Where are we in e-learning today? A status report on current research

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Policy issues facing education

- What should be done to address the fact that the school performance of Aboriginal learners is roughly half of that of non-Aboriginal learners?
- What part should schooling play in the process of integrating students with diverse backgrounds in the socio-cultural, political, economic, and linguistic fabric of Canada?
- What mechanisms are available for addressing the persistent gap between the graduation rates of adolescent men and women?
- What should be done to reduce the personal and societal costs of early school leaving?
- How should schools address the needs of a growing population of low birth weight babies to ensure that they derive maximum benefit from society's investment in their education and so that they achieve maximum independence as adults?
- What is society's return on investment of various approaches to trades training?
- How much and what kind of technology is necessary to accomplish the goals of public schooling?

Information and Communication Technologies in Elementary and Secondary Education: A State of the Art Review

Tracey Burns
Charles Ungerleider

ICT in Elementary and Secondary Schools

- Common belief that technology can improve the rate, quality, amount, and effectiveness of learning (Henchey, 2001).
- 88 per cent of elementary and 97 per cent of secondary school students attend a school that has Internet access for instructional purposes (PCEIP).
- "To date, there is much promise but less substance, especially long-term evidence, regarding the effective use of technology for learning" (Abrami, 2001)
- Critical that the available research be assembled, reviewed, and critiqued.

ICT in K-12 - our focus:

- Efficacy of ICTs for achievement, motivation, and metacognitive learning.
- Role of ICTs for instruction in content areas.

ICT in K-12 Education: Review supports only four claims:

- Student attitudes toward computers and computer related technologies improve as a consequence of exposure to them.
- The use of ICTs for group work can be beneficial if teachers are able to take into account the complex interplay among the age of the students, the kind of task, and the amount of independence allowed.
- The use of ICTs for mathematics instruction has a significantly positive effect on teaching high level concepts to students in grade eight or above.
- The majority of the research reviewed is contradictory and/or seriously flawed.

K-12 Further questions:

- How are attributions to ICT task performance affected by gender?
- How do we reconcile findings from large-scale assessments showing no or negative effects of access to computers with contrasting experimental results?
- What is the impact of ICTs on student motivation, and how do we measure it?
- Are metacognitive skills being enhanced by ICT learning environments?
- What is the role of ICTs in particular subject areas other than mathematics and language arts?

Implications for the development of policy for k-12

- Much of the reviewed research conducted outside of Canada and, thus, does not provide a uniquely pan-Canadian perspective.
- There are simply too few studies of sufficiently rigorous design to permit informed policy choices.
- ***This is especially troubling given that the use of ICTs requires significant expenditure of scarce resources.***

CMEC-IC Research Review of Networked and On-line Learning:

Charles Ungerleider & Tracey Burns

Research Questions:

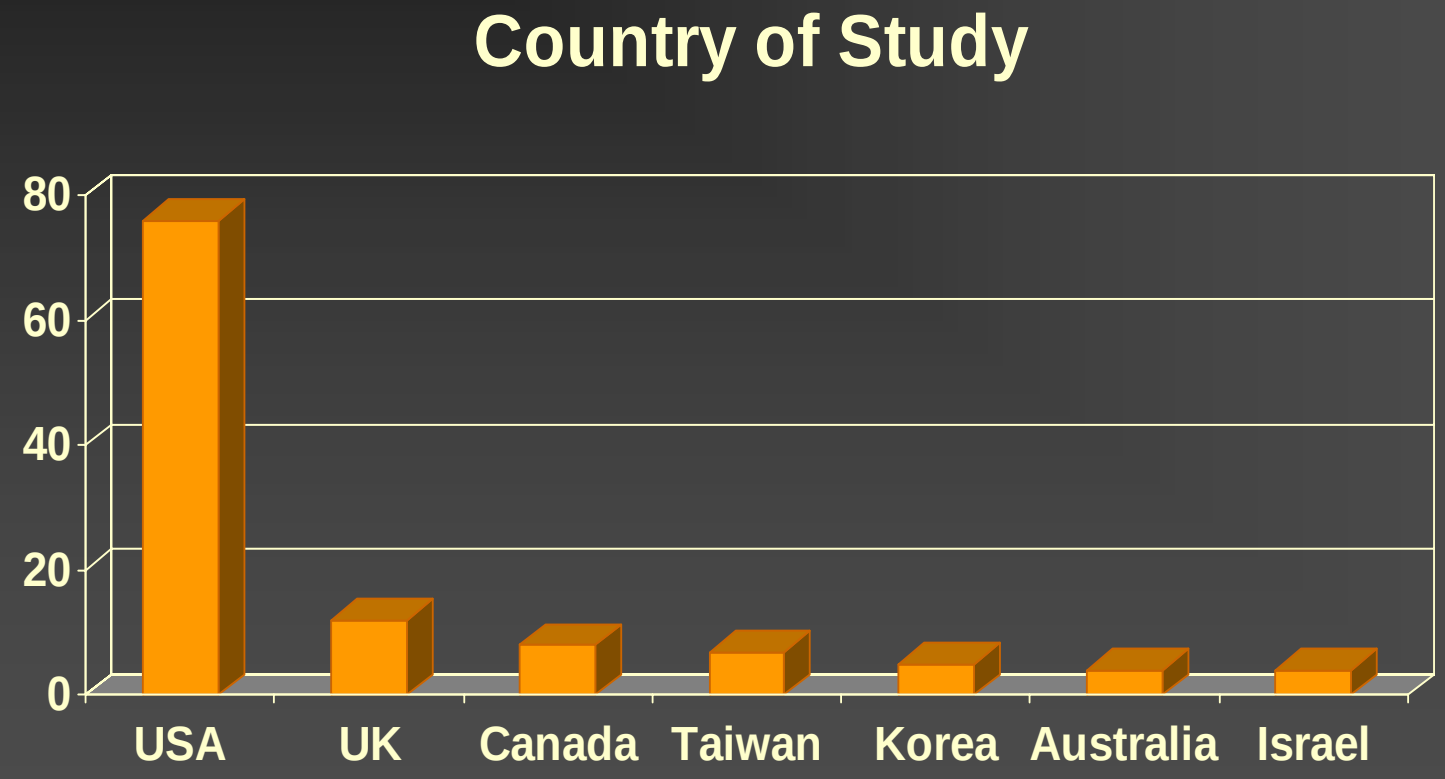
Is the literature capable of answering questions according to the principles that guide the policy-oriented work of the Campbell Collaboration?

- Is on-line and networked learning more effective than classroom delivered instruction?
- Is on-line and networked learning more efficient than classroom delivered instruction?

Mapping the research

- Papers mapped using techniques similar to EPPI centre reviews
- A map **provides** a systematic description of research; a basis for narrowing criteria for quantitative research synthesis; and a context for interpreting synthesis results, including suggestions for primary research (Gough et al., 2003)

Mapping the research, cont.



China

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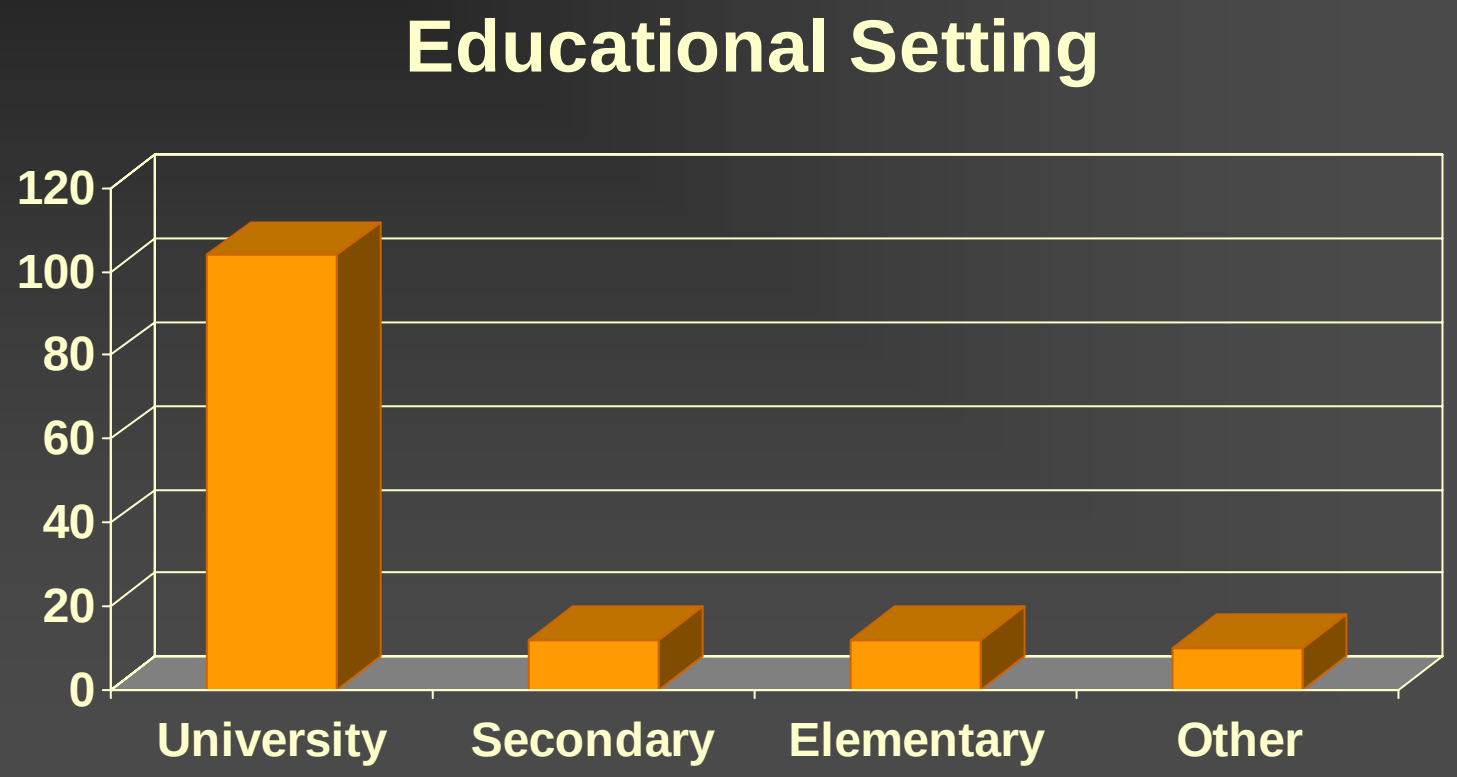
Sweden

Mapping the research, cont.



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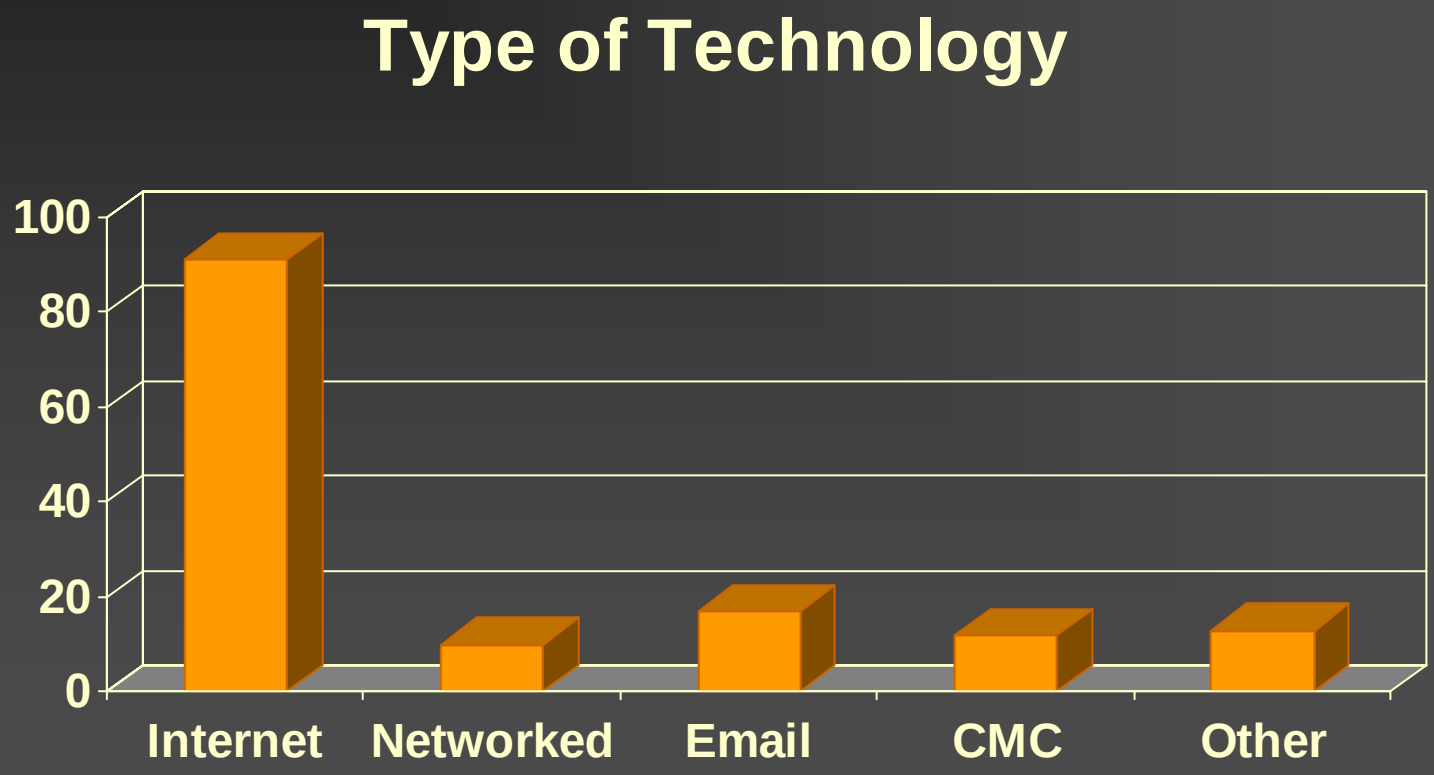

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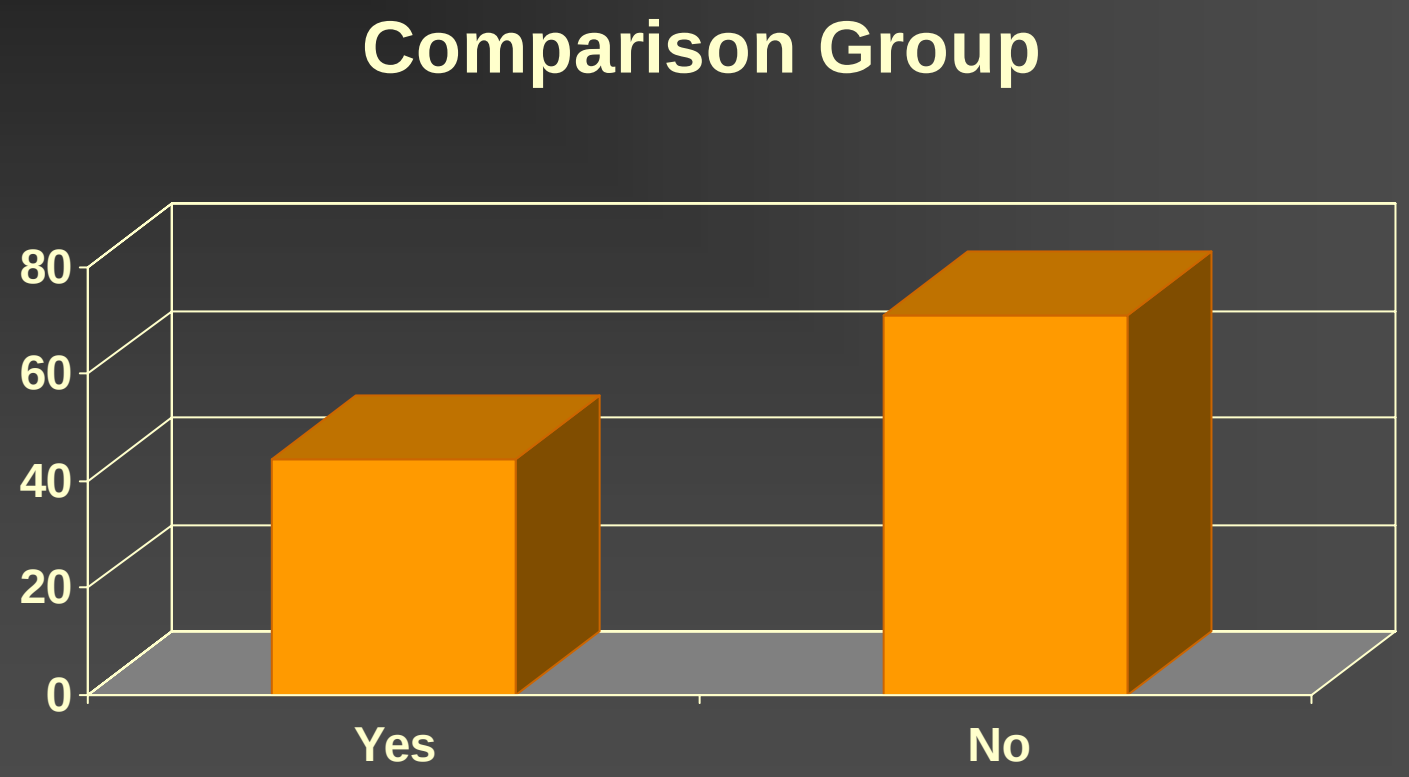

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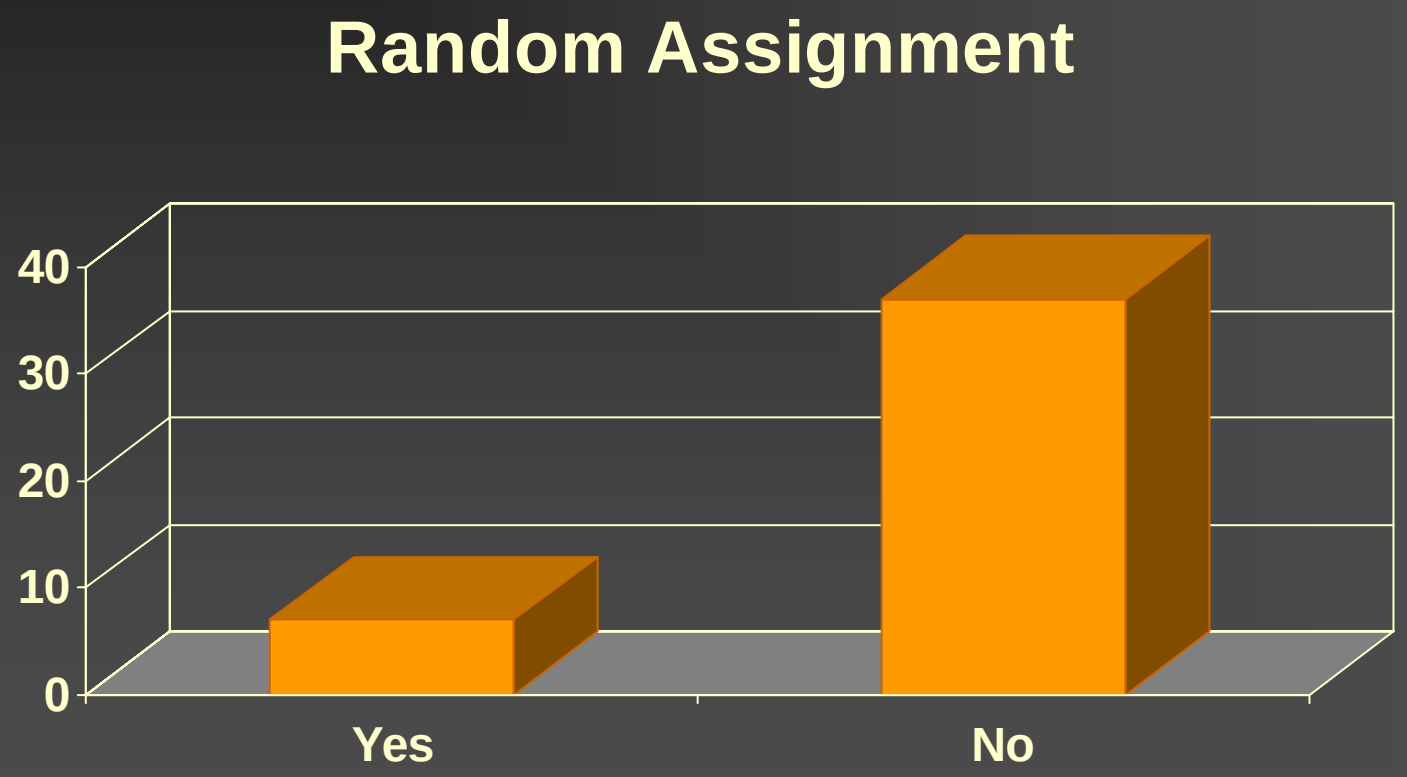

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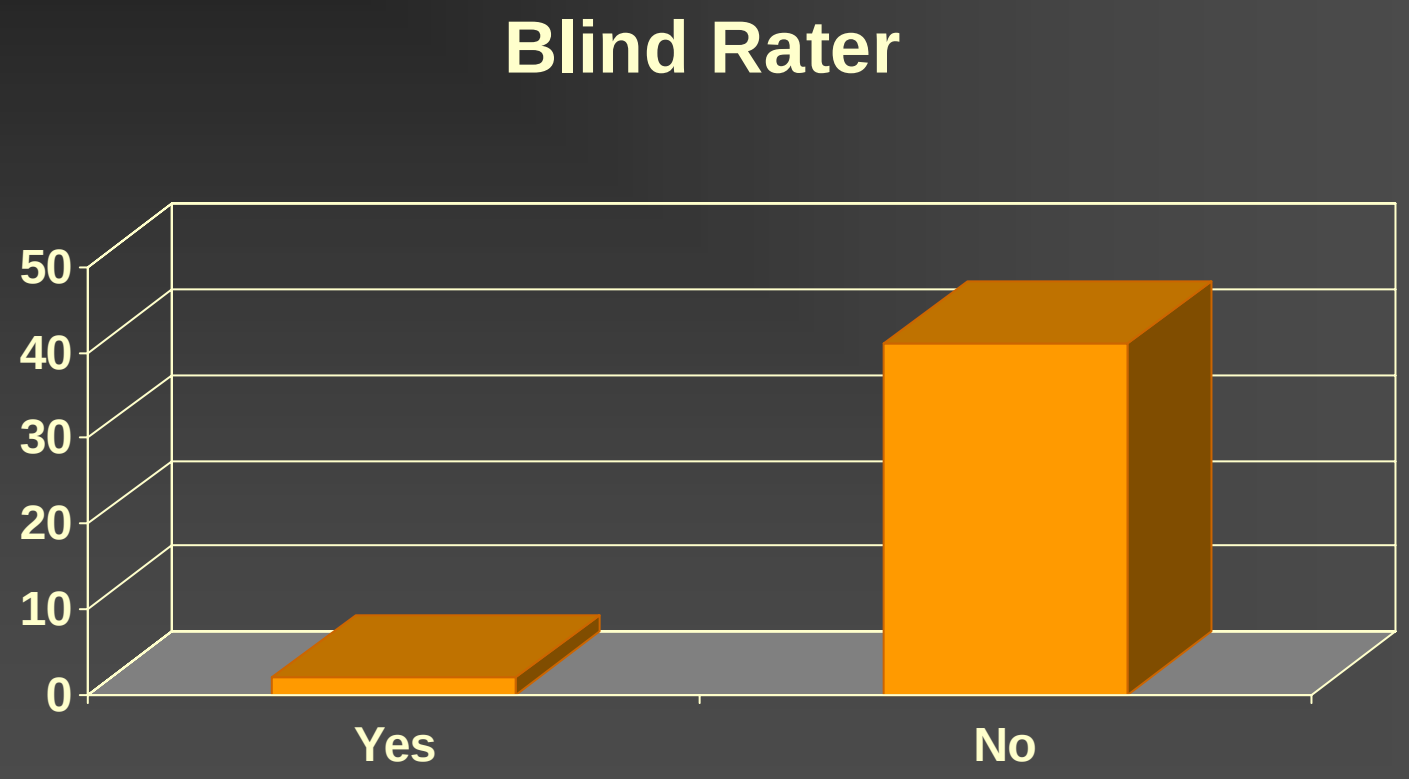
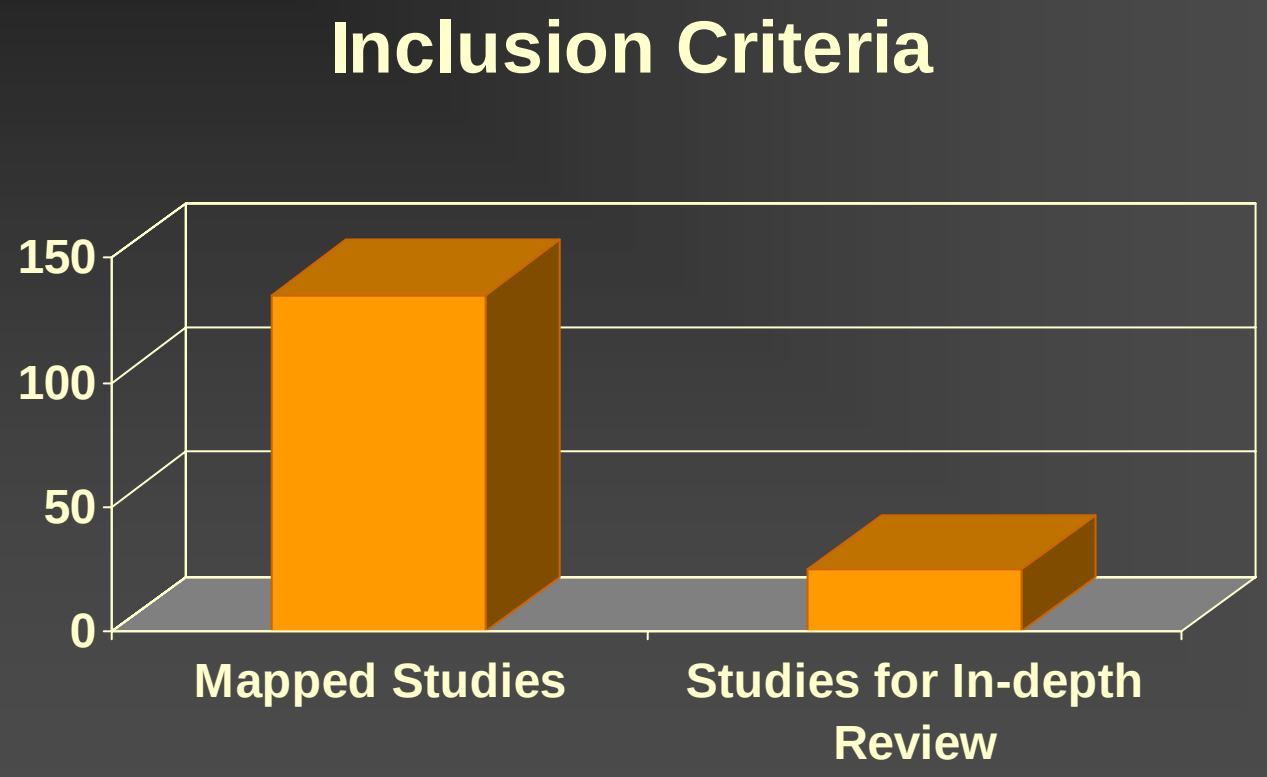


In-depth review



In-depth review: Study Characteristics

- 75 % of studies originated in the USA
  - Australia, UK (2)
  - Taiwan, Finland, Israel (1)
- 83 % of studies were conducted in universities
  - Only 2/25 in secondary schools (one included only because it looked at a special population)
  - Only 2/25 in elementary setting

In-depth review: Diversity of Topics

- Variety of technologies
  - Hypertext homework tools, synchronous AV instruction
- Variety of interventions
  - Entire networked courses vs. single lectures; homework assignments vs. tests
- Variety of subjects
  - Science and writing in elementary school, physics and English literature in high school; business and social work in university

In-depth review: General Themes

- Mixed picture of effectiveness
  - Number of studies purporting to show an effect of one method over the other is small
  - Many of the claims being made are mitigated by methodological concerns
- Common themes:
  - Advantages of traditional learning: interaction with instructor and students; structure; feedback in the "here and now"
  - Advantages of networked learning: flexibility to learn where and when one wishes; ability to go at own pace

In-depth review: Concerns

- Concerns expressed regarding:
  - Use of networked instruction for teaching subjects with affective component (e.g., social work; teacher education)
  - High levels of attrition of networked students compared to traditional students
  - Although measures of achievement were not significantly different between the two groups, measures of *perceived* achievement and satisfaction ratings were

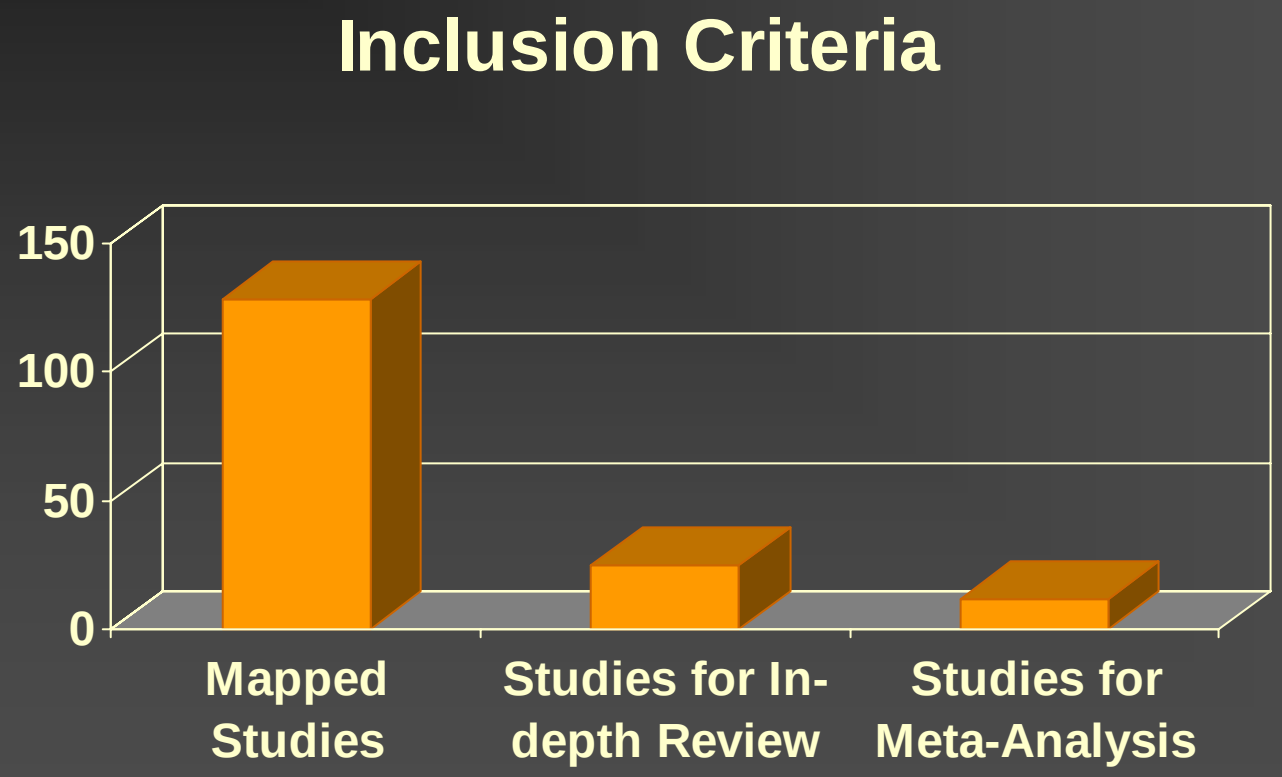
In-depth review: Gaps

- Lack of research in elementary and secondary schools
- Lack of research on inclusion (role of gender, ethnicity, rural/urban populations, etc)
- Lack of Canadian research

In-depth review: Methodological concerns

- Only 10 of the 25 studies included in the in-depth review were not seriously flawed
  - Sobering statistic given the constraints that went into selecting studies for the review
  - Most common problems: design; statistics, or interpretation

Meta-Analysis



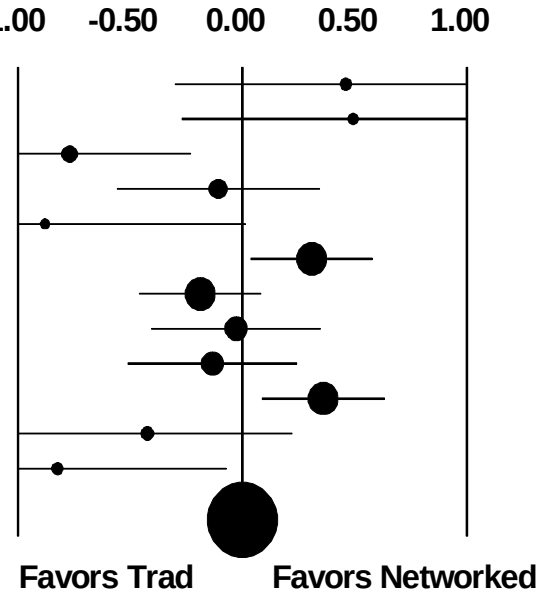
Meta-analysis: Study Characteristics

- 83 % of studies originated in the USA
  - Canada, Greece (1)
- 83 % of studies were conducted in universities
  - 2 in secondary schools
  - None in elementary setting

Meta-analysis: Achievement

Meta Analysis: Achievement

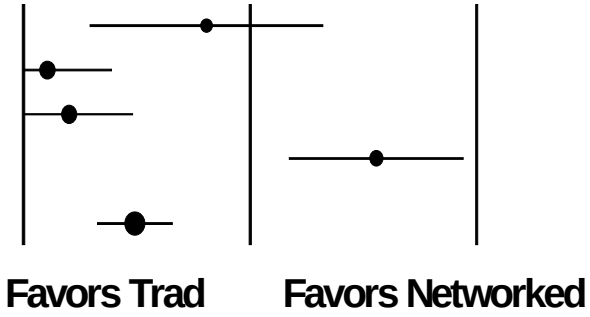
Citation	EffectName	Effect	NTotal	PValue
Bain	measure 2	.460	30	.206
Bain	measure 1	.493	30	.176
Barkhi	final grade	-.770	62	.004
Collins	final marks	-.107	173	.637
Hartzoulakis	post-tests	-.881	24	.036
Maki	GRE Questions	.308	218	.024
Maki	final exam	-.189	218	.166
Sankaran	Increm. test scores	-.028	116	.882
Sankaran	final test scores	-.134	116	.478
Tuckman	GPAs	.360	263	.009
Waschull	test scores (study 2)	-.424	41	.177
Waschull	test scores (study 1)	-.823	33	.023
FixedCombined (12)		**.000**	**1324**	**.993**



Meta-analysis: Satisfaction

Meta Analysis: Satisfaction

Citation	EffectName	Effect	NTotal	PValue
Barkhi	satisfaction	-.192	63	.449
Maki	satisfaction2	-.895	218	.000
Maki	satisfaction1	-.799	218	.000
Sankaran	attitude to web	.557	116	.004
Fixed Combined (4)		**-.509**	**615**	**.000**



Meta-analysis: General Themes

- No significant difference in effectiveness
  - As measured by achievement on tests and final course grades
  - Echoes findings of in-depth review
- Significant difference in satisfaction ratings
  - Regardless of actual achievement; may be related to retention
  - Echoes findings of in-depth review
- These themes are also echoed in two other meta-analyses (Allen *et al.*, 2002; Bernard *et al.*, 2003)

Meta-Analysis: Gaps

- No research in elementary settings; too little in secondary schools
- No research on inclusion (role of gender, ethnicity, rural/urban populations, etc)
- Lack of Canadian research

Meta-Analysis: Methodological Concerns

- 4 studies included in the meta-analysis were seriously flawed.
  - Only 2 had random assignment of participants to groups
  - None had blind raters
  - None of the researchers we contacted to request more information responded to the request

Conclusions

- Lack of clean research, especially Canadian research, is troubling
- Data from correlational studies indicate that traditional divides still exist in computer use and academic achievement (gender, ethnicity, SES, rural/urban, etc.)
- Clear need for systematic research on these areas in order to provide a basis for evidence-based policy formation