiction – without them.

If I struggle against retirement, it is because my students have been indispensable. This is good luck.”
The best way to learn a subject is to teach it someone else,
And even better to teach it to a computer.
Dear Journal Editor, It's Me Again
by Roy F. Baumeister

Dear Sir, Madame, or Other:

Enclosed is our latest version of Mo # 05-02-22-RRRR, that is, the re-re-revised revision of our paper. Choke on it. We have again rewritten the entire manuscript from start to finish. We even changed the goodman running head. Hopefully we have suffered enough by now to satisfy even you and your bloodthirsty reviewers.

I shall skip the usual point-by-point description every single change made in response to the critiques. After all, it is fairly clear that your reviewers are less interested in details of scientific procedure than in working out their personality problems and sexual frustrations by seeking some kind of deranged gleed in the sadistic and arbitrary exercise of tyrannical power over helpless authors like ourselves who happen to fall into their clutches. We do understand that, in view of the misanthropic psychopaths you have on your editorial board, you need to keep sending them papers, for if they weren't reviewing manuscripts they'd probably be out mugging old ladies or clubbing baby seals to death. Still, from this batch of reviewers, C was clearly the most hostile, and we request that you not ask him or her to review this revision. Indeed, we have mailed letter bombs to four or five people we suspected of being reviewer C, so if you send the manuscript back to them the review process could be unduly delayed.

Some of the reviewers' comments we couldn't do anything about. For example, if (as reviewer C suggested) several of my recent ancestors were indeed drawn from other species, it is too late to change that. Other suggestions were implemented, however, and the paper has improved and benefited. Thus, you suggested that we shorten the manuscript by 5 pages, and we were able to accomplish this very effectively by altering the margins and printing the paper in a different font with a smaller typeface. We agree with you that the paper is much better this way.

One perplexing problem was dealing with suggestions from B. As you may recall (that is, if you even bother reading the reviews before doing your decision letter), that reviewer listed 16 works that he/she felt we should cite in this paper. These were on a variety of different topics, none of which had any relevance to our work that we could see. Indeed, one was an essay on the Spanish-American War from a high school literary magazine. The only common thread was that all 16 were by the same author, presumably someone whom reviewer B greatly admire and feels should be more widely cited. To handle this, we have modified the introduction and added, after the review of relevant literature, a subsection entitled "Review of Irrelevant Literature" that discusses these articles and also duly addresses some of the more asinine suggestions in the other reviews.

We hope that you will be pleased with this revision and will finally recognize how urgently deserving of publication this work is. If not, then you are an unscrupulous, depraved monster with no shred of human decency. You ought to be in a cage. May whatever hatred you come from be the butt of the next round of ethnic jokes. If you do accept it, however, we wish to thank you for your patience and wisdom throughout this process and to express our appreciation of your scholarly insights. To repay you, we would be happy to review some manuscripts for you; please send us the next manuscript that any of these reviewers submit to your journal.

Assuming you accept this paper, we would also like to add a footnote acknowledging your help with this manuscript and to point out that we liked the paper much better the way we originally wrote it but you held the editorial shotgun to our heads and forced us chop, reshuffle, reslate, hedge, expand, shorten, and in general convert a messy paper into simplified vegetables. We couldn't, or wouldn't, have done it without your input.

Sincerely,
Assuming you accept this paper, we would also like to add a footnote acknowledging your help with this manuscript and to point out that we liked the paper much better the way we originally wrote it but you held the editorial shot-gun to our heads and forced us to chop, reshuffle, restate, hedge, expand, shorten, and in general convert a meaty paper into stir fried vegetables. We couldn't and wouldn't have done it without your input.
Computer Science!
Computer Science is a full-fledged scientific subject.
The program should concentrate on the key concepts and foundations of the field.
Two different programs are needed;
Each of the programs should have required units and electives.
The zipper principle.
Two different programming paradigms should be taught.
A computer laboratory is mandatory.
New course material is needed.
Teachers certified to teach computer science must have an adequate formal computer science education.

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The principles that guided our work were these:
“Indeed, we believe computer science is poised to become as fundamental to biology as mathematics has become to physics. [.....] However, what this report uncovers, for the first time, is a fundamentally important shift from computers supporting scientists to 'do'
traditional science to *computer science*
becoming embedded into the very fabric of
science and how science is done, creating
what we are prepared to go so far as to
call 'new kinds' of science.'
emphasizing the notion of an algorithmic problem and its solution the algorithm.

It should focus on lasting concepts of computer science not on changing technology.
one for the so-called 3-unit program, intended for those who have only a general interest in computer science,

and one for the 5-unit one, for those who want to get much more involved in this scientific discipline.
There must be a kernel that everyone should learn, but then again, the teachers should be able to choose what they like best and feel comfortable with. The teachers thus become part of the actual design of the final study program.
Conceptual and experimental issues should be interwoven throughout the program.
To provide different ways of algorithmic thinking and different ways of solving problems.

One should be versatile. One can not always watch the world through red filtered glasses and see everything in red. The same goes for techniques for problem solving, or, for that matter, also computer languages;

In any case, one approach is never enough.
to support laboratory sessions and individual
“screen time” for each student.
by different teams in different academic institutions. The teams must have computer scientists on board, as well as high school teachers and researchers in computer science education.
i.e., at least an undergraduate degree in computer science.
J. Gal-Ezer, C. Beeri, D. Harel & A. Yehudai:


J. Gal-Ezer & D. Harel:

J. Gal-Ezer & D. Harel:

"What (else) should CS educators know?"

Student Understanding
Animation/visualization/simulation
Teaching methods
Assessment
Educational technology
The transfer of new technologies into classroom
Transferring to remote teaching
Recruitment and retention of students
The construction of the discipline
"I must plead guilty to having played that futile game by saying things like: "There is no research evidence on that. We researchers need a way of communicating that affirms the legitimacy of education research without challenging the legitimacy of the other pedagogic research"."
SIGCSE Award for Outstanding Contribution to Computer Science Education

2006 Rich Pattis
2005 Kim Bruce
2004 Mordechai Ben-Ari
2003 Eric Roberts
2002 Elliot Soloway
2001 Allen B. Tucker
2000 Andries van Dam
1999 Peter Denning
1998 William Wulf
1997 Andrew Tanenbaum
1996 Nell Dale
1995 Robert Aiken
1994 Norman Gibbs
1993 Alan Kay
1992 Daniel McCracken
1991 David Gries
1990 Curriculum '68 Committee
1989 Edsger Dijkstra
1988 Grace Murray Hopper
1987 Niklaus Wirth
1986 Donald Knuth
1985 Elliot Organick
1983 Karl Karlstrom
1982 Alan Perlis
1981 William Atchison

Keynote SIGCSE, March 2007
### CS Graduates of Israeli Universities

<table>
<thead>
<tr>
<th>Institution</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>% Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hebrew Univ.</td>
<td>132</td>
<td>71</td>
<td>203</td>
<td>35%</td>
</tr>
<tr>
<td>Technion</td>
<td>172</td>
<td>64</td>
<td>236</td>
<td>27%</td>
</tr>
<tr>
<td>Tel-Aviv Univ.</td>
<td>173</td>
<td>64</td>
<td>248</td>
<td>30%</td>
</tr>
<tr>
<td>Bar-Ilan Univ.</td>
<td>285</td>
<td>164</td>
<td>449</td>
<td>37%</td>
</tr>
<tr>
<td>Haifa Univ.</td>
<td>134</td>
<td>154</td>
<td>288</td>
<td>53%</td>
</tr>
<tr>
<td>Ben-Gurion Univ.</td>
<td>121</td>
<td>49</td>
<td>170</td>
<td>29%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,017</td>
<td>577</td>
<td>1,594</td>
<td>36%</td>
</tr>
</tbody>
</table>
In Biology, Chemistry and Mathematics, girls comprise the majority of the passing students.

In Biology: about 64%;
In Chemistry about 63%;
In Mathematics about 52%.

In CS (and in physics): about 32%
Number of students (boys/girls) and average grades in high-level CS in high school

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Students</th>
<th>Final Average Grade (0-100)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>2003</td>
<td>5343 (68%)</td>
<td>2498 (32%)</td>
</tr>
<tr>
<td>2004</td>
<td>4608 (68%)</td>
<td>2188 (32%)</td>
</tr>
<tr>
<td>2005</td>
<td>3884 (69%)</td>
<td>1774 (31%)</td>
</tr>
</tbody>
</table>

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“Girls want more than to sit at a PC”

“Females are more likely to take up IT if it involves team working, creativity and problem-solving”

Sarah Murray.

(FT REPORT ─ DIGITAL BUSINESS).

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Byline: SARAH MURRAY

Keynote SIGCSE, March 2007
Grandchildren pictures
Grandchildren pictures #2
Grandchildren pictures #3
Problems that women might encounter

- CS courses have reputation for being boring;
- CS students suffer from the “nerd” image;
- Before entering college women have less hands-on experience;
- Women do not receive the same level of support from the social environment;
Pedagogical issues

- Developing courses that are motivating and reflect the relevance of CS to real life;
- Develop courses that allow creative freedom;
- Combating the asocial reputation of computing;
- Designing assignments, lecture examples and laboratories that have relevance to the students’ lives;

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Social issues:

- Recognizing the importance of female role models by hiring more women as lecturers and TAs;

- Actively recruiting women to CS programs;

- Bringing about cultural and environmental change;

And more........
Enrollment statistics for CS1 and first mathematics courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Male</th>
<th>Calculus I</th>
<th>Linear Algebra I</th>
<th>Discrete Math</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1 (n = 20,317)</td>
<td>78%</td>
<td>84.4%</td>
<td>81.6%</td>
<td>81.5%</td>
</tr>
<tr>
<td>Calculus I (n = 7,137)</td>
<td>84.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear Algebra I (n = 11, 304)</td>
<td>81.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discrete Math (n = 7,245)</td>
<td></td>
<td></td>
<td></td>
<td>18.5%</td>
</tr>
</tbody>
</table>

P = 0.0001
Once she makes it, she is there!
Peace  평화  Barış  
Paix    שלום  Hasîtî  
शांति  Friede  سلام  
和平  Mip  Paz