

Ubiquitous Computing in K-12 Classrooms: A Systematic Review

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Agenda

- Introduction
- Methodology
- The Nature of the Data
- Findings
- What's Next
- Questions

Introduction

Why do this Review?

- Commissioned study
- Topical (see especially OLPC)
- Hasn't been done
- Seemed like a good idea at the time

What has been done already

- Michigan Freedom to Learn - Research Summaries
- Penuel (2006 and 2002)
- Apple Computing (2005)
- Andrews (2006)
- Maderthaner (2007)

Methodology

Ten steps for meta-analysis:

1. Determine the research question
2. Develop terms and definitions related to the question
3. Develop a search strategy for identification of relevant studies
4. Establish criteria for inclusion and exclusion of studies
5. Select studies based on abstract review (agreement)
6. Select studies based on full-text review (agreement)
7. Extract effect sizes (agreement)
8. Develop codebook of study features
9. Code studies (agreement)
10. Conduct statistical analysis and interpretation

The research question

How, to what extent, and under what circumstances does **one-to-one computing** impact K-12 student **achievement**, student and teacher **technology use** and **technology proficiency**, and student and teacher **attitudes** toward technology?

3 Search strategy - internet

- ERIC
- Other Databases
 - Search terms for ERIC and other database searches: One-to-one, ubiquitous computing, laptop initiative, K-12, school, education, pda, handheld, mobile, portable, technology integration, personal digital assistant, computers
- “Hand Searches” in particular:
 - “pearling” with google and google scholar
 - one-to-one clearinghouses

Useful Internet Resources



One-to-One Clearinghouse

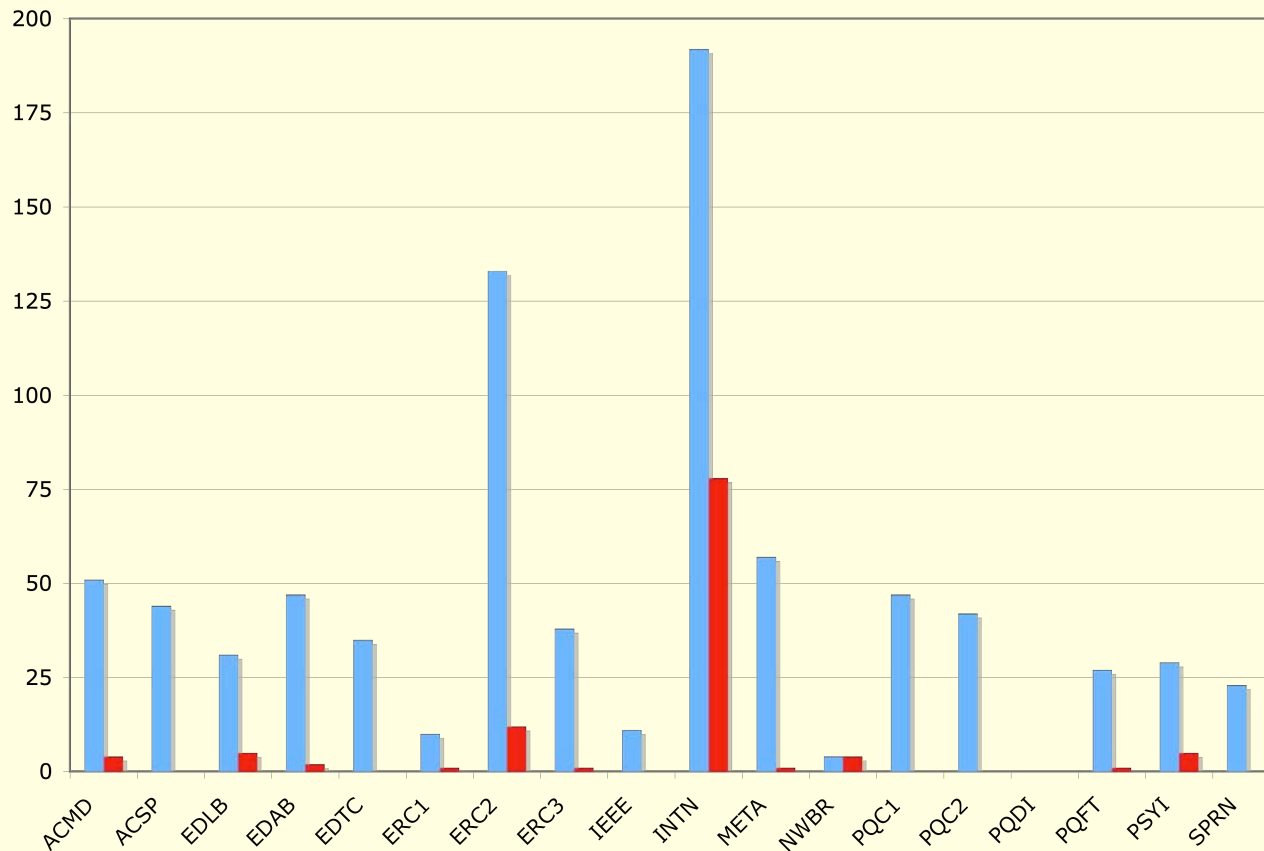
Anytime Anywhere Learning Foundation



The effects of ubiquitous computing
on student learning

The Nature of the Evidence

Hits and Includes by Database Search



Code	Search
ACMD	ACM Digital Library
ACSP	Academic Search Premier
EDLB	EditLib
EDAB	Education Abstracts
EDTC	Educational Technology
ERC1	ERIC 1
ERC2	ERIC 2
ERC3	ERIC 3
IEEE	IEEEExplore
INTN	Internet
META	MetaPress
NWBR	New Brunswick
PQC1	ProQuest CBCA Education 1
PQC2	ProQuest CBCA Education 2
PQDI	ProQuest Dissertations
PQFT	ProQuest Education Full Text
PSYI	PsychInfo
SPRN	SpringerLink

The Nature of the Evidence

	Hits	Includes	Hit rate (includes/hits)	%age of total hits
Non-ERIC Database searches	444	18	4.1%	54.1%
Eric searches	181	14	7.7%	22.0%
"Hand searches"	196	82	41.8%	23.9%
Totals	821	114	13.9%	100.0%

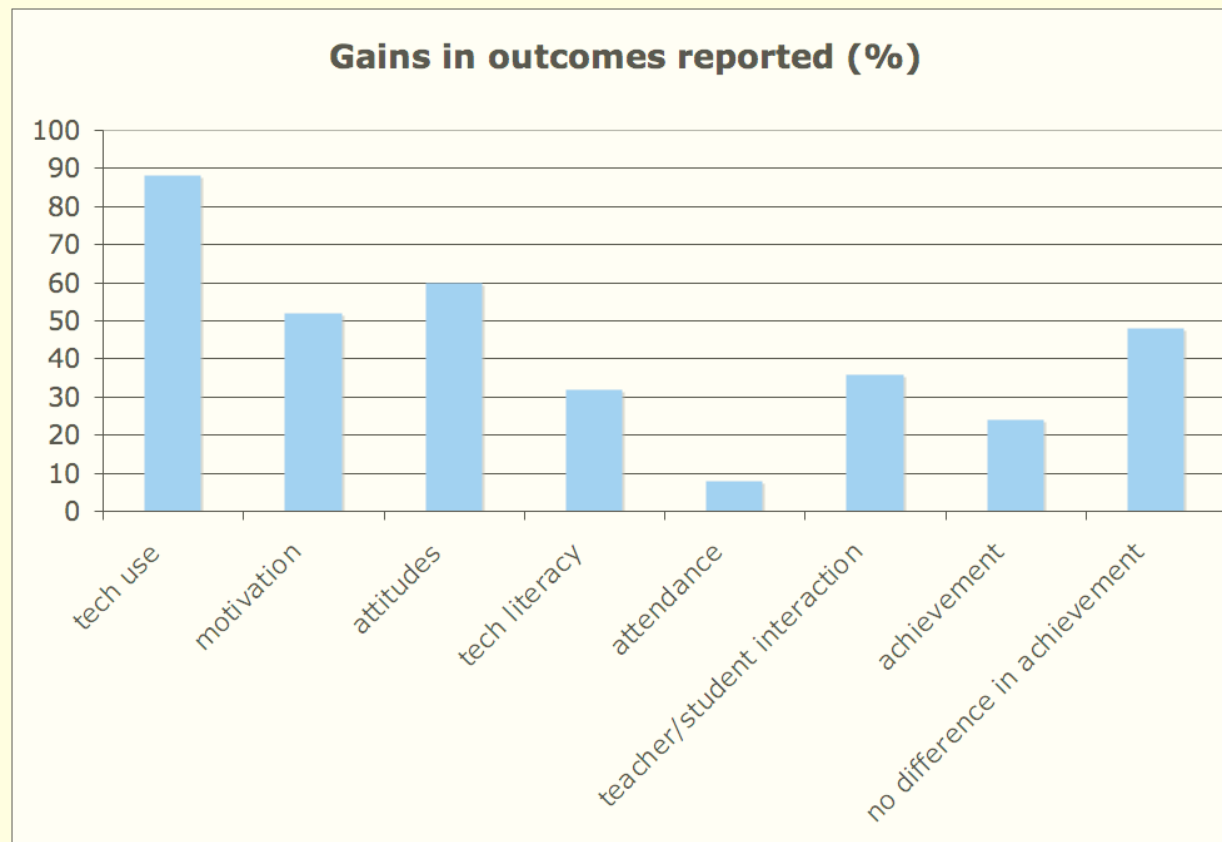
The Nature of the Evidence

Article type	Hits by article type	Includes by article type	%age of total hits	%age of total includes
Book, Section	5	0	0.6%	0.0%
Book, Whole	6	1	0.7%	0.9%
Conference Proceedings	82	15	10.0%	13.2%
Dissertation/Thesis	16	2	1.9%	1.8%
Generic	48	4	5.8%	3.5%
Journal Article	460	26	56.0%	22.8%
Magazine Article	10	0	1.2%	0.0%
Newspaper Article	6	0	0.7%	0.0%
Report	185	66	22.5%	57.9%
Web Page	3	0	0.4%	0.0%

The Nature of the Evidence

- 114 Articles and reports of one to one evaluations
- 44 with quantitative data on achievement
- 22 with quantitative data from which effect sizes could be extracted

Results - Vote Count

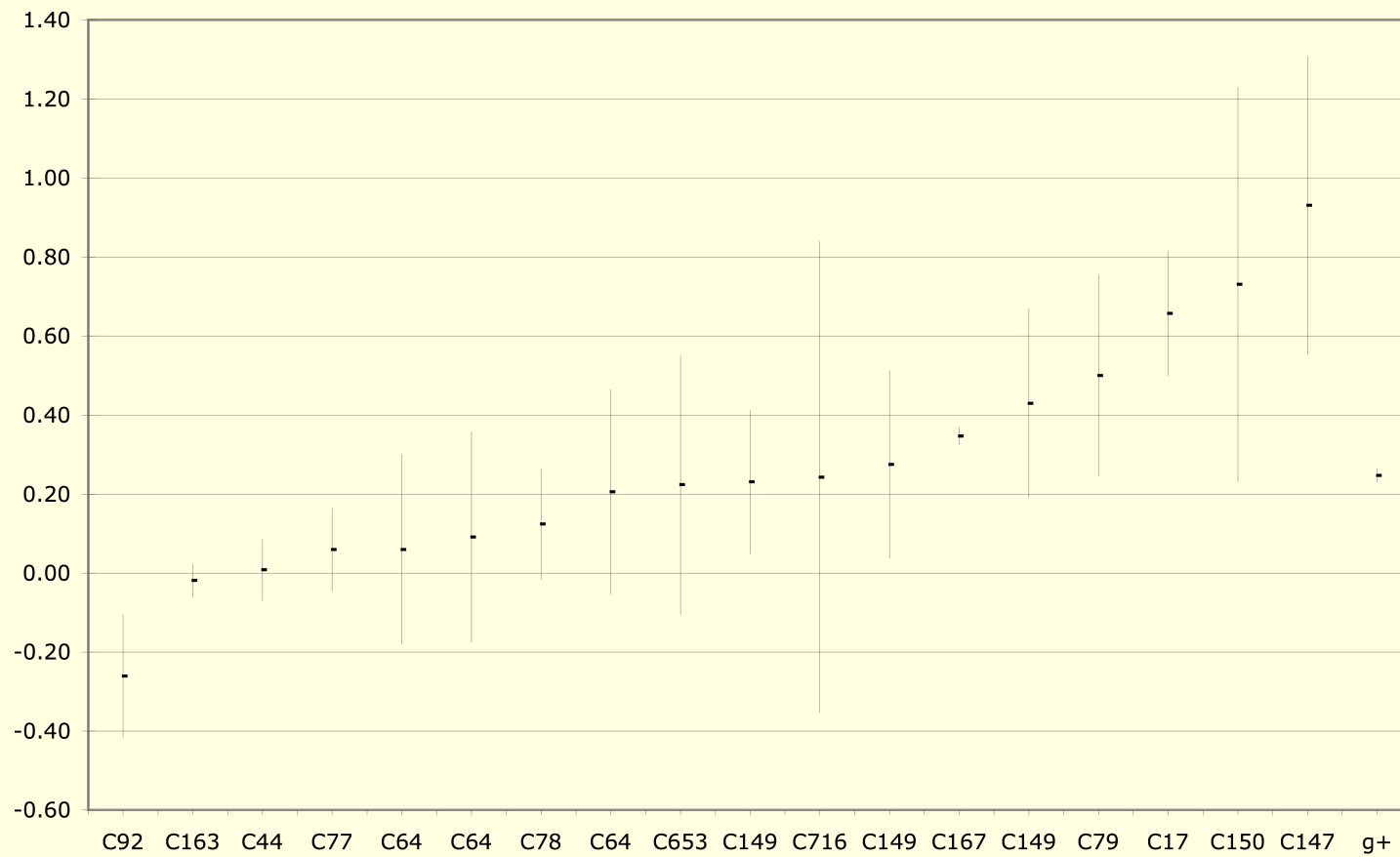


Results - ES Extraction

Study	Hedges' g	Standard Error (σ_g)	Variance (σ_g^2)	95 th Lower Limit	95 th Upper Limit	z value	p value	Weights (w_i)	Weighted g ($w_i)(g_i)$
121C17	0.66	0.08	0.01	0.50	0.82	8.13	0.00	153.12	100.59
121C44	0.01	0.04	0.00	-0.07	0.09	0.20	0.84	623.28	5.10
121C64	0.21	0.13	0.02	-0.05	0.47	1.55	0.12	57.11	11.75
121C64	0.09	0.14	0.02	-0.18	0.36	0.67	0.50	53.86	4.92
121C64	0.06	0.12	0.02	-0.18	0.30	0.49	0.62	66.63	3.97
121C77	0.06	0.05	0.00	-0.05	0.16	1.10	0.27	345.22	20.53
121C78	0.12	0.07	0.01	-0.02	0.26	1.74	0.08	196.50	24.34
121C79	0.50	0.13	0.02	0.24	0.76	3.83	0.00	58.55	29.28
121C92	-0.26	0.08	0.01	-0.42	-0.11	-3.29	0.00	158.97	-41.47
121C147	0.93	0.19	0.04	0.55	1.31	4.83	0.00	26.97	25.10
121C149	0.43	0.12	0.01	0.19	0.67	3.51	0.00	66.78	28.70
121C149	0.28	0.12	0.01	0.04	0.51	2.26	0.02	67.72	18.63
121C149	0.23	0.09	0.01	0.05	0.41	2.48	0.01	115.89	26.74
121C150	0.73	0.26	0.07	0.23	1.23	2.87	0.00	15.37	11.23
121C163	-0.02	0.02	0.00	-0.06	0.02	-0.88	0.38	2142.78	-40.79
121C167	0.35	0.01	0.00	0.32	0.37	31.02	0.00	8005.61	2775.34
121C653	0.22	0.17	0.03	-0.10	0.55	1.33	0.18	35.55	7.96
121C716	0.24	0.30	0.09	-0.35	0.84	0.80	0.42	10.78	2.62
	0.25	0.01	0.00	0.23	0.26	27.29	0.00	12200.70	3014.52
							Q	df	p
							374.63	17	0.00

Results - ES Extraction

Effect Sizes and Confidence Intervals (Writing Included)

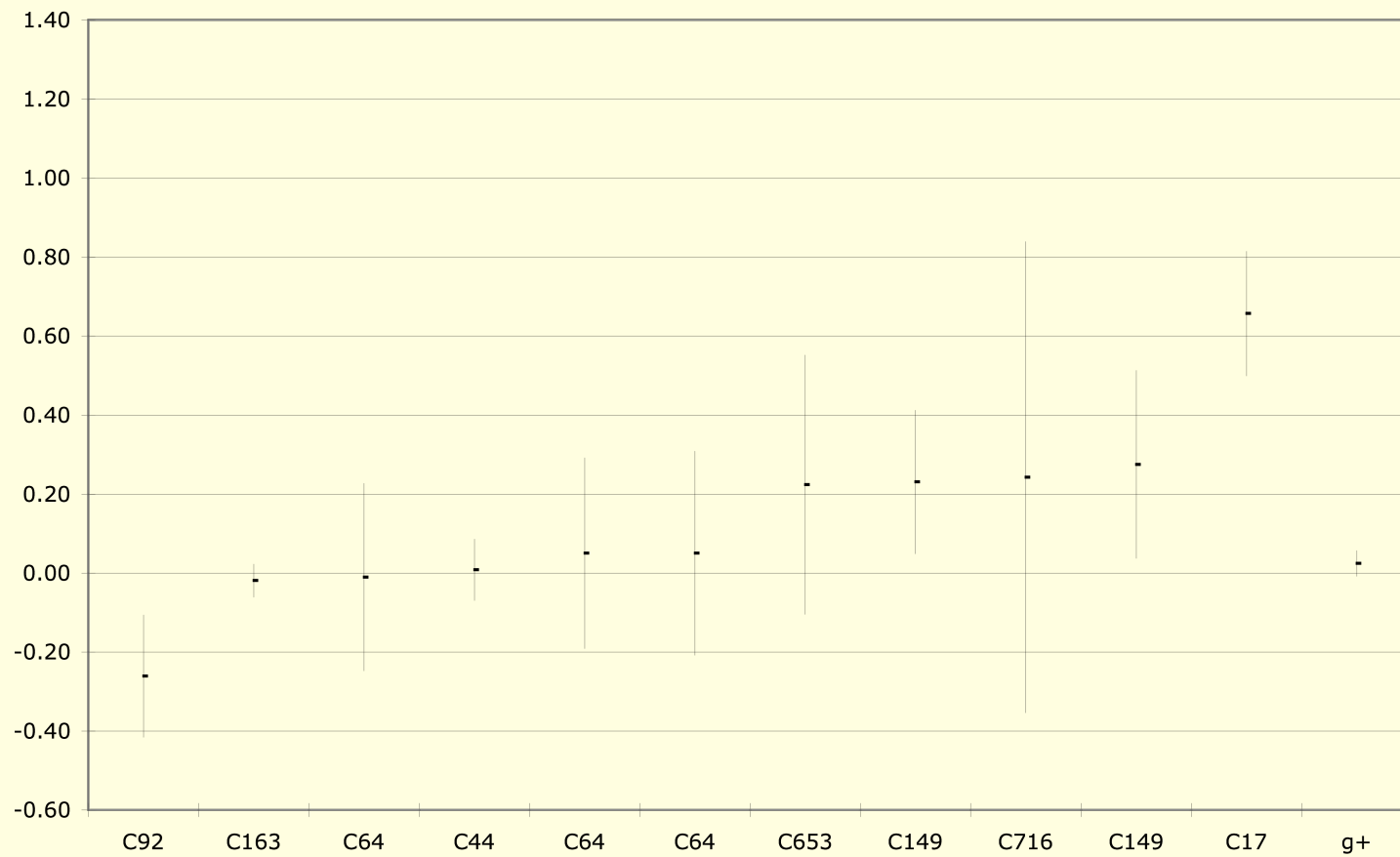


Results - ES Extraction

General Achievement Scores (without writing)									
Study	Hedges' g	Standard Error (σ_g)	Variance (σ_g^2)	95 th Lower Limit	95 th Upper Limit	z value	p value	Weights (w_i)	Weighted g ($w_i)(g_i)$
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121C64	0.05	0.13	0.02	-0.21	0.31	0.38	0.12	57.30	2.88
121C64	0.05	0.12	0.02	-0.19	0.29	0.41	0.50	65.57	3.29
121C64	-0.01	0.12	0.01	-0.25	0.23	-0.09	0.62	67.91	-0.70
121C92	-0.26	0.08	0.01	-0.42	-0.11	-3.29	0.00	158.97	-41.47
121C163	-0.02	0.02	0.00	-0.06	0.02	-0.88	0.38	2142.78	-40.79
121C653	0.22	0.17	0.03	-0.10	0.55	1.33	0.18	35.55	7.96
121C716	0.24	0.30	0.09	-0.35	0.84	0.80	0.42	10.78	2.62
	0.02	0.02	0.00	-0.01	0.06	1.43	0.00	3498.87	84.84
							Q	df	p
							89.96	10	0.00

Results - ES Extraction

Effect Sizes and Confidence Intervals (Writing Removed)



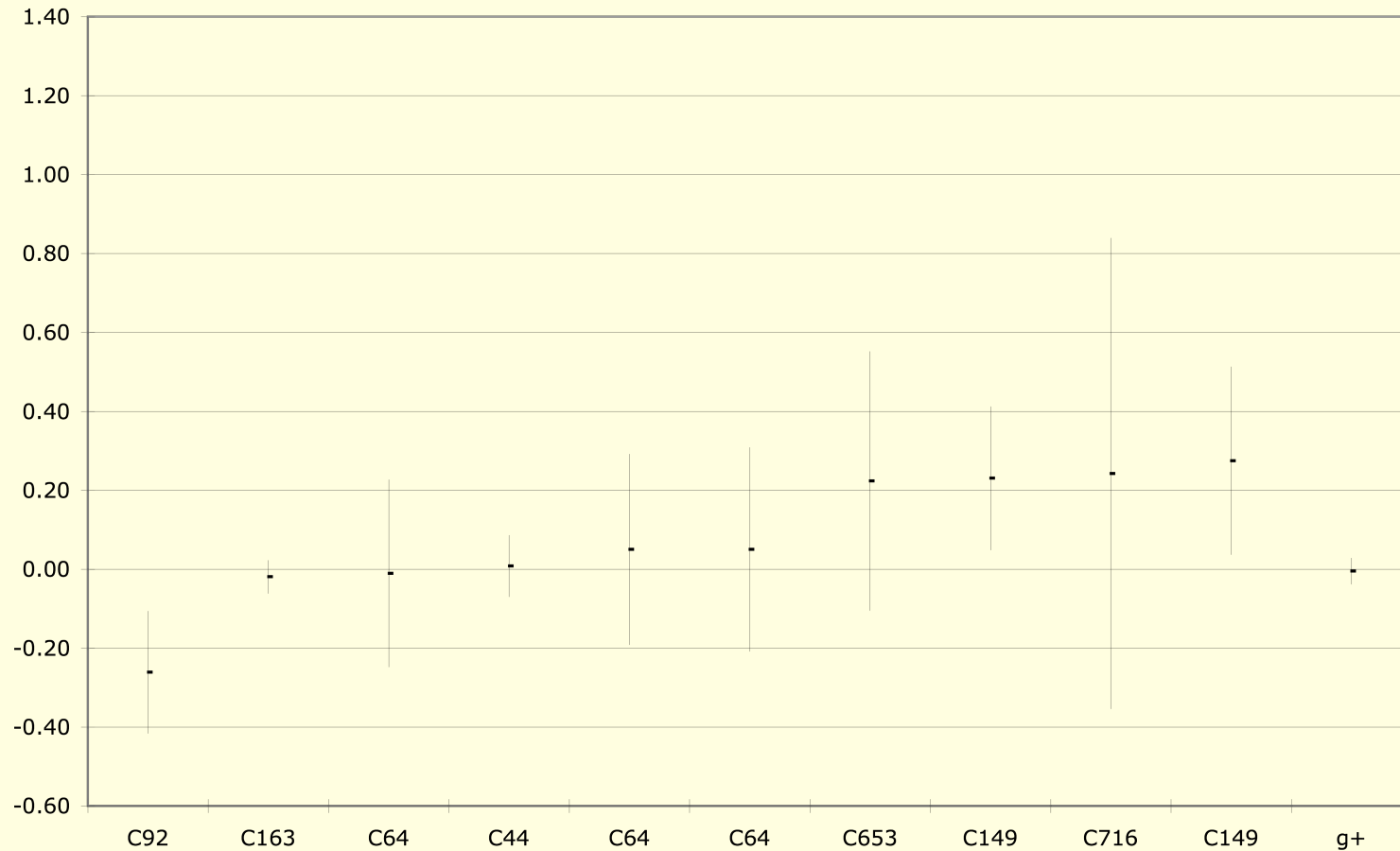
Results - ES Extraction

General Achievement Scores (Writing and Study 121C17 removed)

Study	Hedges' g	Standard Error (σ_g)	Variance (σ_g^2)	95 th Lower Limit	95 th Upper Limit	z value	p value	Weights (w_i)	Weighted g ($w_i)(g_i)$
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121C716	0.24	0.30	0.09	-0.35	0.84	0.80	0.42	10.78	2.62
	0.00	0.02	0.00	-0.04	0.03	-0.27	0.00	3345.75	-15.75
							Q	df	p
							25.59	9	0.02

Results - ES Extraction

Effect Size and Confidence Intervals Writing Removed, 121C17 Removed



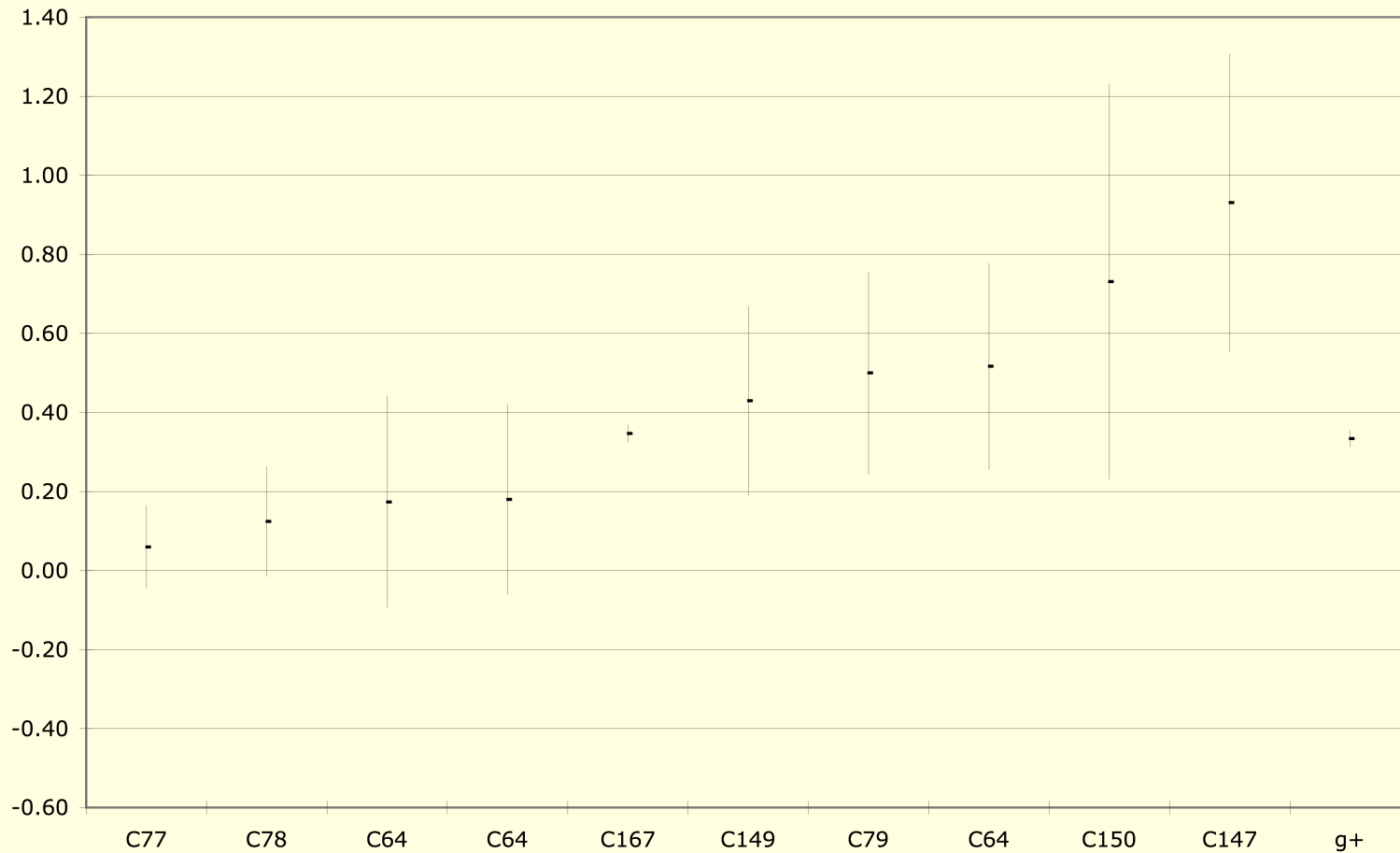
Results - ES Extraction

Writing Scores

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121C167	0.35	0.01	0.00	0.32	0.37	31.02	0.00	8005.61	2775.34
	0.33	0.01	0.00	0.31	0.35	31.44	0.00	8891.28	2964.75
							Q	df	p
							55.06	9	0.00

Results - ES Extraction

Effect Sizes and Confidence Intervals - Writing Scores



What about the other data?

Potential methodologies:

- Vote count
- Argument catalogue (see Abrami et al 2007)
- Narrative/qualitative synthesis
- Something new - categorize achievement data and synthesize with “less quantitative” data

What's Next?

- Analysis of non-quantitative studies
- Qualitative synthesis of writing methods with positive results
- Dissemination of findings
 - Academic paper
 - Practitioner article
 - Website with registry (K-Mob tool)
 - Direct contact (email or other) with program stakeholders

Questions

???

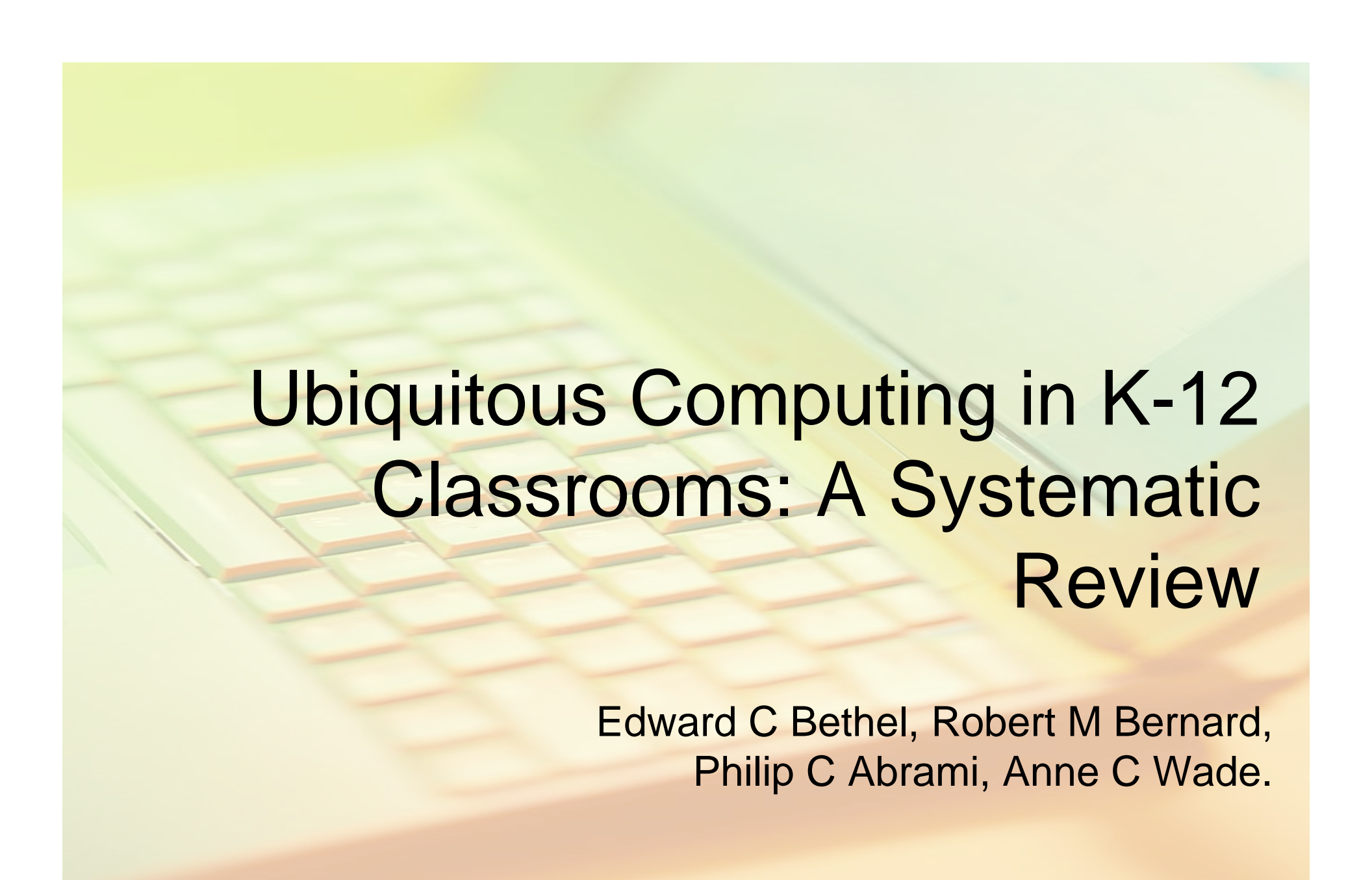
Thank you!

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