Computer assisted learning and its impact on educational programs within the past decade: A bibliometric overview of research

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With the increasing ubiquity of computers and the internet in the daily lives of people and in light of the recent broad debates on educational standards and how to achieve them, questions of using computer based learning approaches to improve the effectiveness and efficacy of competence acquisition are of increased importance. A review of psychological contributions within this area of research seems to be in order. We chose a bibliometric approach similar to Schui & Krampen (2007) to show the development of research publications on different angles of computer based learning and their application in educational contexts.

Method: A selection of APA-Thesaurus terms is used to define the corresponding literature in the psychological databases PsycINFO (Anglo-American focus) and PSYNDEX (focus on German-speaking countries). The following three sets of literature were formed and subsequently analyzed (Table 1).

***Table 1:** Formation of literature sets and absolute document counts for the combined sets in PSYNDEX (PY) and PsycINFO (PI).*

Literature sets and their corresponding APA-Thesaurus Terms			# of documents in the combined sets (no year limit)		
Computer Aided Learning (CL)	*Educational Systems (ED)*	*Evaluation (EV)*	*Combined Set*	*PSYNDEX (PY)*	*PsycINFO (PI)*
Computer aided instruction	Educational Audiovisual Aids	Course Evaluation	**CL_ED**	**113**	**278**
Teaching machines	Educational Objectives	Evaluation			
Programmed instruction	Educational Program Planning	Evaluation Criteria	**CL_EV**	**146**	**391**
	Educational Programs	Educational Program Evaluation			
	Educational Standards	Educational Quality	**CL_ED_EV**	**18**	**26**
	Educational Reform				
			CL total	**1111**	**8951**

Results

The literature on *computer-aided learning* is a small fraction (0.25%–1.25%) of the total psychology literature. Percentages are comparable to small sub-disciplines like sport-, political- or environmental psychology. When combined with education- or evaluation-related terms, frequencies are in the one-tenth of a percent range. From 1995–2006, the total CL-literature has an upward trend (PI: moderate; PY: stronger, see Fig. 1). Within CL, literature on educational contexts ranges from 2%–18% (see Fig. 2). Publications with evaluative focus have a small peak from 1999–2001 in PI and scatter from 5%–27% in PY (see Fig. 3). The most frequently used descriptors in CL apply to technical or teaching aspects. Some specify areas of application, i.e. college, high school, elementary school, mathematics-, science-, and special education, or foreign language- and cooperative learning. The most frequent education-related terms (excluding the broad term 'education' itself) are 'educational programs' and 'educational program evaluation' (PI: <5 publications per year before 1998, 5–25 after; PY: more moderate increase).

Dominant literature types in PI are journal articles (CL_ED 71.2%; CL_EV 83.6), book chapters (CL_ED 18.3; CL_EV 7.2%) and dissertations (CL_ED 9.4%; CL_EV 8.2%). In PY, the relation of articles (CL_ED 38.1%; CL_EV 43.2%) and chapters (CL_ED 42.5%; CL_EV 35.6%) is more even, dissertations are somewhat less frequent. In PI, over 90% of the literature is empirical (~10% thereof qualitative), ~3% are literature reviews. Meta-analyses (3%) and longitudinal studies (2%) are found only in CL_EV. In contrast, PY contains more overview literature (especially in CL_ED 46%) and a lot of case studies and illustrative empirical data, that don't play a role in PI. The originating countries for publications in CL_ED and CL_EV are very similar and are combined in the following ranking, based on PI: U.S. (58.9%), United Kingdom (10.6%), Canada (5.3%), Australia (3.7%), and the Netherlands (2.7%). The remaining 35 countries are under 2%. In broader geographical terms, 64.2 % of authors are from North America, 23.2% from Europe, 6.9% from Asia, and 4.5% from Australia/New Zealand. In PI, almost all of the relevant literature is in English (CL_ED: 98.6%; CL_EV: 97.7%). In PY, only 7% of the CL_ED-literature is in English, in CL_EV it's 6.8%. Within CL, the English percentage is 18%, which is above the overall approx. 13% of English-language literature in PY.
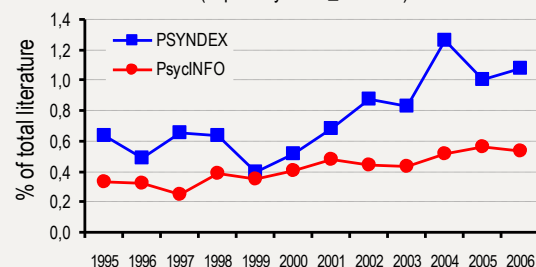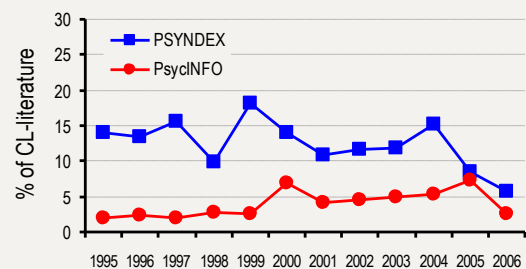

***Fig. 1:** CL within total psychology literature*

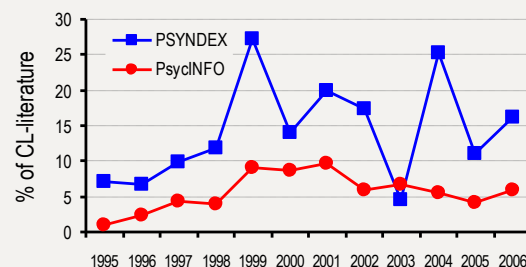
***Fig. 2:** Educational Systems within CL*

***Fig. 3:** Evaluation within CL*

Conclusion

A look at the publication frequencies from 1995–2006 shows, that everything that involves computer assisted learning, didn't really take off before the late 1990's. As a side-effect of the internet boom, the concept of using computers for teaching became more of a matter of course and thus, a higher priority in educational politics (see Revermann 2004). This is also mirrored in the increasing occurrence of the descriptors 'educational programs' and 'educational program-evaluation' since 1998.

The results suggest that there is a large number of empirical findings on an extensive range of applications of computer based learning. The relatively small number of meta-analyses hints at the heterogeneity of approaches. The same goes for longitudinal studies, pointing at the difficulties of testing the efficacy of computer based learning paradigms within larger samples over longer time periods.

Looking at the leading countries in this field of research, a strong Anglo-American lead is followed by other European countries and Asia. The numbers of publications from Africa and South America are negligible which can be seen as an indication of the information divide. Concerning the international visibility of publications from the German-speaking countries, it must be considered, that many application scenarios are language-specific, so the literature about them is also in German. But nevertheless, if one looks at the relatively high absolute publication numbers in CL_ED and CL_EV, German-speaking authors should strive to put more effort into translating their works for the international community.

References

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