

Gloria Natividad · J. Michael Spector
Nicholas Evangelopoulos

An Analysis of Two Decades of Educational Technology Publications

Who, What and Where

Lecture Notes in Educational Technology

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Lecture Notes in Educational Technology

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Gloria Natividad
University of North Texas
Denton, TX
USA

J. Michael Spector
University of North Texas
Denton, TX
USA

and

Instituto Tecnológico de Saltillo
Saltillo
Mexico

Nicholas Evangelopoulos
University of North Texas
Denton, TX
USA

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Contents

1	Introduction	1
	Criteria for Selecting the Ten Journals	2
	Research Methods	5
	Operational Definitions	6
	Limitations	17
	Historical Background	17
	Previous Studies	18
	A Series of Analyses on Educational Technology Journals	20
	References	24
2	The Ten Journals Selected for This Study	25
	The British Journal of Educational Technology (BJET)	25
	The Journal of the Learning Sciences (JLS)	28
	Educational Technology Research and Development (ETR&D)	30
	Instructional Science	31
	TechTrends	35
	Educational Technology and Society	36
	Computers and Education	39
	Journal of Educational Computing Research	43
	Journal of Research on Technology in Education (JRTE) (2001–2014) —Formerly Known as Journal of Research on Computing in Education (1995–2001)	44
	Educational Technology: The Magazine for Managers of Change in Education	49
	References	50
3	How Was the Data Collected and Analyzed?	51
	High-Level Themes	52
	Extracted Factors	53
	High-Loading Terms	56
	Factor Labels	57
	References	60

4 Research Questions and Their Answers	61
Research Question 1	61
Research Question 2	66
Research Question 3	69
Research Question 4	72
Research Question 5	73
5 Research Topics and Trends in Educational Technology	85
Research Question 5	85
Discussion	92
Recommendations for Further Research	93
References	94
6 Epilogue	95
References	98
Appendix A: British Journal of Educational Technology (BJET)	99
Appendix B: British Journal of Educational Technology (BJET)—5 Top-Cited Articles	103
Appendix C: Journal of the Learning Sciences	109
Appendix D: Journal of the Learning Sciences—5 Top-Cited Articles	113
Appendix E: Educational Technology Research and Development (ETR&D)	119
Appendix F: Educational Technology Research and Development (ETR&D)—5 Top-Cited Articles	123
Appendix G: Instructional Science	129
Appendix H: Instructional Science—5 Top-Cited Articles	131
Appendix I: TechTrends—5 Top-Cited Articles	137
Appendix J: Journal of Educational Technology & Society	143
Appendix K: Journal of Educational Technology & Society—5 Top-Cited Articles	145
Appendix L: Computers & Education	151
Appendix M: Computers & Education—5 Top-Cited Articles	159
Appendix N: Journal of Educational Computing Research	165
Appendix O: Journal of Educational Computing Research—5 Top-Cited Articles	167

Appendix P: Journal of Research on Technology in Education	173
Appendix Q: Journal of Research on Technology in Education—5 Top-Cited Articles	175
Appendix R: Journal of Research on Computing in Education.	181
Appendix S: Journal of Research on Computing in Education—5 Top-Cited Articles	183
Appendix T: List of the High-Loading Terms for the 3-Factor Solution.	187
Appendix U: List of the High-Loading Terms for the 10-Factor Solution	189
Appendix V: Wordmaps from the Titles and from the Abstracts	191

List of Figures

Fig. 3.1	A WordMap from the top 25 high-loading abstracts and a WordMap from the top 25 high-loading titles for Factor 22.2, which we labeled: <i>Student Learning</i>	57
Fig. 4.1	The SJR (the SCImago Journal Rank) for the journals: <i>Computers and Education, Journal of the Learning Sciences, Educational Technology Research and Development, the British Journal of Educational Technology Educational Technology and Society, Instructional Science, Journal of Educational Computer Research and TechTrends</i>	66
Fig. 5.1	Time series plots: percentage of all articles published per year in the ten journals, for each of the 22 topics.	87

List of Tables

Table 1.1	Names of the ten journals selected to be analyzed in this study and the total number of research papers published in each one from 1995 to 2014	5
Table 1.2	Emerging technologies and the challenges to adopt them (from the NMC Horizon Reports 2004–2014)	12
Table 1.3	Information reported on each of the eight journals (among the ten selected to be analyzed in this study) as part of the series of analyses in educational technology: the magazine for managers of change in education	21
Table 1.4	Methodology, findings, and years covered on each of the eight journals (among the ten selected to be analyzed in this study) as part of the series of analyses in educational technology	22
Table 2.1	<i>British Journal of Educational Technology (BJET)</i> Scientific indicators	26
Table 2.2	The ten most-cited articles published in the <i>British Journal of Educational Technology (BJET)</i>	27
Table 2.3	<i>Journal of the Learning Sciences</i> Scientific indicators	29
Table 2.4	The Ten most-cited articles published in the <i>Journal of the Learning Sciences</i>	30
Table 2.5	<i>Educational Technology Research and Development</i> Scientific indicators	32
Table 2.6	The ten most-cited articles published in <i>Educational Technology Research and Development (ETR&D)</i>	33
Table 2.7	<i>Instructional Science</i> Scientific indicators.	34
Table 2.8	The ten most-cited articles published in <i>Instructional Science</i> during the selected period of 20 years	35
Table 2.9	<i>TechTrends</i> scientific indicators	37
Table 2.10	The ten most-cited articles published in <i>TechTrends</i> during the 20 years	38

Table 2.11	<i>Journal of Educational Technology and Society</i> scientific indicators	40
Table 2.12	The ten most-cited articles published in the <i>Journal of Educational Technology and Society</i> over 17 years (1998–2014).	41
Table 2.13	<i>Computers and Education</i> scientific indicators	42
Table 2.14	The ten most-cited articles published in <i>Computers and Education</i> during the 20 years	43
Table 2.15	<i>Journal of Educational Computing Research</i> scientific indicators	45
Table 2.16	The ten most-cited articles published in the <i>Journal of Educational Computing Research</i> during the 20 years	46
Table 2.17	<i>Journal of Research on Technology in Education (JRTE)</i> scientific indicators	47
Table 2.18	The ten most-cited articles published in the <i>Journal of Research on Technology in Education (JRTE)</i> (2001–2014).	48
Table 2.19	The ten most-cited articles published in the <i>Journal of Research on Computing in Education</i> (previous name <i>Journal of Research on Technology in Education</i> 1995–2001).	49
Table 3.1	List of the high-loading terms identified by the LSA analysis performed for factors 1–8.	54
Table 3.2	List of the high-loading terms identified by the LSA analysis performed for factors 9–16.	55
Table 3.3	List of the high-loading terms identified by the LSA analysis performed for factors 17–22.	56
Table 3.4	The 22 factors labels and their high-loaded articles from the journals analyzed	58
Table 3.5	Contingency table (cross-tabulation).	59
Table 4.1	Journal Metrics: SNIP, IPP, and SJR	63
Table 4.2	Journal Metrics: SNIP, IPP, and SJR	64
Table 4.3	Journal Metrics: SNIP, IPP, and SJR	65
Table 4.4	Most-cited research article in each journal, published from 1995 to 2014; and the total number of years passed from first published to the year the paper had earned the highest number of citation in that particular journal	67
Table 4.5	Total number of authors with the highest HIP index (High-Impact-Paper Count).	69
Table 4.6	Authors' names with the highest HIP index (High-Impact-Paper Count), having published three or more	69
Table 4.7	Authors who have published high-loaded research articles in multiple of these ten journals.	70

Table 4.8	The most-cited authors from the High-Impact Papers (from 5457 to 759 citations).	72
Table 4.9	The most cited authors from the High-Impact Papers (from 746 to 472 citations).	74
Table 4.10	The most cited authors from the High-Impact Papers (from 469 to 357 citations).	75
Table 4.11	The most cited authors from the High-Impact Papers (from 357 to 303 citations).	76
Table 4.12	The most-cited authors from the High-Impact Papers (from 302 to 267 citations).	78
Table 4.13	The most-cited authors from the High-Impact Papers (from 267 to 245 citations).	79
Table 4.14	The most-cited authors from the High-Impact Papers (from 245 to 223 citations).	80
Table 4.15	The most-cited authors from the High-Impact Papers (from 223 to 206 citations).	81
Table 4.16	The most-cited authors from the High-Impact Papers (from 205 to 200 citations).	83
Table 5.1	Factor labels (22 factors) and the number of research articles addressing those factors published in the ten top journals selected for this study from January 1995 to December 2014	86
Table 5.2	The 3 years that received the highest number of citations for the five top-cited articles published in each of the journals	93

Chapter 1

Introduction



We are going to ask you to begin by taking a look back at your own educational journey. Think back to your overall school experience and your impression of the typical student today versus then. The first noticeable change will likely be the advances in technology and access to such. Beyond that, we want you to consider whether those changes have truly affected the learning taking place.

Due to changes in the world, changing patterns in educational psychology, the development of new technologies, and the rethinking of educational practice, the field of educational technology has continued to change significantly. Now think about a different field, such as business, medicine, or entertainment. We can see, hear, and even feel the way technology has changed those aspects of our lives. However, most people would say that even though school has changed a great deal, the learning has not changed as quickly as those other fields, at least not as much as experts predicted. Educational technology has definitely changed, but the improvement in learning has not kept up or been impacted as much as expected.

In order to improve how well our investment in technology is doing, we have to understand how it has impacted our past, is impacting our present, and will continue to impact our future. However, there are differing opinions and the research itself has fallen short of being helpful. We have to keep in mind that technology is only a variable, just as curricula, school culture, teacher practice, funding support, social environment, and other factors are variables affecting learning and instruction. The U.S. Department of Education (2010) reports that technology has impacted education, but has not yet transformed education (see <https://www.ed.gov/sites/default/files/netp2010.pdf>).

A trend is a shift or tendency within a system. Trends might move us in a new direction, while others can inhibit movement, or even send us backward. Those who make decisions for our schools should have the foresight to discern between them, along with fads or temporary novelties, and embrace trends that will endure. Also, should they endure? Is there research suggesting that technology-enhanced practices are producing results? Schools may be unable to control the direction in which some technology trends may lead, but they may be able to leverage other trends to

improve teaching and learning. Educational technologies are necessary for innovation and improvement, but technologies can also create barriers and disadvantages.

Considering the many changes and innovations involving technology in recent years, we are going to take you through the work that educational researchers have published in the last 20 years in ten of the top educational technology research journals in the field. Our purpose is to help you look at lasting trends and technologies that have had or might have an impact on education.

As stated before, the U.S. Department of Education has concluded that technology in education has not yet transformed the American educational system. They are calling on educators and administrators at every level to make better use of evidence in order to improve student outcomes. Without evidence, results will not drive improvement. Information among scientists and researchers can be spread quickly now, but researchers as well as practitioners have to be careful to take the time to ensure the information is valid.

The annual National Technology Leadership Summit (NTLS) brings together editors of educational technology journals, representatives from educational associations, nonprofit foundations, and private corporations, and federal policy makers to discuss the influence of digital technologies in education and to propose recommendations as to how digital technologies can enhance education in the twenty-first century.

Educational technology journals allow us to look at the best research through a review of high-quality published research studies in the hopes that future researchers use the information that has already been discovered. At the National Technology Leadership Summits, a common question was: *What is being published in educational technology journals and how has that changed in the last 10 years?* The answer is important, because trends in educational technology might be used to choose special issue topics and allow researchers and journal writers to work together on future research, therefore providing findings that are more useful and will actually move us toward the transformation we have been seeking, both long and short term. Hopefully, we will gain the evidence we need to guide learning technology developers, consumers, education researchers, policymakers, and research funders.

The Ten Top Journals in Educational Technology Selected for this Study and Criteria for Selecting those Journals

The educational technology research journals were selected in collaboration with Dr. J. Michael Spector and the National Technology Leadership Coalition. The journal editors associated with the National Technology Leadership Coalition (see <http://ntlcoalition.org/>) identified key research journals that might be analyzed to identify educational technology research trends. The NTLC editors who were

involved in the discussion over a 2-year period included: Dave Edyburn (*Journal of Research on Technology in Education*), Ann Thompson (*Journal of Computing in Teacher Education*), Anita McAnear (*Learning and Leading with Technology*), Kinshuk (*Journal of Educational Technology & Society*), Peter Albion, (*Journal of Technology and Teacher Education*), Michael Spector and Tristan Johnson (*Educational Technology Research & Development*), Abbie Brown and Chuck Hodges (*TechTrends*), and Glen Bull and Lynn Bell (*Contemporary Issues in Technology and Teacher Education*). The discussion among the editors led to a long list of journals to consider. Prof. Spector subsequently published a comprehensive list of educational technology journals as part of the Association for Education Communications and Technology (AECT) Tenure and Promotion Guide (see http://aect.site-ym.com/?publications_landing):

Peer-reviewed journals:

- *Asia Pacific Educational Review*
- *British Journal of Educational Technology*
- *Computers and Education*
- *Computers in Human Behavior*
- *Distance Education*
- *Educational Computing Research*
- *Educational Researcher*
- *Educational Technology Review*
- *Educational Technology Research & Development*—a high-quality AECT sponsored journal, considered the premier journal in educational technology research
- *Educational Technology & Society*—an open access online journal published by the International Forum of Educational Technology & Society
- *Evaluation and Program Planning*
- *Journal of Applied Instructional Design*—an AECT sponsored online journal
- *Journal of Computer Assisted Learning*
- *Journal of Computers in Education*
- *Journal of Computing in Higher Education*—available to AECT members
- *Journal of Higher Education*
- *Journal of the Learning Sciences*
- *Innovative Higher Education*
- *Journal of Research on Technology in Education*
- *Instructional Science*—available to AECT members
- *Interpersonal Computing and Technology Journal*
- *International Journal of Computer-Supported Collaborative Learning*—available to AECT members
- *International Journal of Designs for Learning*—an AECT sponsored online journal
- *International Journal of Teaching and Learning in Higher Education*
- *Higher Education*
- *Performance Improvement Quarterly*

- *Quarterly Review of Distance Education*—available to AECT members
- *Review of Research in Education*
- *Simulation & Gaming*
- Smart Learning Environments
- *TechTrends*—an AECT sponsored journal influential in the educational technology community
- *Technology, Instruction, Cognition and Learning*.

Non-refereed journals:

- *Educational Technology: The Magazine for Managers of Change in Education*—a journal that is very influential within the educational technology community.
- *The Journal—Technological Horizons in Education*.

Upon discussion with editors and journal publishers and the general members of the NTLC, the following criteria were discussed with regard to identifying the journals that represented major research in the broad field of educational technology:

- Impact factor: The 5-year impact factor was considered a critical indicator, but it was not necessarily considered a reason to rule out certain journals that clearly published research and had a significant impact on the field.
- Scope: The scope of the journal should not be too narrow (e.g., distance learning) or too broad (e.g., teacher education); the scope should encompass all aspects of educational technology research, implementation, and deployment.
- Focus: The focus should be primarily on research findings rather than on anecdotal evidence or product reports.
- Readership: The readership should be broadly representative of educational technology research on a global level rather than on research in a particular country or region.
- Authorship: Authorship should be open to researchers around the world and not those associated with one group or professional association.

Those journals that failed to satisfy two or more of these criteria were ruled out. These guidelines were closely followed in order to choose the most relevant, current, and broad-based research findings. Given those criteria, the AECT publication of relevant journals, and discussions of the NTLC editors, the following list of ten most influential educational technology journals was selected for analysis: (1) *Educational Technology Research and Development* (ETR&D), (2) *Instructional Science*, (3) *Journal of the Learning Sciences*, (4) *TechTrends*, (5) *Educational Technology: The Magazine for Managers of Change in Education*, (6) *Journal of Educational Technology & Society*, (7) *Computers and Education*, (8) *British Journal of Educational Technology*, (9) *Journal of Educational Computing Research*, and (10) *Journal of Research on Technology in Education*.

Table 1.1 shows the journals' names and the total number of articles published during the period of investigation of this study, which extends to 20 years, from each of the ten journals.

Table 1.1 Names of the ten journals selected to be analyzed in this study and the total number of research papers published in each one from 1995 to 2014

	Journal title	Published articles 1995–2014
1	<i>Educational Technology Research and Development (ETR&D)</i>	663
2	<i>Instructional Science</i>	546
3	<i>Journal of the Learning Sciences</i>	272
4	<i>TechTrends</i>	1280
5	<i>Educational Technology: The Magazine for Managers of Change in Education</i>	1031
6	<i>Journal of Educational Technology & Society</i>	1253
7	<i>Computers and Education</i>	2369
8	<i>British Journal of Educational Technology (BJET)</i>	1202
9	<i>Journal of Educational Computing Research</i>	862
10	<i>Journal of Research on Technology in Education</i>	492

Research Methods

We want to address the methods used to research the ten journals in the 20-year period covered by this study. A database was created with bibliographical information from January of 1995 to December of 2014. Editorials, introductions to special issues, conference reports, book reviews, and paper discussion commentaries and their responses were not incorporated. With the Internet being so influential in research over the last 20-year period, this extended period of time was selected, rather than a shorter 10-year period as originally planned, in order to be able to perform a more informative trend analysis.

Latent semantic analysis (LSA), a text analytic method that extracts underlying concepts from observed instances of word usage, was used to analyze the large body of collected research articles (9969) published during the last 20 years in the ten journals studied. The rigorous analysis followed the guidelines in Evangelopoulos et al. (2012) and the steps recommended in Kulkarni et al. (2014).

The software used for the citation analysis, *Publish-or-Perish*, relies on Google Scholar and Microsoft Academic Search for its citation counts. Even though the citation sources considered by *Publish-or-Perish* include books, conference proceedings, a wider range of journals, shorter pieces such as editorials and colloquium contributions, *Publish-or-Perish* still presents a good estimate of citation numbers and was determined to be better than any other single source for this purpose. However, since, as noted earlier, only research publications were included in the final data set analyzed in this study, the researchers cross-referenced for accuracy the papers retrieved from *Publish-or-Perish* against a Ten Journal Master List file, compiled and verified using information from multiple digital libraries and the publishers' web sites, and disregarded articles returned by *Publish-or-Perish* that were not contained in the master list.

Operational Definitions

Science

A stereotypical scientist works alone to research and experiment. However, science is really meant to be social and cumulative. With only a few exceptions, scientific research cannot be done without drawing on the work of others or collaborating with others. In order for scientific findings to have substance, direction, and meaning, they must incorporate society and historical knowledge.

Why perform research in the first place? We need a better understanding of our physical, biological, or social world. However, in order to be considered scientific, knowledge has to be presented to others in order to be evaluated, critiqued, and judged. To do this, researchers talk to their colleagues and supervisors in laboratories, in hallways, via social networks, and over the telephone. They trade information over computer networks. They give presentations at seminars and conferences. They write up results and send them to scientific journals, which in turn send the papers to be read by experts in the field. After a paper is published or a finding is presented, it is judged by other scientists in the context of what they already know from other sources. This is all a social process. “Throughout this continuum of discussion and deliberation the ideas of individuals are collectively judged, sorted, and selectively incorporated into the consensual but ever evolving scientific worldview. In the process, individual knowledge is gradually converted into generally accepted knowledge” (Hamilton [2002](#), p. 69).

Academic Journals

Henry Oldenburg was one of the founding editors of the oldest published scientific journal, *Philosophical Transactions of the Royal Society*; he felt that an academic journal is a way for researchers to share and improve knowledge, and to try to make sciences and philosophies complete. Oldenburg pioneered the practice of sharing the manuscripts that were submitted to his journal with experts who would judge their quality before publication. This was the beginning of both the modern scientific journal and the practice of peer review.

An academic or scholarly journal is a peer-reviewed or refereed periodical that distributes knowledge and provides a forum for introducing new research and for critiquing existing research.

Scholarly Articles

A scholarly article is one that has been submitted and has gone through peer review by an academic journal. The work is either solicited or unsolicited. Someone whose work is solicited has been asked to submit their work, while unsolicited work is from someone who would like their work published but has not been directly asked to do so. Editors at the journal determine whether to reject the submission outright or begin the process of peer review. In peer review, the editor chooses experts to review the submission, who normally remain anonymous.

Typically, there are at least two peer reviewers (referees), and there may be more than three experts in the article's subject matter. They report on the content, style, and other factors, and then the editor can make a decision about publishing. While it is more common for them to be confidential, there are some public peer reviews. Even accepted articles are often subjected to further (sometimes considerable) editing by the journal's editorial staff before they appear in print. This process can take from several weeks to several months. Most of the journals involved in this study provide feedback to authors within 2 or 3 months.

Scholarly Publishing

Scholarly publishing is when high-quality research goes through the peer review processes and is found to be valid. All but one of the journals involved in this analysis have a standard peer-review policy in place and the single outlier is reviewed by the editor and often by senior consulting editors. That journal—*Educational Technology*—is one of the first ones to emerge in the 1960s in this area, and it has been one of the most influential among both researchers and practitioners, which is why it has been included in the analysis.

Historically, there are three recognized phases of American scholarship: first, a focus on teaching, building character, and preparing students for civic or religious leadership. Second, a practical focus on adding service as a goal (not just serving society but reshaping it) in order for education to be considered useful (the beginning of applied research). Third, the advancement of knowledge through research, which became more prevalent in colleges and universities after World War II, when nuclear energy was developed. In 1945, Vannevar Bush published a report urging federal support for research, stating that scientific progress was imperative to the health, prosperity, and security of the nation. Soon, faculty hired as teachers were being evaluated primarily as researchers.

We still witness the *publish or perish* idea among academics, who seek journals to include their work in order to increase their rank and income. However, teaching may now be more strongly supported in the area of education. Schoenfeld and Magnan (1992) suggested a ranking order of places to publish, in descending order by what they called a *Nielsen rating*:

1. Refereed scholarly journal, the more prestigious the better
2. Refereed professional journal or book
3. Book chapter
4. Non-refereed semiprofessional periodical or textbook
5. Conference proceedings, essay collection
6. Semitechnical general circulation magazine
7. General circulation magazine or newspaper
8. Radio or TV documentary.

Prestige and Ranking

Regardless of subject matter, you will find journals dedicated to any given academic discipline. Among those, there are always a small number that enjoy selective publishing, because they receive the most submissions. This is part of how journals earn prestige.

Besides the number of articles citing articles already published in natural and social science journals, there are other quantitative factors (e.g., the number of citations, how quickly articles are cited, and the average *half-life* of articles) that can be used to evaluate prestige. Which one rules, quality or quantity? For this study, prestige rankings are understood as a combination of the number of endorsements and the prestige or importance of the journals issuing them and are provided by SJR SCImago Journal Rank.

Journal Metrics

Journal metrics is how we measure the performance and/or impact of scholarly journals. We are in the age of standardized measurement. This has been the trend for at least the past 25 years, and educational technology is no exception. The impact factor, developed by Eugene Garfield, is generally and widely considered to be the most broadly spread way to measure the rank of academic publications. Garfield (1997) stressed that in different research fields, there is varied citation potential. For example, on average, biochemical papers contain 30 cited references, and mathematics articles 15. To avoid unfair comparisons among fields, he suggested “the most accurate measure of citation potential is the average number of references per paper published in a given field” (p. 242).

SNIP

SNIP (Source Normalized Impact per Paper) measures contextual citation impact by weighting citations based on the total number of citations in a subject field. SNIP is defined as the ratio of a journal's citation count per paper and the citation potential in its subject field.

IPP

IPP (The Impact per Publication) measures the ratio of citations per article published in the journal. The IPP metric uses a citation window of 3 years, which is considered to be the optimal time period to accurately quantify citations in most subject fields. When normalized for the citations in the subject field, the raw Impact per Publication becomes the Source Normalized Impact per Paper (SNIP). Note that in the context of the calculation of SNIP, the raw Impact per Publication is usually referred to as RIP.

SJR

The SJR (the SCImago Journal Rank) is a prestige metric based on the idea that not all citations are the same. The calculation of the SJR involves three stages

- (1) Initial assignation of the SJR: a default prestige is assigned to every journal.
- (2) Iteration process of calculation: now the computation is iterated to calculate the prestige of each journal based on the prestige transferred by the rest.
- (3) Computation of SJRQ: each journal now has its SJR, the indicator of global prestige of a journal, computed. Therefore, the prestige average per article could be compared without having in mind other factors like the frequency of each journal, the number of articles, etc.

h-Index

The h-index is a journal-level metric that attempts to measure both the productivity and citation impact of the publications of a scholarly journal. The index was suggested in 2005 by Jorge E. Hirsch, a physicist at the University of California in San Diego. The h-index works properly only for comparing scholarly journals from the same field since citation conventions differ widely among different fields. The h-index is intended to measure simultaneously the quality and quantity of scientific output.

Open Access

Internet access caused an explosion of available information. Therefore, access to academic journals has greatly increased in recent years. Databases, like Google Scholar and the Social Science Research Network, index articles by subject and keywords. Smaller, more specialized journals are often prepared by academic departments and published only online and sometimes as blogs. Many involved in higher education are encouraging open access. Authors can self-archive papers, so they can be searched for and read. Authors can also publish papers in a free and open access journal that does not charge for subscriptions because it is either subsidized or sustained by publication fees. However, it can be tricky for publishers to protect their revenue, while still promoting open access, and charging young scholars with limited income puts them at a disadvantage.

Another con of the open access movement is the publication of *junk or fake journals*, which have lower (if any) publishing standards. These fake journals use the names of well-established journals to create a similar name, and then using email, charge the author to publish an article. As of April 2013, there were over 300 of these journals (see <http://beallslist.weebly.com/> for an updated list).

Latent Semantic Analysis (LSA)

Latent semantic analysis (LSA) is a text mining technique that identifies common themes in a collection of documents. It was initially introduced as latent semantic indexing, an information-retrieval- and query-optimization system (Deerwester et al. 1990), but was eventually used to analyze textual data by extracting socially constructed components of meaning within a large body of documents, a corpus. In other words, Latent semantic analysis (LSA) is a model of knowledge representation for texts that works by applying dimension reduction to local co-occurrence data from a large collection of documents after performing singular value decomposition on it (Evangelopoulos 2015). When the reduction is applied, the system forms condensed representations for the words that incorporate higher order associations. The higher order associations are primarily responsible for any semantic similarity between words in LSA (Landauer 2007).

Emerging Educational Technologies

While educational technology integration is a challenge, it has pushed education systems to define their goals and objectives. Countries with varied demographics have come together, attempting to identify what is possible for children 9–13 years

of age to know and to be able to do. The goal is to improve students' personal and societal performance. Scholars and researchers from all over the world have been exploring the issue of emerging educational technologies and their impact for years. Examples of groups doing this and the efforts they have made include:

1. The New Media Consortium's Horizon Report (see <http://www.nmc.org/nmc-horizon/>),
2. The Roadmap for Educational Technology (see <http://acrhive2.cra.org/ccf/files/docs/groe/Roadmap%20for%20Education%20Technology%20-%20Summary%20Brochure.pdf>),
3. The European STELLAR project (see <http://www.teleurope.eu/pg/frontpage>),
4. The GaLA: Games and Learning Alliance (see <https://conf.seriousgamesociety.org/>).
5. The IEEE Technical Committee on Learning Technology (see <http://lttf.ieee.org/>), and
6. The National Technology Leadership Coalition (see <http://www.ntlcoalition.org/>).

The New Media Consortium (NMC) is an alliance of various not-for-profit organizations which research and apply new media and technologies in the area of learning transfer. NMC's annual *Horizon Report* details the findings from NMC's ongoing Horizon Project, a research-oriented effort that seeks to identify and describe emerging technologies likely to have a large impact on teaching, learning, or creative expression. Since the project launched in March 2002, the NMC has held an ongoing series of conversations with more than 400 technology professionals, campus technologists, faculty leaders from colleges and universities, and representatives of leading corporations from around the world to explore and forecast the impact of emerging technologies across all learning sectors.

Adapted from the Horizon Reports, Table 1.2 shows the significant challenges discussed in each year's report. You will notice which emerging technologies were expected to have a large impact over the following 5 years in education all around the world. You should also find significant challenges and constraints for teaching, learning, and creative inquiry with regard to adopting those technologies. It also predicts the timelines for a featured set of technologies being adopted by many colleges and universities.

Most people in this field know that we must value and integrate professional development into the culture of the schools. Also, we must address the challenges faced in fulfilling the needs of today's students. These are two significant issues that are having and will continue to have a significant impact on the ways in which schools approach the core missions of teaching, learning, and creative inquiry, not only in developed countries, but also in economically disadvantaged places.

Table 1.2 Emerging technologies and the challenges to adopt them (from the NMC Horizon Reports 2004–2014)

	Significant challenges	Broad adoption expected within:		
		One year or less	Three-to-five	Four-to-five
2014	Low Digital Fluency of Faculty Relative Lack of Rewards for Teaching Competition from New Models of Education Scaling Teaching Innovations Expanding Access Keeping Education Relevant http://www.nmc.org/publications/2014-horizon-report-higher-ed	– Flipped Classroom and Learning Analytics	– 3D Printing-Games and Gamification	Quantified Self and Virtual Assistants
2013	Faculty training lacking digital media literacy Scalable modes of assessment needed for new scholarly forms of authoring, publishing and researching Education Processes and Practices limit new technologies Technology and Practices are not supporting the demand for personalized learning Most academics are not using new technologies for learning, teaching nor research. http://www.nmc.org/pdf/2013-horizon-report-k12.pdf	MOOCs and Tablet Computing	Games & Gamification and Learning Analytics	3D Printing and Wearable Technology
2012	Economic pressures and new models of education are bringing unprecedented competition to the traditional models of higher education Appropriate metrics of evaluation lag the emergence of new scholarly forms of authoring, publishing, and researching Digital Media Literacy as a key skill in every discipline and profession Institutional barriers impede moving forward with emerging technologies	Mobile apps and Tablet Computing	Game-based Learning and Learning Analytics	Gesture-Based Computing and Internet of things

(continued)

Table 1.2 (continued)

	Significant challenges	Broad adoption expected within:		
		One year or less	Three-to-five	Four-to-five
2011	Significant challenges for libraries and university collections to document scholarship http://www.nmc.org/pdf/2012-horizon-report-HE.pdf Digital Media Literacy as a key skill in every discipline and profession Appropriate metrics of evaluation for new forms of authoring, publishing and researching Economic pressures and new models of education are bringing unprecedented competition to the traditional models of higher education Keeping pace with the rapid proliferation of information, software tools and devices is challenging for students and teachers alike. http://www.nmc.org/pdf/2011-Horizon-Report.pdf	Electronic Books and Mobiles	Augmented Reality and Game-Based Learning	Gesture-Based Computing and Learning Analytics
2010	The role of the academy and the way we prepare students for their future lives is changing The work of students is seen as collaborative by nature and there is more collaboration between departments Appropriate metrics for evaluating new scholarly forms of authoring, publishing and researching are needed Digital media literacy as a key skill in every discipline and profession Institutions increasingly focus more narrowly on key goals due to shrinking budgets. http://www.nmc.org/pdf/2010-Horizon-Report.pdf	Mobile Computing and Open Content	Electronic Books and Simple Augmented Reality	Gesture-Based Computing and Visual Data Analysis

(continued)

Table 1.2 (continued)

	Significant challenges	Broad adoption expected within:		
		One year or less	Three-to-five	Four-to-five
2009	A growing need for formal instruction in key new skills, including information literacy, visual literacy and technological literacy Students are different but a lot of educational material is not There is a need for innovation and leadership at all levels of the academy It is expected to measure and prove through formal assessment that our students are learning Higher education is expected to make use of and to deliver services, content and media to mobile devices. http://www.nmc.org/pdf/2009-Horizon-Report.pdf	Mobiles and Cloud Computing	Geo-Everything and The Personal Web	Semantic-Aware Applications and Smart Objects
2008	There is a need for innovation and leadership at all levels of the academy Higher education is expected to make use of and to deliver services, content and media to mobile and personal devices The renewed emphasis on collaborative learning is pushing the educational community to develop new forms of interaction and assessment There is a need to provide formal instruction in information, visual and technological literacy as well as in how to create meaningful content with today's tools. http://www.nmc.org/pdf/2008-Horizon-Report.pdf	Grassroots Video and Collaboration Webs	Mobile Broadband and Data Mashups	Collective Intelligence and Social Operating Systems
2007	Assessment of new forms of work continues to present a challenge to educators and peer reviewers There are significant shifts taking place in scholarship, research, creative expression, and learning, and a profound	User Created Content and Social Networking	Mobile Phones and Virtual Worlds	The New Scholarship & Emerging Forms of Publication and Massively Multiplayer Educational Gaming

(continued)

Table 1.2 (continued)

	Significant challenges	Broad adoption expected within:		
		One year or less	Three-to-five	Four-to-five
	need for leadership at the highest levels of the academy that can see the opportunities in these shifts and carry them forward Issues of intellectual property and copyright continue to affect how scholarly work is done There is a skills gap between understanding how to use tools for media creation and how to create meaningful content The renewed emphasis on collaborative learning is pushing the educational community to develop new forms of interaction and assessment Higher education is facing a growing expectation to deliver services, content and media to mobile and personal devices. http://www.nmc.org/pdf/2007_Horizon_Report.pdf			
2006	Peer review and other academic processes, such as promotion and tenure reviews, increasingly do not reflect the ways scholarship actually is conducted Information literacy should not be considered a given, even among “net-gen” students Intellectual property concerns and the management of digital rights and assets continue to loom as largely unaddressed issues The typical approach of experimentally deploying new technologies on campuses does not include processes to quickly scale them up to broad usage when they work, and often creates its own obstacles to full deployment	Social Computing and Personal Broadcasting	The Phones in their Pockets and Educational Gaming	Augmented Reality and Enhanced Visualization and Context-Aware Environments and Devices

(continued)

Table 1.2 (continued)

	Significant challenges	Broad adoption expected within:		
		One year or less	Three-to-five	Four-to-five
2005	The phenomenon of technological “churn” is bringing new kinds of support challenges. http://www.nmc.org/pdf/2006_Horizon_Report.pdf All these 6 technologies chosen for the 2005 Horizon Report are seeing significant development in the private sector, but their applications for higher education are still unfolding The underlying technologies fade into the background while collaboration and communication are paramount Familiarity with the toolset may lead to increasingly creative approaches to learning on the part of students. http://www.nmc.org/pdf/2005_Horizon_Report.pdf	Extended Learning and Ubiquitous Wireless	Intelligent Searching and Educational Gaming	Social Networks & Knowledge Webs and Context-Aware Computing/Augmented Reality
2004	The existing body of knowledge is sufficient but not widely understood Good learning-design models need to be made more accessible to people charged with the authoring of learning objects and higher level-components Tools need to be developed that make the use of these practices automatic and transparent to authors and other aggregators of content Quality standards need to be articulated so learning objects can be certified as meeting minimum criteria for effectiveness. http://www.nmc.org/pdf/2004_Horizon_Report.pdf	Learning Objects and Scalable Vector Graphics (SVG)	Rapid Prototyping and Multimodal Interfaces	Context-Aware Computing and Knowledge Webs

Limitations

There are a number of factors that may influence the research topics studied and published in the educational technology field. First of all, some research topics lack the necessary data, and therefore receive minimal coverage in the ten top journals selected for this study. Next, there are many additional sources that could offer insights that were not included due to various reasons; those may be included in future studies. For example, other journals, editorials, conference proceedings, interviews, introductions to special issues, commentaries, book reviews, and reputable websites. Also, tenure and promotion requirements may have influenced the direction of research as authors typically pursue topics with the greatest potential for publication in top journals like the ten studied here. Looking at detailed interviews with leading editors and researchers is likely to add insight and depth to our findings, so these very well could be used in future studies, if we need to elaborate on or confirm our findings. Conversely, data for other research topics (such as those found in *Learning and Instruction*) might have been easily acquired, resulting in a large number of high-quality papers.

Other limitations pertain to the methodology used in this analysis. LSA does not provide an in-depth analysis of a paper or text, it extracts the terms contained in a set of documents and analyzes the relationships between and among that set of documents; and then it produces a set of key concepts related to the documents and terms. To address some of the limitations of LSA the researchers applied singular value decomposition (SVD) to find direct and indirect association as well as higher order co-occurrences among the terms that resulted from the LSA.

Taking all of these limitations into consideration, we can still confidently provide, at least a preliminary indication of the research trends, emerging technologies, and the authors publishing research in the area of educational technology in the period of 20 years, from 1995 to 2014.

Historical Background

Let us take a look at the journey that led us to educational technology as a mature discipline. Just in the last 30 years has ET been emerging as a recognized discipline. Many studies focusing on research topics and trends in the field of education exist in the literature; we can look at them to get some help with the understanding of trends in scholarship.

Some of these studies from published research papers have been done with the goal of analyzing research trends and characterizing scientific communities. Most of the studies have been limited to only one journal; some have broadened their scope

to include three or, on a few occasions, five different journals. Other weaknesses found in the literature include a narrow area of research, methodologies that were not rigorous enough in their analyses, and criteria that did not justify selecting those specific journals.

Using the top ten journals mentioned previously, we set out to present a better understanding of trends in educational technology research.

Educational Technology

Ever since educational technology was recognized as a discipline of study and research, many scholars, and especially educational technologists, have been pre-occupied with creating its definition. This is necessary in order for a new profession to be recognized. So, the AECT's (see <http://aect.site-ym.com/>) Board of Directors agreed and approved in 2004, after many meetings, e-mails, telephone calls, and conference calls, and with the participation of the Professors of Instructional Design and Technology (PIDT; see <http://www.byuipt.net/pidt/>) and the AECT Definition and Terminology Committee, a one-sentence definition for educational technology:

Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources.

Previous Studies

So, what are the issues, and what impact and trends are relevant to this field? As we start to address these questions, there are many studies we can consider. For example, Torkelson made a review covering 25 years, analyzing 553 papers, and attempting to answer three fundamental questions: (1) who are we as a profession, as exemplified by our choice of terminology, purpose, and theoretical foundations? (2) What have we done? (3) Has *AVCR* made any difference in education? Torkelson argued that we should always be conscious of purpose and systematic inquiry in future AECT publications. This study was significant because it provided an overview of the status of the educational technology profession.

In a 1989 survey by Higgins, Sullivan, Harper-Marinch and Lopez about topics and types of articles published in *ETR&D*, the topic of interactive video was ranked first, while subscribers ranked the topic of instructional development first. This raised the question as to whose preferences should be given priority.

Ely et al. (1992) conducted a content analysis in *Educational Technology*, reviewing articles from the five leading journals at that time: *British Journal of Educational Technology (BJET)*, *Educational and Training Technology International*, *Educational Technology*, *Educational Technology Research and Development*, and *TechTrends*. They identified ten emerging trends that reflected the status of the field at the time of the study. The ten trends were

- (a) Instructional design and development principles are guiding technology-based teaching/learning products
- (b) Evaluation is gaining importance as performance technology is developed
- (c) The growing number of ET case studies are providing general guidance
- (d) Distance education is used at every educational level and in almost every sector
- (e) The field of ET has more and better information about itself than ever before
- (f) Computers are present in virtually all schools
- (g) Telecommunications is the link that connects education to the world
- (h) New technology is changing the teacher's role in the learning process
- (i) The pressure to adopt technology versus concern for its impact on children in the society at large is a new debate; and
- (j) Professional education of educational technologists has stabilized in size and scope.

A study by Molenda et al. (1998) discussed ten key issues after looking at trends in educational technology. It is important to note that experts felt that the rapid technology developments, the merging of old media into digital format, and the changes in the related companies, made it very difficult to confirm what the problems were and how to measure them. Later, trends were presented that seemed to be emerging due to socioeconomic powers influencing business and society. The move was toward patterns of practice and the stages of those patterns.

Other studies found in the literature review focused on the variety of research approaches; here are just a few of these types of research:

- (a) Greatly organized basic-research studies of cognitive processes prompted from communications with computers
- (b) Descriptive and exploratory studies about the application of information and communication technologies as educational tools
- (c) Context specific, design-based research of how certain technologies function in particular environments but not in others
- (d) Applied research on solving schools and training organizations problems.

Other studies focused on whether or not educational technology is effective. Topics and perspectives included the following:

- (a) Achievement gains for the treatment (technology supported) condition over the control condition
- (b) Studies discouraging media comparison and studies showing no sustained improvement in education
- (c) Computer-Assisted Instruction and training and increasing teacher effectiveness.

Many studies have been done on the trends, with the types of research and topics published including the following:

- (a) Trends in technology research
- (b) Effectiveness of different forms of feedback or feedback strategies
- (c) The ongoing media-effect debate
- (d) Program evaluation.

A Series of Analyses on Educational Technology Journals

During the years 2011–2014, *Educational Technology: The Magazine for Managers of Change in Education*, published a series of analyses on educational technology journals. Richard E. West was the contributing editor and worked with 83 student co-authors. They analyzed 23 of “the most popular journals in the field” of educational technology, a study which led to the first article of this series published in the July–August issue of 2011.

They studied the journal abstracts and keywords of a single journal at a time and reported results on the research methods used, article types, and subject terms, during periods of 5, 8, and 10 years. From the 23 journals they analyzed, 8 are among the 10 studied in this book.

You can look at Table 1.3 for a summary of the information published in each of these eight journals’ studies. In addition, Table 1.4 presents the methodology the authors followed, the findings they reported in their research articles, and the time period of the examination.

It is important to understand what kind of research has been conducted in the recent past, as well as the patterns and discussions that are being discussed in academic journals. Several recent studies have reported citation and authorship patterns, but, as shown in this section, most of them only within single journals.

Through analyses of ten of the top journals in educational technology we want to show both individual thoughts as well as findings on the field overall: trends in research topics, citations, and authorship. This is how to better understand trends in scholarship over the past 20 years (1995–2014) and potential new directions in research and publications.

Table 1.3 Information reported on each of the eight journals (among the ten selected to be analyzed in this study) as part of the series of analyses in educational technology: the magazine for managers of change in education

	Trends in research methods	Types of articles (methods)	Major contributing authors	Top cited publications	Trends in Topics	Total articles studied	Authorship
<i>British Journal of Educational Technology BJET</i>	X	X	X	X		545	1146, among whom 15 published 3 or more times
<i>The Journal of the Learning Sciences</i>	X	X	X The top one for each year 2001–2009	X The top one for each year 2001–2009	X	145	255, among whom 10 authored 3 or more
<i>Educational Technology Research & Development ETR&D</i>	X		X The top one for each year 2001–2009	X The top one for each year 2001–2009	X	315	557, among whom 95 authored 3 or more
<i>Instructional Science</i>	X		X The top one for each year 2002–2011	X The top one for each year 2002–2011		265	498, among whom 20 authored 3 or more
<i>Journal of Educational Computing Research JECT</i>	X		X The top one for each year 2003–2012	X 5 top cited overall	X	428	923, among whom 6 authored at least 4 papers,
<i>Journal of Research on Technology in Education JRTE</i>	X		X The top one for each year 2001–2009	X The top one for each year 2001–2009		273	510, among whom 14 authored 3 or more
<i>The Journal of Educational Technology and Society</i>	X	X	X 5 most contributing authors (from 6 to 23 authored papers)	X The top 2 cited papers per year (2010, 2011, 2012 and 2013)	X three-word phrases, and keywords	492	
<i>Computers & Education</i>	X	X	X	X The top one for each year 2002–2011		1394 but used only 584 for article type analysis	3632, among whom 53 authored 4 or more papers

Table 1.4 Methodology, findings, and years covered on each of the eight journals (among the ten selected to be analyzed in this study) as part of the series of analyses in educational technology

	Methodology	Findings
<i>British Journal of Educational Technology (BJET)</i> 2001–2010 (10 years)	Wilson Web database; tallied authorship frequencies, Publish or Perish for citation counts	Shifted their focus towards publishing more theoretical articles concentrating on emerging educational technology trends Publications on the use of computer games and virtual reality in instructions and computers in assessment increased significantly. Papers on perceptions of educators, parents, and students have remained constant
<i>The Journal of the Learning Sciences</i> 2001–2010 (10 years)	Subject term frequencies by counting ERIC EBSCO; tallied all authors; Publish or Perish software and Google Scholar for citations; and grouped closely related topics together	Showed the top 12 article categories. Found that JLS was heavily focused on qualitative methods. A strong trend towards science and mathematics-related articles. 27% of the articles were theoretical and commentary papers
<i>Educational Technology Research and Development (ETR&D)</i> 2001–2010 (10 years)	They identified the key two-word phrases from the abstracts using a word-count tool. They ranked authors by total number of publications and Publish or Perish for citation counts. For methodology trends they coded each article	They found a balance among theory, research, and design. The majority of the two-word phrases had a strong connection to technology, research, or design in educational settings
<i>Instructional Science</i> 2002–2011 (10 years)	They analyzed author provided key words; if not available they used subject terms provided by EBSCO. The words and phrases were compiled and organized by frequency in Excel spreadsheets. They coded for the methodology types. Google Scholar was utilized for citation trends	They found a large increase in inferential studies published; a decrease in theoretical work, and an important emphasis on Cognitive Load Theory
<i>Journal of Educational Computing Research</i> 2003–2012 (10 years)	The research methodologies used were coded by categories. The subject terms were extracted from the EBSCO database, then spreadsheets	<i>JECT</i> employs a primarily inferential approach. Most common topics found were ‘educational technology’ and ‘computer assisted instruction.’

(continued)

Table 1.4 (continued)

	Methodology	Findings
	were created, and the data was alphabetized and analyzed for number of occurrences. Word frequency count was performed on the tiles using the websites textalyster.net and Google Scholar for citations	From the topic analysis they found an emphasis on online and computer-based learning
<i>Journal of Research on Technology in Education</i> <i>JRTE</i> 2001–2010 (10 years)	They used the author's keywords and if not available, they used the subject terms from EBSCO database. Those keywords were grouped and counted. For the types of methodology they coded and classified the articles. They tallied the authors after they had been alphabetized and counted them. For citation analysis they used Google Scholar	They found the majority of research methodology utilized was inferential, interpretive, and mixed method. Articles focused mainly on PK-12 settings and on technology integration, distance education, teacher education, subject education, and attitudes toward technology. Surprisingly they found a decrease in the number of published articles per year during the second half of the decade (average 32.8 vs. 21.8). The articles in the last years were longer and more comprehensive
<i>Journal of Educational Technology and Society</i> 2010–2014 (5 years)	They analyzed the keywords provided by the authors and also the three-word phrases from the abstracts. They coded the methodology types and used Publish or Perish for the citation analysis	They found that the journal publishes mostly quantitative research and that many of the authors are international and most of the research is collaborative. Some of the most cited articles are related to distance learning and computer-assisted learning
<i>Computers and Education</i> 2002–2011 (10 years)	The article types were coded from 584 articles out of the 1429. Authors' keywords were used to identify trends. Words mentioned more often than 30 times were used as main categories. Abstracts were analyzed using a word counting program. They used the top 10 out of over 200 as a cut-off point	The most common method was inferential (53%). The analysis yielded 657 keywords, which were grouped into 11 main categories, the most frequent ones being: teaching/learning strategies and interactive learning environments, and teaching and learning strategies. The majority of articles were collaborative work

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Chapter 2

The Ten Journals Selected for This Study



Each one of the ten journals selected for the study will now be introduced.

The British Journal of Educational Technology (BJET)

First appearing in 1970, the *British Journal of Educational Technology (BJET)* is an official publication of the British Educational Research Association. As a peer-reviewed journal, it aims to cover “developments in international educational and training technology”. The original publication rate of three issues per year has now increased to six, including at least one issue annually devoted to a special topic. Submitted articles are not assigned specific reviewers in BJET. Their unique process allows reviewers to choose articles about topics in which they are interested. Authors from universities around the world make this magazine popular internationally.

BJET specializes in publishing shorter research articles (2000–3000 words) covering “the whole range of education and training, concentrating on the theory, applications, and development of learning technology and communications”. Since the editorial board moves articles quickly through the publication process, it advertises 5 weeks for its online submission system and review process. With the ever-changing and evolving field of technology and education, the *BJET* editors believe this quick process gives it an advantage over other journals. *BJET* also publishes book reviews, editorials, and a colloquia section devoted to works in progress and shorter pieces. The 2015 Journal Citations Reports gave BJET an impact factor of 1.318, with a rank of 46 out of 224 (see: [http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1467-8535/homepage/ProductInformation.html](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1467-8535/homepage/ProductInformation.html)).

Table 2.1 shows the *British Journal of Educational Technology (BJET)* scientific indicators contained in the Scopus database (SCImago 2007), used to assess and analyze scientific domains of the journal.

Table 2.1 *British Journal of Educational Technology (BJET)* Scientific indicators

British Journal of Educational Technology (BJET)																
Indicators	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
SJR	0.259	0.278	0.463	0.214	0.366	0.409	0.633	0.482	0.733	1.110	0.735	1.151	1.595	1.801	1.501	1.510
Total documents	30	32	47	21	49	61	95	72	101	95	91	114	124	113	128	122
Total docs. (3 years)	70	84	89	109	100	117	131	205	228	268	268	287	300	329	351	365
Total references	557	456	868	485	1.042	1.118	1.657	1.696	2.146	1.860	2.233	2.484	3.090	3.179	3.410	4.448
Total cites (3 years)	20	36	55	40	47	83	193	242	314	466	545	848	917	947	928	755
Self cites (3 years)	6	4	14	0	10	13	22	21	23	34	19	42	53	83	86	41
Citable docs. (3 years)	70	84	87	107	96	112	124	193	214	249	251	271	285	298	316	328
Cites/doc. (4 years)	0.29	0.43	0.56	0.40	0.51	0.73	1.53	1.30	1.68	1.95	2.24	3.04	3.18	3.30	3.27	2.49
Cites/doc. (3 years)	0.29	0.43	0.63	0.37	0.49	0.74	1.56	1.25	1.47	1.87	2.17	3.13	3.22	3.18	2.94	2.30
Cites/doc. (2 years)	0.22	0.40	0.67	0.32	0.53	0.66	1.40	1.04	1.37	1.59	2.06	3.24	2.86	2.64	2.69	1.98
References/doc.	18.57	14.25	18.47	23.10	21.27	18.33	17.44	23.56	21.25	19.58	24.54	21.79	24.92	28.13	26.64	36.46
Cited docs.	14	24	33	30	32	49	72	102	124	155	165	204	199	217	239	215
Uncited docs.	56	60	56	79	68	68	59	103	104	113	103	83	101	112	112	150
% International collaboration	0.00	3.13	4.26	0.00	12.24	6.56	11.58	15.28	28.71	47.37	24.18	9.65	10.48	14.16	6.25	14.75

SJR SCImago Journal and Country Rank (see: <http://www.scimagojr.com>)

Table 2.2 The ten most-cited articles published in the *British Journal of Educational Technology* (BJET)

Cites	Authors	Title	Year
1915	S Bennett, K Maton, L Kervin	The ‘digital natives’ debate: A critical review of the evidence	2008
501	S Warburton	Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching	2009
490	HM Huang	Toward constructivism for adult learners in online learning environments	2002
468	B Dalgarno, MJW Lee	What are the learning affordances of 3-D virtual environments?	2010
441	A Amory, K Naicker, J Vincent ...	The use of computer games as an educational tool: identification of appropriate game types and game elements	1999
431	S Wheeler, P YEOmAnS ...	The good, the bad and the wiki: Evaluating student-generated content for collaborative learning	2008
414	MD Dickey	Three-dimensional virtual worlds and distance learning: two case studies of Active Worlds as a medium for distance education	2005
384	YS Wang, MC Wu, HY Wang	Investigating the determinants and age and gender differences in the acceptance of mobile learning	2009
343	J Davies, M Graff	Performance in e-learning: online participation and student grades	2005
339	N Ford, SY Chen	Matching/mismatching revisited: an empirical study of learning and teaching styles	2001

Table 2.2 shows the ten most-cited articles overall for the time span of this study (1995–2014). Appendix A displays a table of the research papers published in the *BJET* which were cited 200 or more times during the 20 years (a total of 38 papers). Table 2.2 shows the most-cited article overall in the 20 years: “*The ‘digital natives’ debate: A critical review of the evidence*,” by Sue Bennett, Karl Maton, and Lisa Kervin, published in 2008, with 1915 citations in as few as 6 years after first being published, at the time this analysis was completed (January 10–16, 2016).

Appendix B contains a table with the five top-cited articles published in the *BJET* by year, from 1995 to 2014 (20 years, and 100 papers). The years 2005, 2008, and 2009 show the highest number of citations received by the five top-cited articles: 1627, 2960, and 1656 respectively.

The Journal of the Learning Sciences (JLS)

If one were looking for articles that offer real-world contributions to education, this versatile cognitive science journal is where many-sided articles about the research on teaching and learning are published. Relevant articles come from disciplines such as artificial intelligence, cognitive science, cognitive and educational psychology, cognitive anthropology, education, and educational technology. The journal's main goal is to foster new ways of thinking about learning and teaching, that further the cognitive science disciplines' impact on the practice of education.

In 2015, Thomson Reuters, in *Journal Citation Reports*[®] for 2014, ranked *JLS* 12 out of 224 in Education and Educational Research and 9 out of 55 Psychology, Educational. *The JLS* is one of two official journals of the International Society of the Learning Sciences (www.isls.org). *JLS* provides a multidisciplinary forum for research on education and learning as theoretical and design sciences. It publishes research that illustrates the processes of learning and the ways in which technologies, instructional practices, and learning environments can be designed to support learning in different contexts.

JLS articles draw on theoretical frameworks from such diverse fields as cognitive science, sociocultural theory, educational psychology, computer science, and anthropology. Submissions are not limited to any particular research method, but must be based on rigorous analyses that present new insights into how people learn and/or how learning can be supported and enhanced (see: http://www.tandfonline.com/loi/hlms20#.Vr_E3k32aUk).

Table 2.3 shows the *Journal of the Learning Sciences* scientific indicators found in the Scopus database (SCImago 2007), used to assess and analyze the scientific domains of the journal.

Table 2.4 shows the ten most-cited articles overall for the time span of this study (1995–2014). Appendix C displays a table showing the research papers published in the *JLS*, which were cited 200 or more times during the 20 years, a total of 53 papers. Table 2.4 shows the most-cited article overall in the 20 years: “*Interaction analysis: Foundations and practice*,” by Brigitte Jordan and Austin Henderson, published in 1995; it had been the subject of 1819 citations at the time this analysis was completed (January 10–16, 2016).

In Appendix D, the reader can also find a table with the five top-cited articles published in the *JLS* by year, from 1995 to 2014 (20 years, 100 papers). The years 2000, 2003, and 2004 show the highest number of citations received by the five top-cited articles: 1882, 2308, and 4517, respectively.

Table 2.3 *Journal of the Learning Sciences* Scientific indicators

Journal of the Learning Sciences																
Indicators	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
SJR	1.392	1.112	1.646	1.383	2.506	1.982	3.160	2.717	3.090	4.355	2.221	1.758	2.337	2.344	2.764	2.680
Total documents	10	12	12	20	12	17	13	20	16	15	20	17	18	19	21	29
Total docs. (3 years)	34	32	33	34	44	44	49	42	50	49	51	51	52	55	54	58
Total references	656	643	753	653	656	1.048	865	1.093	901	1.040	1.065	1.023	1.183	1.211	1.241	1.244
Total cites (3 years)	52	52	58	59	76	95	154	218	211	242	214	191	170	173	228	151
Self cites (3 years)	7	9	13	5	11	19	9	22	15	11	6	6	17	12	14	12
Citable docs. (3 years)	34	32	33	34	37	35	37	37	46	47	49	46	45	47	48	52
Cites/doc. (4 years)	1.53	1.64	1.82	1.84	2.11	3.30	3.76	5.04	5.02	6.80	4.97	5.65	4.10	4.31	4.61	3.64
Cites/doc. (3 years)	1.53	1.63	1.76	1.74	2.05	2.71	4.16	5.89	4.59	5.15	4.37	4.15	3.78	3.68	4.75	2.90
Cites/doc. (2 years)	1.36	1.57	1.64	1.58	1.48	2.91	5.13	5.78	2.97	4.09	3.30	3.29	3.53	3.84	3.74	2.54
References/doc.	65.60	53.58	62.75	32.65	54.67	61.65	66.54	54.65	56.31	69.33	53.25	60.18	65.72	63.74	59.10	42.90
Cited docs.	24	20	22	23	29	27	36	35	36	39	47	42	39	41	47	42
Uncited docs.	10	12	11	11	15	17	13	7	14	10	4	9	13	14	7	16
% International collaboration	0.00	0.00	0.00	5.00	0.00	0.00	15.38	20.00	25.00	80.00	5.00	23.53	5.56	10.53	9.52	3.45

SJR SCImago Journal and Country Rank (see: <http://www.scimagojr.com>)

Table 2.4 The Ten most-cited articles published in the *Journal of the Learning Sciences*

Cites	Authors	Title	Year
1819	B Jordan, A Henderson	Interaction analysis: Foundations and practice	1995
1793	JR Anderson, AT Corbett, KR Koedinger ...	Cognitive tutors: Lessons learned	1995
1377	S Barab, K Squire	Design-based research: Putting a stake in the ground	2004
1364	A Collins, D Joseph, K Bielaczyc	Design research: Theoretical and methodological issues	2004
1291	MTH Chi	Quantifying qualitative analyses of verbal data: A practical guide	1997
786	B Barron	When smart groups fail	2003
692	DC Edelson	Design research: What we learn when we engage in design	2002
670	RD Pea	The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity	2004
608	C Quintana, BJ Reiser, EA Davis, J Krajcik ...	A scaffolding design framework for software to support science inquiry	2004
583	MTH Chi	Commonsense conceptions of emergent processes: Why some misconceptions are robust	2005

Educational Technology Research and Development (ETR&D)

Educational Technology Research and Development (ETR&D) is the only scholarly journal in the field focusing entirely on research and development in educational technology. It is a bi-monthly publication of the Association for Educational Communications and Technology.

In the *Research Section*, the highest priority is reviewing manuscripts to rigorous original quantitative, qualitative, or mixed-methods studies on topics relating to applications of technology or instructional design in educational settings. Such topics include K-12, higher education, and adult learning (e.g., in corporate training settings). Analytical papers that evaluate important research issues related to educational technology research and reviews of the literature on similar topics are also published. With well-documented articles on the practical aspects of research as well as applied theory in educational practice, it provides a comprehensive source of current research information in instructional technology.

The *Development Section* publishes research on planning, implementation, evaluation, and management of a variety of instructional technologies and learning environments. Proven formative evaluations and theoretically based instructional design research papers are welcome, as well as papers that report on outcomes of innovative approaches in applying technology to instructional development. Papers

here may involve a variety of research methods and should focus on one or more aspects of the instructional development process; when relevant and possible, papers should discuss the implications of instructional design decisions and provide evidence linking outcomes to those decisions.

The *Cultural and Regional Perspectives Section* (formerly *International Review*) welcomes innovative research about how technologies are being used to enhance learning, instruction, and performance specific to a culture or region. Educational technology studies submitted to this section should be situated in cultural contexts that critically examine issues and ideologies prevalent in the culture or region or by individuals or groups in the culture or region. Theoretical perspectives can be broadly based and include research such as critical race theory, cultural-historical activity theory, and cultural models. The papers published in this section include quantitative, qualitative, and mixed-methods articles and reviews drawing on relevant theories, empirical evidence, and critical analyses of the findings, implications, and conclusions within a cultural context. Manuscripts undergo a blind review process involving a panel of three reviewers with initial outcomes usually provided within 2 months (see: <http://www.springer.com/education+%26+language/learning+%26+instruction/journal/11423>) (Spector et al. 2014).

Table 2.5 shows the *Educational Technology Research and Development* (ETR&D) scientific indicators found in the Scopus database (SCImago 2007), used to assess and analyze scientific domains of the journal.

Table 2.6 shows the ten most-cited articles overall for the time span of this study (1995–2014). Appendix E displays a table of the research papers published in the ETR&D which were cited 200 or more times during the 20 years (a total of 64 papers). Table 2.6 shows the most-cited article overall in the 20 years was “*Teacher pedagogical beliefs: The final frontier in our quest for technology integration?*” by Peggy A. Ertmer, published in 2005 and the subject of 1433 citations in only 9 years since the article was first published at the time this analysis was completed (January 10–16, 2016).

In Appendix F, the reader can also find a table with the five top-cited articles published in ETR&D by year from 1995 to 2014 (20 years, 100 papers). The years 1999, 2000, and 2005 show the highest number of citations received by the five top-cited articles: 2991, 3076, and 3779, respectively.

Instructional Science

Instructional Science is an interdisciplinary refereed scholarly journal aimed at promoting a deeper understanding of the process of instruction and learning. The journal’s conception of “instruction” recognizes that there are many ways to stimulate and support learning. The journal covers a variety of perspectives from the learning sciences.

Although the journal occasionally publishes review articles, research that is well-tested and original is strongly preferred. The journal is unusual in that it gives

Table 2.6 The ten most-cited articles published in *Educational Technology Research and Development (ETR&D)*

Cites	Authors	Title	Year
1433	PA Ertmer	Teacher pedagogical beliefs: The final frontier in our quest for technology integration?	2005
1332	MD Merrill	First principles of instruction	2002
1280	DH Jonassen	Toward a design theory of problem-solving	2000
1254	DH Jonassen	Instructional design models for well-structured and III-structured problem-solving learning outcomes	1997
1130	PA Ertmer	Addressing first-and second-order barriers to change: Strategies for technology integration	1999
955	LP Rieber	Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games	1996
946	DH Jonassen, L Rohrer-Murphy	Activity theory as a framework for designing constructivist learning environments	1999
892	KF Hew, T Brush	Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research	2007
891	F Wang, MJ Hannafin	Design-based research and technology-enhanced learning environments	2005
827	J Herrington, R Oliver	An instructional design framework for authentic learning environments	2000

space to full and detailed reporting of major studies. While studies focusing on learning processes, learning technology, learner characteristics, and learning outcomes are welcome, papers published in the journal all make an explicit contribution to the science of instruction by drawing out the instructional implications of new research on learning.

Recent guest-edited, special issues have focused on cognitive load theory, networked learning, web-based instruction, teachers' thinking in higher education, epistemology and instructional design, and the francophone tradition of didactic practice.

Table 2.7 shows the *Instructional Science* scientific indicators found in the Scopus database (SCImago 2007), used to assess and analyze scientific domains of the journal.

Table 2.8 shows the ten most-cited articles overall for the time span of this study (1995–2014). Appendix G displays a table of the research papers published in *Instructional Science* which were cited 200 or more times during the 20 years (a total of 25 papers). Table 2.8 shows the most-cited article overall in the 20 years was “*Content analysis of online discussion in an applied educational psychology course*”, by Noriko Hara, Curtis Jay Bonk, and Charoula Angeli, published in 2000 and with the high number of 1063 citations at the time this analysis was completed (January 10–16, 2016).

Table 2.7 *Instructional Science* Scientific indicators

Instructional Science																
Indicators	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
SJR	0.315	0.441	0.645	0.475	0.500	0.432	0.773	1.442	1.311	1.361	1.184	0.774	1.179	1.623	1.607	1.907
Total documents	20	17	20	21	22	21	23	17	19	26	32	36	47	56	69	55
Total docs. (3 years)	60	61	60	57	58	63	64	66	61	59	62	77	94	115	139	172
Total references	696	799	853	783	785	852	978	804	1,091	1,162	1,317	1,883	2,539	2,755	3,405	2,552
Total cites (3 years)	36	53	35	39	37	48	103	171	135	132	142	151	208	292	367	291
Self cites (3 years)	1	3	7	9	4	3	6	9	7	9	17	3	8	31	37	19
Citable docs. (3 years)	60	61	60	57	58	63	64	66	61	59	61	76	91	113	136	157
Cites/doc. (4 years)	0.60	0.93	0.82	0.88	0.67	0.95	1.79	2.26	2.12	2.76	2.80	1.99	2.76	2.81	2.85	2.24
Cites/doc. (3 years)	0.60	0.87	0.58	0.68	0.64	0.76	1.61	2.59	2.21	2.24	2.33	1.99	2.29	2.58	2.70	1.85
Cites/doc. (2 years)	0.61	0.70	0.41	0.81	0.51	0.77	1.70	2.75	1.73	1.25	2.16	1.79	2.38	2.54	1.90	1.61
References/doc.	34.80	47.00	42.65	37.29	35.68	40.57	42.52	47.29	57.42	44.69	41.16	52.31	54.02	49.20	49.35	46.40
Cited docs.	23	32	20	20	22	27	44	50	42	36	47	53	71	86	106	111
Uncited docs.	37	29	40	37	36	36	20	16	19	23	15	24	23	29	33	61
% International collaboration	15.00	0.00	0.00	14.29	9.09	28.57	21.74	29.41	26.32	19.23	28.13	13.89	14.89	28.57	21.74	29.09

Table 2.8 The ten most-cited articles published in *Instructional Science* during the selected period of 20 years

Cites	Authors	Title	Year
1063	N Hara, CJ Bonk, C Angeli	Content analysis of online discussion in an applied educational psychology course	2000
816	G Schraw	Promoting general metacognitive awareness	1998
605	F Paas, A Renkl, J Sweller	Cognitive load theory: Instructional implications of the interaction between information structures and cognitive architecture	2004
559	PA Ertmer, TJ Newby	The expert learner: Strategic, self-regulated, and reflective	1996
515	MJ Hannafin, SM Land	The foundations and assumptions of technology-enhanced student-centered learning environments	1997
488	RE Mayer	Cognitive, metacognitive, and motivational aspects of problem-solving	1998
437	CA Wolters, PR Pintrich	Contextual differences in student motivation and self-regulated learning in mathematics, English, and social studies classrooms	1998
368	A Weinberger, B Ertl, F Fischer, H Mandl	Epistemic and social scripts in computer-supported collaborative learning	2005
360	DW Surry, JD Farquhar	Diffusion theory and instructional technology	1997
352	R Moreno	Decreasing cognitive load for novice students: Effects of explanatory versus corrective feedback in discovery-based multimedia	2004

In Appendix H, the reader can also find a table with the five top-cited articles published in *Instructional Science* by year, from 1995 to 2014 (20 years, 100 papers). The years 1998, 2000, and 2004 show the highest number of citations received by the five top-cited articles: 2197, 1691, and 1670, respectively.

TechTrends

TechTrends is a leading publication for professionals in the educational communication and technology field. Its major purposes are to provide a forum for professional practitioners to exchange information concerning the management of media and programs, the application of educational technology principles and techniques to instructional programs, corporate and military training, and any other kinds of information that can contribute to the advancement of knowledge of practice in the field; to provide a means by which practitioners can be kept current on the latest developments in the design, manufacture, and use of communications

materials and devices; and to provide a vehicle for communication among the members of AECT to share information.

TechTrends considers manuscripts of the following types:

- Reports of innovative and/or exemplary practice.
- General articles discussing matters of concern to practitioners.
- Critical reviews of important literature, materials, and devices related to the field.
- Summaries of research translated into practical application.
- Reports on developmental programs and trends of national and international significance.
- News about the latest products, both materials and devices, for use in the field.
- Articles of use to managers and others with various specializations within the general educational communications and technology field.

Table 2.9 shows the *TechTrends* scientific indicators found in the Scopus database (SCImago 2007), used to assess and analyze scientific domains of the journal.

Table 2.10 shows the ten most-cited articles overall in *TechTrends* for the time span of this study (1995–2014). Note that the total number of research papers published here, which were cited 200 or more times during the 20 years were only 3. Table 2.10 shows the most-cited article overall published in *TechTrends* during the 20 years was “*Computers as mindtools for engaging learners in critical thinking*,” by David H. Jonassen, Chad Carr, and Hsiu-Ping Yueh, published in 1998 and the subject of 556 citations at the time this analysis was completed (January 10–16, 2016).

In Appendix I, the reader can also find a table with the five top-cited articles published in *TechTrends* by year, from 1995 to 2014 (20 years, 100 papers). The years 1998, 2004, and 2005 show the highest number of citations received by the five top-cited articles: 842, 647, and 583, respectively.

Educational Technology and Society

The Journal of Educational Technology and Society is a quarterly journal that seeks academic articles on the issues relating to the developers of educational systems and educators who implement and manage such systems, showing both perspectives. This journal is being terminated at the end of 2017 although it is widely regarded as the best open access and open source refereed journal in the area of educational technology. They should work from the following premises:

- Educators aim to use technology to enhance individual learning as well as to achieve widespread education and expect the technology to blend with their individual approach to instruction. However, most educators are not fully aware

Table 2.9 *TechTrends* scientific indicators

TechTrends																
Indicators	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
SJR	0.101	–	0.102	0.102	0.102	–	–	–	0.218	0.216	0.231	0.366	0.431	0.432	0.274	0.477
Total documents	0	–	0	0	0	–	–	–	76	109	112	52	41	51	76	109
Total docs. (3 years)	16	–	10	10	10	–	–	–	68	144	253	297	273	205	144	168
Total references	0	–	0	0	0	–	–	–	614	1.226	1.168	666	517	695	1.038	1.894
Total cites (3 years)	2	–	0	0	0	–	–	–	19	33	83	132	142	134	87	125
Self cites (3 years)	0	–	0	0	0	–	–	–	2	5	5	7	8	10	7	17
Citable docs. (3 years)	16	–	9	9	9	–	–	–	55	110	187	205	193	149	119	139
Cites/doc. (4 years)	0.13	–	0.00	0.00	0.00	–	–	–	0.35	0.30	0.44	0.62	0.71	0.79	0.98	0.81
Cites/doc. (3 years)	0.13	–	0.00	0.00	0.00	–	–	–	0.35	0.30	0.44	0.64	0.74	0.90	0.73	0.90
Cites/doc. (2 years)	0.00	–	0.00	0.00	0.00	–	–	–	0.35	0.30	0.33	0.71	0.84	0.59	0.86	0.68
References/doc.	0.00	–	0.00	0.00	0.00	–	–	–	8.08	11.25	10.43	12.81	12.61	13.63	13.66	17.38
Cited docs.	2	–	0	0	0	–	–	–	11	24	42	71	72	53	37	56
Uncited docs.	14	–	10	10	10	–	–	–	57	120	211	226	201	152	107	112
% International collaboration	0.00	–	0.00	0.00	0.00	–	–	–	6.58	7.34	5.36	1.92	2.44	1.96	2.63	3.67

Table 2.10 The ten most-cited articles published in *TechTrends* during the 20 years

Cites	Authors	Title	Year
556	DH Jonassen, C Carr, HP Yueh	Computers as mindtools for engaging learners in critical thinking	1998
214	ME Engstrom, D Jewett	Collaborative learning the wiki way	2005
208	OT Murray, NR Olcese	Teaching and learning with iPads, ready or not?	2011
191	S Cox, CR Graham	Using an elaborated model of the TPACK framework to analyze and depict teacher knowledge	2009
190	T Martindale, DA Wiley	Using weblogs in scholarship and teaching	2004
189	RC Graham, N Burgoyne, P Cantrell, L Smith, L St Clair ...	Measuring the TPACK confidence of inservice science teachers	2009
188	PR Albion, PA Ertmer	Beyond the foundations: The role of vision and belief in teachers' preparation for integration of technology	2002
153	RF Branon, C Essex	Synchronous and asynchronous communication tools in distance education	2001
151	SA Barab, KE Hay, TM Duffy	Grounded constructions and how technology can help	1998
148	GM Johnson	Synchronous and asynchronous text-based CMC in educational contexts: A review of recent research	2006

of the benefits that may be obtained by proactively harnessing the available technologies and how they might be able to influence further developments through systematic feedback and suggestions.

- Educational system developers and artificial intelligence (AI) researchers are sometimes unaware of the needs and requirements of typical teachers, with a possible exception of those in the computer science domain. In transferring the notion of a “user” from the human–computer interaction studies and assigning it to the “student,” the educator’s role as the “implementer/manager/user” of the technology has been forgotten.

The aim of the journal is to help the two communities better understand each other’s role in the overall process of education and how they may support each other. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to *Educational Technology and Society* and four months thereafter. *Educational Technology and Society* invites articles with the following themes within the context of learning, education, and training:

- Open Access to Educational Resources and Systems
- Adaptive and Personalized Technology-Enhanced Learning
- Digital Game and Intelligent Toy Enhanced Learning

- Computer-Supported Collaborative Learning
- Wireless, Mobile, Pervasive, and Ubiquitous Technologies for Learning
- Technology-Enhanced Assessment in Formal and Informal Education
- Big Data in Education and Learning Analytics
- Technology-Enhanced Subject Domain Teaching in Compulsory and Post-Compulsory (Formal) Education and Training
- Motivational and Affective Aspects in Technology-Enhanced Learning
- Technology-Enabled Learning of Thinking and Critical Skills
- Recommended and Expert Systems for Learning
- Technology Supported Education for People with Disabilities
- Technologies for Smart Learning
- Virtual Worlds in Learning, Education, and Training
- Knowledge Management in e-Learning
- Large-Scale Implementation of Technology in Education.

Table 2.11 shows the *Journal of Educational Technology and Society* scientific indicators found in the Scopus database (SCImago 2007), used to assess and analyze scientific domains of the journal.

Table 2.12 shows the ten most-cited articles published in the *Journal of Educational Technology and Society* overall for the time span of this study. Appendix J displays a table of the research papers published here, which were cited 200 or more times during the 20 years (a total of 17 papers). Table 2.12 shows the most-cited article overall in the 20 years was “*Representing the learning design of units of learning*,” by Rob Koper and Bill Oliver, published in 2004 and with 469 citations at the time this analysis was completed (January 10–16, 2016).

In Appendix K, the reader can also find a table with the five top-cited articles published in the *Journal of Educational Technology and Society* by year, from 1998 to 2014 (17 years, 85 papers). The years 2004, 2005, and 2009 show the highest number of citations received by the five top-cited articles: 1309, 1227, and 4517 respectively.

Computers and Education

Computers and Education publishes high-quality research that interests a wider education community. Its aim is to present ways in which digital technology can enhance education, which extends theory and practice.

Review papers with clear aims (research questions), a framework of analysis, and conclusions that reflect the aims of the paper are welcomed, rather than small-scale evaluations of specific software/systems in specialist domains or particular courses in individual institutions (unless the findings have broader relevance that is explicitly drawn out in the paper). Papers that include discussions of the implementation of software and/or hardware should focus on the context of use, the

Table 2.11 *Journal of Educational Technology and Society* scientific indicators

Journal of Educational Technology and Society		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Indicators																	
SJR		0.143	0.160	0.229	0.257	0.363	0.270	0.222	0.329	0.513	0.462	0.681	0.840	1.237	1.370	0.980	0.919
Total documents		56	92	55	92	48	56	74	87	85	85	102	83	87	119	141	84
Total docs. (3 years)		10	66	158	203	239	195	196	178	217	246	257	272	270	272	289	347
Total references		751	1.618	846	1.688	935	1.382	2.006	2.475	2.986	3.191	3.333	2.697	3.383	4.605	5.494	3.607
Total cites (3 years)		3	8	41	54	113	88	170	190	310	373	551	632	660	717	741	646
Self cites (3 years)		3	7	12	20	13	10	8	28	32	49	64	37	45	54	86	48
Citable docs. (3 years)		7	52	138	174	214	171	177	166	208	241	251	265	264	264	280	337
Cites/doc. (4 years)		0.43	0.15	0.30	0.30	0.49	0.48	0.92	1.00	1.43	1.70	2.22	2.55	2.64	2.85	2.98	2.10
Cites/doc. (3 years)		0.43	0.15	0.30	0.31	0.53	0.51	0.96	1.14	1.49	1.55	2.20	2.38	2.50	2.72	2.65	1.92
Cites/doc. (2 years)		0.43	0.15	0.31	0.35	0.38	0.47	0.99	1.23	1.28	1.47	1.92	2.13	2.18	2.20	2.29	1.86
References/doc.		13.41	17.59	15.38	18.35	19.48	24.68	27.11	28.45	35.13	37.54	32.68	32.49	38.89	38.70	38.96	42.94
Cited docs.		2	6	34	35	70	53	86	84	116	137	179	187	187	200	218	215
Uncited docs.		8	60	124	168	169	142	110	94	101	109	78	85	83	72	71	132
% International collaboration		8.93	14.13	10.91	10.87	14.58	12.50	5.41	16.09	12.94	16.47	22.55	24.10	25.29	13.45	19.86	28.57

Table 2.12 The ten most-cited articles published in the *Journal of Educational Technology and Society* over 17 years (1998–2014)

Cites	Authors	Title	Year
469	R Koper, B Olivier	Representing the learning design of units of learning	2004
389	M Tam	Constructivism, instructional design, and technology: Implications for transforming distance learning	2000
366	SY Park	An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning	2009
362	K Kreijns, PA Kirschner, W Jochems	The sociability of computer-supported collaborative learning environment	2002
341	GJ Hwang, CC Tsai, SJH Yang	Criteria, strategies and research issues of context-aware ubiquitous learning	2008
336	SH Yang	Using blogs to enhance critical reflection and community of practice	2009
335	SJH Yang	Context-aware ubiquitous learning environments for peer-to-peer collaborative learning	2006
322	M Nichols	A theory for e-Learning	2003
316	M Virvou, G Katsionis, K Manos	Combining software games with education: Evaluation of its educational effectiveness	2005
302	D Hernández-Leo, ED Villascclaras-Fernández ...	COLLAGE: A collaborative Learning Design editor based on patterns	2006

user/system interface, usability issues, and evaluations of the user experience and impacts on and implications for learning and teaching.

Table 2.13 shows the *Computers and Education* scientific indicators found in the Scopus database (SCImago 2007), used to assess and analyze scientific domains of the journal.

Table 2.14 shows the ten most-cited articles overall for the time span of this study. Appendix L displays a table of the research papers published in *Computers and Education* which were cited 200 or more times during the 20 years (a total of 134 papers). Table 2.14 shows the most-cited article overall in the 20 years was “*What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction*,” by Pei-Chen Sun, Ray J. Tsai, Glenn Finger, Yueh-Yang Chen, and Downing Yeh, published in 2008 and the subject of the very large number of 1036 citations in only 6 years, at the time this analysis was completed (January 10–16, 2016).

In Appendix M has a table with the five top-cited articles published in the *Journal of Computers and Education* by year, from 1995 to 2014 (20 years, 100 papers). The years 2006, 2007, and 2008 show the highest number of citations received by the five top-cited articles: 2781, 2538, and 3154, respectively.

Table 2.13 *Computers and Education* scientific indicators

Computers and Education		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Indicators																	
SJIR		0.350	0.418	0.518	0.493	0.668	0.580	0.702	1.096	1.340	1.291	1.366	1.592	2.265	2.770	2.469	2.578
Total documents		34	43	42	52	56	49	50	58	124	231	211	281	230	246	286	233
Total docs. (3 years)		141	130	133	119	137	150	157	155	157	232	413	566	723	722	757	762
Total references		771	1.083	1.018	1.322	1.185	1.388	1.599	2.000	3.983	9.148	9.333	12.494	11.433	12.544	14.482	13.106
Total cites (3 years)		69	83	103	96	165	163	310	353	425	790	1.657	2.897	3.832	3.965	4.216	3.434
Self cites (3 years)		10	23	15	12	22	29	22	22	47	130	238	533	603	591	585	468
Citable docs. (3 years)		141	130	133	119	135	145	151	150	153	228	409	563	717	716	744	748
Cites/doc. (4 years)		0.49	0.67	0.80	0.74	1.21	1.10	1.99	2.30	2.86	3.53	4.08	5.32	5.45	5.70	5.97	4.87
Cites/doc. (3 years)		0.49	0.64	0.77	0.81	1.22	1.12	2.05	2.35	2.78	3.46	4.05	5.15	5.34	5.54	5.67	4.59
Cites/doc. (2 years)		0.52	0.53	0.82	0.75	1.16	1.22	2.12	1.97	2.65	3.36	3.73	4.98	5.03	4.86	5.16	4.18
References/doc.		22.68	25.19	24.24	25.42	21.16	28.33	31.98	34.48	32.12	39.60	44.23	44.46	49.71	50.99	50.64	56.25
Cited docs.		48	48	63	46	77	79	104	99	114	182	341	503	636	643	688	662
Uncited docs.		93	82	70	73	60	71	53	56	43	50	72	63	87	79	69	100
% International collaboration		2.94	4.65	4.76	3.85	14.29	8.16	14.00	10.34	7.26	13.85	13.27	13.17	15.22	16.26	17.83	17.17

Table 2.14 The ten most-cited articles published in *Computers and Education* during the 20 years

Cites	Authors	Title	Year
1036	PC Sun, RJ Tsai, G Finger, YY Chen, D Yeh	What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction	2008
885	M Sharples	The design of personal mobile technologies for lifelong learning	2000
875	S Ainsworth	The functions of multiple representations	1999
861	WJ Pelgrum	Obstacles to the integration of ICT in education: results from a worldwide educational assessment	2001
796	B De Wever, T Schellens, M Valcke, H Van Keer	Content analysis schemes to analyze transcripts of online asynchronous discussion groups: A review	2006
692	M Papastergiou	Digital game-based learning in high school computer science education: Impact on educational effectiveness and student motivation	2009
622	LF Motiwalla	Mobile learning: A framework and evaluation	2007
607	C Romero, S Ventura, E García	Data mining in course management systems: Moodle case study and tutorial	2008
604	C Chou, MC Hsiao	Internet addiction, usage, gratification, and pleasure experience: the Taiwan college students' case	2000
584	C Evans	The effectiveness of m-learning in the form of podcast revision lectures in higher education	2008

Journal of Educational Computing Research

The *Journal of Educational Computing Research* is a truly interdisciplinary, rigorously refereed journal that contains a wealth of information: articles of value and interest to the educator, researcher, and scientist. Articles convey the latest in research reports and critical analyses to both theorists and practitioners. The *Journal of Educational Computing Research* addresses four primary areas of research interest:

- The outcome effects of educational computing applications, featuring findings from a variety of disciplinary perspectives which include the social, behavioral, information, and physical sciences
- The design and development of innovative computer hardware and software for use in educational environments
- The interpretation and implications of research in educational computing fields
- The theoretical and historical foundations of computer-based education.

The term “education” is viewed in its broadest sense by the journal’s editors. They examine the use of computer-based technologies at all levels of the formal education system, business and industry, home-schooling, lifelong learning, and

unintentional learning environments. “Computing” refers to all forms of computer applications and innovations - both hardware and software. For example, this could range from mobile and ubiquitous computing to immersive 3D simulations and games to computing-enhanced virtual learning environments. Each issue features articles useful for practitioners and theorists alike. The *Journal of Educational Computing Research* provides an international forum for interdisciplinary communication on an increasingly significant subject: research into the applications, effects, and implications of computer-based education. The journal is published in two volumes (four issues each) every calendar year by Sage Publications. Issues are available in print and online.

Table 2.15 shows the *Educational Computing Research* scientific indicators found in the Scopus database (SCImago 2007), used to assess and analyze scientific domains of the journal.

Table 2.16 shows the ten most-cited articles overall for the time span of this study. Appendix N displays a table of the research papers published in the *Journal of Educational Computing Research* which were cited 200 or more times during the 20 years (a total of 17 papers). Table 2.16 shows the most-cited article overall in the 20 years was “*Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing*,” by Charlotte N. Gunawardena, Constance A. Lowe, and Terry Anderson, published in 1997 and with the large number of 1492 citations at the time this analysis was completed.

In Appendix O, the reader can also find a table with the five top-cited articles published in the *Journal of Educational Computing Research* by year, from 1995 to 2014 (20 years, 100 papers). The years 1995, 1997, and 2005 show the highest number of citations received by the five top-cited articles: 1895, 2475, and 1551, respectively.

Journal of Research on Technology in Education (JRTE) (2001–2014)—Formerly Known as Journal of Research on Computing in Education (1995–2001)

The *Journal of Research on Technology in Education (JRTE)* is published quarterly, and is the official journal of the International Society for Technology in Education—ISTE. *JRTE* is a premiere source for high-quality peer-reviewed research that defines the state of the art, and future horizons, of learning and teaching with technology in educational environments. The *JRTE* publishes original research, literature reviews and syntheses, and methodological reviews, policy analyses, and theoretical or conceptual positions that relate to the efficacy of instructional uses of educational technology. It is international in scope.

Table 2.15 *Journal of Educational Computing Research* scientific indicators

Journal of Educational Computing Research																
Indicators	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
SJR	0.361	0.231	0.348	0.406	0.319	0.268	0.390	0.407	0.708	0.677	0.422	0.575	0.573	0.581	0.841	0.867
Total documents	42	46	46	43	48	35	47	43	43	40	46	46	47	35	40	30
Total docs. (3 years)	122	125	127	134	135	137	126	130	125	133	126	129	132	139	128	122
Total references	1.483	1.413	1.699	1.359	1.538	1.211	1.671	1.796	1.785	1.962	2.335	1.989	2.003	1.575	1.747	1.458
Total cites (3 years)	54	37	54	71	68	53	102	112	110	163	135	174	152	144	196	142
Self cites (3 years)	18	11	12	20	19	6	22	7	26	11	21	13	8	4	6	9
Citable docs. (3 years)	122	125	127	134	135	137	124	127	120	130	124	129	132	139	128	121
Cites/doc. (4 years)	0.44	0.43	0.54	0.49	0.58	0.45	0.82	0.84	0.95	1.48	1.32	1.59	1.38	1.21	1.49	1.26
Cites/doc. (3 years)	0.44	0.30	0.43	0.53	0.50	0.39	0.82	0.88	0.92	1.25	1.09	1.35	1.15	1.04	1.53	1.17
Cites/Doc. (2 years)	0.30	0.16	0.39	0.43	0.39	0.24	0.89	0.82	0.66	1.06	0.83	0.90	1.00	0.92	1.21	1.04
References/doc.	35.31	30.72	36.93	31.60	32.04	34.60	35.55	41.77	41.51	49.05	50.76	43.24	42.62	45.00	43.68	48.60
Cited docs.	43	27	40	47	46	40	57	59	63	71	69	76	69	77	80	66
Uncited docs.	79	98	87	87	89	97	69	71	62	62	57	53	63	62	48	56
% International collaboration	0.00	4.35	0.00	4.65	6.25	14.29	4.26	13.95	6.98	30.00	10.87	8.70	10.64	14.29	12.50	26.67

Table 2.16 The ten most-cited articles published in the *Journal of Educational Computing Research* during the 20 years

Cites	Authors	Title	Year
1492	CN Gunawardena, CA Lowe and T. Anderson	Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing	1997
610	T Busch	Gender differences in self-efficacy and attitudes toward computers	1995
604	MJ Koehler, P Mishra	What happens when teachers design educational technology? The development of technological pedagogical content knowledge	2005
575	MJ Jacobson, RJ Spiro	Hypertext learning environments, cognitive flexibility, and the transfer of complex knowledge: An empirical investigation	1995
462	TBQ Li	Cyber-harassment: A study of a new method for an old behavior	2005
385	JJ Vogel, DS Vogel, J Cannon-Bowers ...	Computer gaming and interactive simulations for learning: A meta-analysis	2006
352	DL Fabry, JR Higgs	Barriers to the effective use of technology in education: Current status	1997
343	S Cassidy, P Eachus	Developing the computer user self-efficacy (CUSE) scale: Investigating the relationship between computer self-efficacy, gender and experience with computers	2002
329	CM Fletcher-Flinn, B Gravatt	The efficacy of computer assisted instruction (CAI): A meta-analysis	1995
329	K Swan, P Shea, E Fredericksen, A Pickett...	Building knowledge building communities: Consistency, contact and communication in the virtual classroom	2000

Table 2.17 shows the scientific indicators from the *Journal of Research on Technology in Education (JRTE)*, found in the Scopus database, used to assess and analyze the scientific domains of the journal.

Table 2.18 shows the ten most-cited articles overall for the time span of this study, from the journal under the name of *Journal of Research on Technology in Education* (2001–2014). Appendix P displays a table of the research papers published in the *JRTE* (2001–2014) which were cited 200 or more times during the time span of the present study (a total of 20 papers). Tables 2.18 and 2.19 show the two most-cited articles overall in the 20 years (during the time the journal changed its name) were from the same first author: Peggy A. Ertmer. Note that this journal changed its name; therefore, the most-cited article from this journal under each of its two names were: “*Examining teachers’ beliefs about the role of technology in the elementary classroom*,” by Peggy A. Ertmer, Addison Paul, Lane Molly, Ross Eva and Woods Denise, published in 1999 in the *Journal of Research on*

Table 2.18 The ten most-cited articles published in the *Journal of Research on Technology in Education (JRTE)* (2001–2014)

Cites	Authors	Title	Year
630	PA Ertmer, AT Ottenbreit-Leftwich	Teacher technology change: How knowledge, confidence, beliefs, and culture intersect	2010
560	J Harris, P Mishra, M Koehler	Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed	2009
533	DA Schmidt, E Baran, AD Thompson ...	Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers	2009
430	R Christensen	Effects of technology integration education on the attitudes of teachers and students	2002
406	WR Penuel	Implementation and effects of one-to-one computing initiatives: A research synthesis	2006
369	RA Vannatta, F Nancy	Teacher dispositions as predictors of classroom technology use	2004
294	RB Kozma	Technology and classroom practices: An international study	2003
290	B Gros	Digital games in education: The design of games-based learning environments	2007
282	RH Kay	Evaluating strategies used to incorporate technology into preservice education: A review of the literature	2006
271	M Liu, Z Moore, L Graham, S Lee	A look at the research on computer-based technology use in second language learning: A review of the literature from 1990–2000	2002

Computing in Education and the subject of 477 citations; and “*Teacher technology change: How knowledge, confidence, beliefs, and culture intersect*,” by Peggy A. Ertmer and Anne Ottenbreit-Leftwich, published in 2010 in the *JRTE* and the subject of 630 citations at the time this analysis was completed (January 10–16, 2016).

Appendix Q shows the five top-cited articles published in the *JRTE* by year, from 2001 to 2014 (14 years, 70 papers). The years 2003, 2006 and 2009 show the highest number of citations received by the five top-cited articles: 1299, 1366, and 1479 respectively.

During the first 7 years of the time span of this study, this journal’s name was *Journal of Research on Computing in Education*. The analysis revealed 13 papers which had received 200 or more citations, and such list can be found in Appendix R.

Appendix S shows a table with the five top-cited articles published in the *Journal of Research on Computing in Education* (previous name of the *Journal of Research on Technology in Education*) by year, from 1995 to 2002 (8 years, 40

Table 2.19 The ten most-cited articles published in the *Journal of Research on Computing in Education* (previous name *Journal of Research on Technology in Education* 1995–2001)

Cites	Authors	Title	Year
477	PA Ertmer, A Paul, L Molly, R Eva ...	Examining teachers' beliefs about the role of technology in the elementary classroom	1999
444	ME Pierson	Technology integration practice as a function of pedagogical expertise	2001
435	SL Dexter, RE Anderson, HJ Becker	Teachers' views of computers as catalysts for changes in their teaching practice	1999
400	S Yildirim	Effects of an educational computing course on preservice and inservice teachers: A discussion and analysis of attitudes and use	2000
370	HJ Becker, J Ravitz	The influence of computer and Internet use on teachers' pedagogical practices and perceptions	1999
338	DM Poole	Student participation in a discussion-oriented online course: A case study	2000
242	DW Sanders, AI Morrison-Shetlar	Student attitudes toward web-enhanced instruction in an introductory biology course	2001
239	MM Ropp	Exploring individual characteristics associated with learning to use computers in preservice teacher preparation	1999
236	MD Roblyer	Is choice important in distance learning? A study of student motives for taking Internet-based courses at the high school and community college levels	1999
223	D Mioduser, R Nachmias, O Lahav ...	Web-based learning environments: Current pedagogical and technological state	2000

papers). The years 1999, 2000, and 2001 show the highest number of citations received by the five top-cited articles: 1755, 1367, and 1073 respectively.

Educational Technology: The Magazine for Managers of Change in Education

(See: the front cover inside page of the printed issues.) *Educational Technology: The Magazine for Managers of Change in Education* is a world-renowned pioneer periodical in the field of technology in education and training. Published continuously since 1961, and now in its 54th year of distribution in more than one hundred countries worldwide, *Ed Tech* is regarded by many as the most important publication in this field.

Published six times annually, with each issue featuring solid, insightful, provocative, substantial papers written by the leading experts in the field, the

magazine offers content that cannot be obtained in other magazines or journals. *Ed Tech* is available only as a print publication. Its contents are carefully and thoughtfully reviewed and edited. *Ed Tech* carries vital professional articles of high merit.

Ed Tech has been one of the leading publications of the field of educational technology since the early 1960s. Its editors have been instrumental in making the term “educational technology” prominent in the world today. The magazine title itself has been a registered trademark since the 1960s. All important movements in the field for more than five decades—from programmed learning, to computer-aided instruction, to instructional design, to performance technology, to interactive multimedia instruction, to e-learning, to constructivist learning environments, to the learning sciences, etc., have been covered at length in the magazine’s pages. The magazine has helped many of the leading authors in the field today to become internationally recognized experts. The contents include the work of more than 50 distinguished, world-renowned contributing editors, who write regularly on all aspects of educational technology.

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Chapter 3

How Was the Data Collected and Analyzed?



Given the fact that the Internet has had a significant impact on science research and academic publishing especially during the last two decades (Kinshuk et al. 2013), a 20-year period was selected rather than a shorter 10-year period as originally planned. Editorials, introductions to special issues, conference reports, book reviews, paper discussion commentaries, and responses to such commentaries were not incorporated.

Data for this exploratory study were collected using the extensive collection of primary source research materials available at the University of North Texas, including Electronic Databases & e-Journals.

This study included data from bibliographical information (i.e., titles, authors' names, keywords, citation references and abstracts, publication years, and volume and issue numbers) on research published during a period of 20 years, Jan 1995–Dec 2014. A comprehensive set of research articles was collected from the following ten highly recognized journals in Educational Technology: (1) *Educational Technology Research and Development (ETRD)*; (2) *Instructional Science (IS)*; (3) *Journal of the Learning Sciences (JLS)*; (4) *TechTrends (TETR)*; (5) *Educational Technology: The Magazine for Managers of Change in Education (ETMAG)*; (6) *Journal of Educational Technology & Society (JETS)*; (7) *Computers and Education (CE)*; (8) *British Journal of Educational Technology (BJET)*; (9) *Journal of Educational Computing Research (JECR)*; and (10) *Journal of Research on Technology in Education (JRTE)*.

It is worth mentioning that nine out of the ten selected journals for the study had most of their published research articles available online through the journals' official websites, and/or through educational search engines; except one—*Educational Technology: The Magazine for Managers of Change in Education (ETMAG)*—which had issues available only in print. Therefore, each one of the *ETMAG* research articles had to be scanned, converted into a PDF document, and then processed with Adobe Acrobat's OCR (optical character recognition) function. *ETMAG* article data were then manually selected, copied, and pasted into that journal's Excel file along with the data from the other nine journals. Since the OCR

feature did not recognize all the characters from the scanned PDF files with 100% accuracy, it was imperative to double-check each scanned article and correct mis-read characters and/or provide missing information.

High-Level Themes

One of the goals of the study was to extract high-level themes representing broad research areas, so analysis initially focused on article abstracts. The abstracts served this purpose well because they are typically very carefully written by their authors, who have made an effort to articulate their article's contribution and its position in a clearly perceived, socially constructed, intellectual structure following the conventions of the educational technology discipline. Citation information was collected from Google Scholar via Publish-Or-Perish, a free software package available from Harzing at <http://www.harzing.com/pop.htm>.

The collected abstracts (from all the ten journals) were analyzed using Latent Semantic Analysis (LSA), a text analytic method that extracts underlying concepts from observed instances of word usage. The analysis followed the guidelines in Evangelopoulos et al. (2012) and the steps in Kulkarni et al. (2014).

Our implementation of LSA started with the compilation of a term frequency matrix of term-by-document dimensionality. Each article abstract served as a document. Terms that appeared only once in the entire collection were excluded. A standard list of 1730 pairs of British-spelled and American-spelled term variants were used to cross-reference the two spelling styles. Inverse document-frequency term frequency weighting (TF-IDF) was used to promote infrequent terms and discount frequent terms. The terms were stemmed to accommodate different grammatical variations of the same term. Trivial English words (*stopwords*) were also excluded. After excluding those terms, applying the stop list and stemming the terms, the active vocabulary for the analysis resulted in 4962 stemmed terms.

Since the goal of the analysis was to identify high-level themes, in order to further reduce the term dimensionality, an initial round of Singular Value Decomposition (SVD) was implemented on a random sample that included one-third of the abstracts (i.e., 3300 abstracts). A random sample was used, instead of the complete set, for purposes of computational efficiency. In this initial round of analysis, 100 principal components were extracted. Based on those components, the *variance explained* (also known as *communality*) for each term was computed (using *variance explained* = row-wise sum of squared term loadings). Based on this explained variance for each term, the final set of stemmed terms that explained 95% of variance was identified, resulting in 1255 stemmed terms. The final round of LSA performed another SVD on the 1255-by-9969 matrix that used (a) the selected 1255 terms and (b) the full set of 9969 abstracts. The final set of extracted topics was based on the dimensions of this SVD.

Singular value decomposition is an extension of principal component analysis, applicable to two sets of variables. In our case, the two sets of variables are the

terms (treating the terms as variables and the documents as observations) and the documents (treating the documents as variables and the terms as observations.) SVD operates on the term frequency matrix A , after all the term filtering and frequency weighting steps are complete, and breaks it down as $A = U\Sigma V^T$, where U are the term eigenvectors, V are the document eigenvectors, Σ is a diagonal matrix of singular values (i.e., square roots of common eigenvalues between terms and documents), and T denotes transposition. Regarding the products of SVD, the singular values quantify the strength of patterns in language use, where “pattern” here refers to groups of terms that tend to occur together in documents, defining contexts, which form the settings of research topics. The term eigenvectors map each term on each one of the extracted latent semantic dimensions, and the document eigenvectors map each document on each of the dimensions.

Extracted Factors

With the purpose of producing interpretable factors, the dimension space was rotated using varimax rotations. The SVD output included the singular values, which were squared to compute the eigenvalues. Then the number of extracted factors could be decided upon, through looking for points where the average eigenvalue dropped abruptly in a *scree plot*. Those were the candidate dimensionalities. The results from these analyses disclosed three alternative candidate dimensionalities (the cut-off points for the number of dimensions to retain): 3, 10, and 22 factors.

After examining the 3, 10, and 22 factors, we opted for the 22 factors because we considered that 22 factors would be more descriptive of the elements of the intellectual structure in the field of educational technology. Because we had obtained high-loading terms and high-loading documents for each factor (see Tables 3.1, 3.2 and 3.3), we used them to label the factors (in many cases, a shortened version of the term was used to represent the root of that term as it occurred in articles). We carefully scrutinized three different sources for each of the 22 factors: (1) the list of high-loading terms revealed by the LSA and SVD analyses; (2) WordMaps created from the top 25 of the high-loading articles, and (3) WordMaps created from the titles of those articles. Tables 3.1, 3.2 and 3.3 list the high-loading terms identified by the LSA analysis performed for each of the 22 factors. Appendices 20 and 21 present the lists of the high-loading terms for the 3-factor solution and the 10-factor solution respectively.

Table 3.1 List of the high-loading terms identified by the LSA analysis performed for factors 1–8

F22.1	F22.2	F22.3	F22.4	F22.5	F22.6	F22.7	F22.8
Learn	student	learn	perceiv	project	Discuss	Preservice	F22.8
Theory	learn	adapt	factor	faculti	collabor	Integr	learner
Student	test	evalu	attitud	manag	online	Teacher	environ
Field	group	softwar	learn	univers	Face	Classroom	collabor
Scienc	control	system	inten	profession	interac	Profession	motiv
Practice	perform	propos	accept	program	commun	Teach	style
understand	experiment	web	efficaci	institu	social	Pedagog	strategi
Issu	achiev	object	student	ict	asynchron	Belief	software
Culture	score	user	influence	distanc	forum	Track	test
World	condition	tool	percep	school	particip	Student	student
framework	significantli	assess	us	organ	Share	Practice	scale
Context	signific	model	behavior	implement	analysi	School	scaffold
Instruct	effect	approach	user	success	network	Curriculum	item
perspect	read	applic	social	need	group	Program	cognit
approach	differ	style	model	team	instructor	Lesson	valid
Process	particip	content	relationship	innov	student	Service	outcom
Social	compar	learner	survei	busi	messag	Plan	support
knowledg	attitud	test	gender	plan	Learn	Content	regul
Think	measur	framework	posit	member	facilit	Elementary	activ
Role	grade	multimedia	satisfac	resourc	active	Implement	attitud
Model	indic	process	affect	integr	synchron	Prepar	agent
Work	cognit	interact	motiv	cours	mediat	Pre	engag
Cognit	level	method	variabl	work	Team	Center	
conceptu	task	concept	eas	skill	discours	Interview	
commun	show	environ	signific	staff	analyz	Video	

Table 3.3 List of the high-loading terms identified by the LSA analysis performed for factors 17–22

F22.17	F22.18	F22.19	F22.20	F22.21	F22.22
video	ict	project	read	virtual	Map
multimedia	learn	student	languag	simul	concept
present	school	learn	english	world	Style
media	student	scienc	text	environ	Collabor
lectur	commun	collabor	write	agent	Knowled
text	polici	softwar	comprehen	interact	Network
materi	inform	multimedia	literaci	life	represent
visual	compet	distanc	word	user	Distanc
interact	faculti	team	foreign	languag	Ethic
produc	program	train	children	real	Social
anim	preservic	univers	vocabulari	second	Share
student	literaci	attitud	cultur	style	Discus
digit	field	ict	simul	map	Gender
softwar	secondari	work	book	visual	Adapt
audio	primari	engin	strategi	social	Prefer
learn	digit	mathemat	reader	commun	Learn
time	instruc	tutor	program	softwar	Construct
classroom	cultur	inquiri	skill	interac	Conceptu
instructor	pupil	tpack	second	realiti	Digit
format	theori	creativ	softwar	collabor	Issu
imag	countri	engag	efl	read	Tpack
user	level	gender	learn	physic	Structur
condition	access	discus	multimedia	internet	Train
feedback	nation		stori	space	Visual
project				applic	Student

High-Loading Terms

To guide the reader in the process we followed (three criteria used) to label the 22 factors, Fig. 3.1 shows only one of the WordMaps, created from the top 25 high-loading abstracts and one from the top high-loading titles created for the 22 factors. All of the Word Maps (from the abstracts and from the titles) for each of the 22-factor solution can be found in Appendix 22. Unlike the lists of loaded terms, which are often shortened, the WordMaps show complete words.

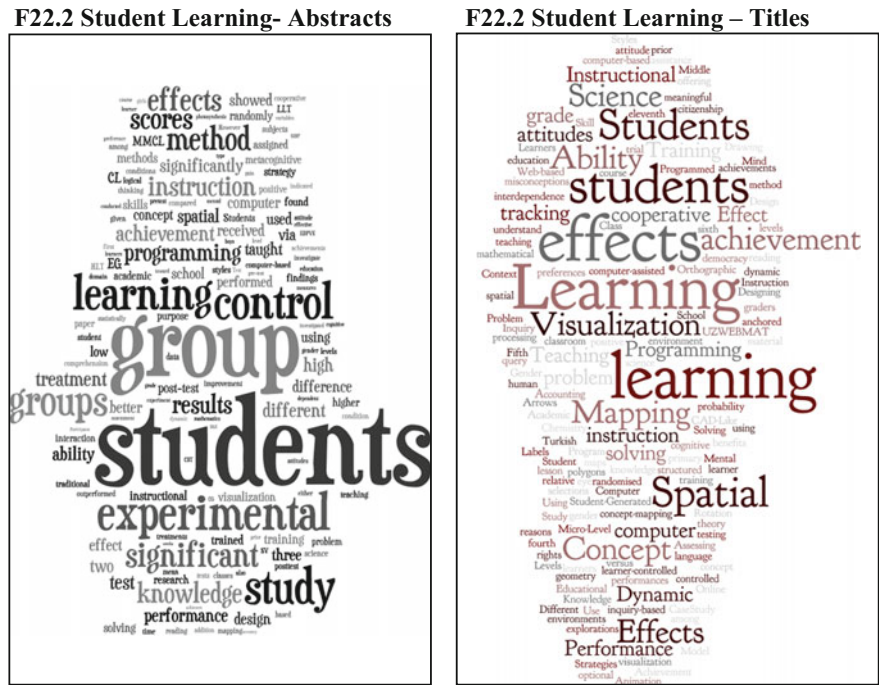


Fig. 3.1 A WordMap from the top 25 high-loading abstracts and a WordMap from the top 25 high-loading titles for Factor 22.2, which we labeled: *Student Learning*

Factor Labels

Factor labels and related high-loading article counts are displayed in Table 3.4, and a Contingency Table (cross-tabulation), Table 5, presents the article counts by journal and by topic. Table 3.5 has been split to show all 22 factors.

The citation data were obtained through running queries on Publish-or-Perish. Since Publish-or-Perish uses the Advanced Scholar Search capabilities of Google Scholar to calculate its various statistics, a large number of papers analyzed is

Table 3.4 The 22 factors labels and their high-loaded articles from the journals analyzed

Factor	Label	Article count
F22.1	Learning and instruction	1786
F22.2	Student learning	1369
F22.3	Learning systems and tools	714
F22.4	Learning experiences	585
F22.5	Faculty training and adult education	563
F22.6	Online learning	520
F22.7	Teacher preparation and professional development	435
F22.8	Learning environments	352
F22.9	Distance education	318
F22.10	Game-based learning	308
F22.11	The internet and digital literacy	400
F22.12	Professional meetings and associations	217
F22.13	Mobile learning	225
F22.14	Problem-solving	266
F22.15	Assessment and feedback	275
F22.16	Childhood education	261
F22.17	Learning with multimedia	268
F22.18	ICT in learning & instruction	225
F22.19	Experiential learning	186
F22.20	Reading comprehension	310
F22.21	Virtual environments	246
F22.22	Concept mapping	151

generated because its databases include not just citations in journals that are listed in the Thomson ISI or Scopus database, but also citations to and in books and book chapters; conference proceedings; working papers and government reports; and journals not listed in ISI or Scopus, and journals in languages other than English.

Table 3.5 Contingency table (cross-tabulation)

	F22.1	F22.2	F22.3	F22.4	F22.5	F22.6	F22.7	F22.8	F22.9	F22.10	F22.11
All journals	1786	1369	714	585	563	520	435	352	318	308	400
Journal	T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11
BJET	195	116	79	65	83	61	23	49	43	49	38
CE	299	498	250	252	73	166	93	99	61	119	82
ETMAG	466	12	51	8	142	28	18	40	54	23	55
ETRD	166	117	42	24	40	28	32	23	12	26	20
IS	134	143	13	17	3	29	10	18	5	2	5
JECR	69	213	23	96	15	45	52	33	16	23	39
JETS	184	167	221	79	94	96	37	65	47	32	50
JLS	152	23	8	2	0	18	10	4	0	3	2
JRTE	49	71	12	39	30	28	91	11	19	7	13
TETR	72	11	15	3	83	21	69	10	61	24	96
	F22.12	F22.13	F22.14	F22.15	F22.16	F22.17	F22.18	F22.19	F22.20	F22.21	F22.2
All journals	217	225	266	275	261	268	225	186	310	246	151
Journal	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22
BJET	1	28	12	48	35	39	54	25	45	39	23
CE	1	78	66	91	95	81	107	38	82	86	47
ETMAG	3	26	13	6	21	23	8	17	14	33	1
ETRD	5	6	38	14	10	11	10	16	17	7	16
IS	1	0	44	24	9	11	0	2	16	5	9
JECR	1	9	33	32	37	14	6	8	43	23	13
JETS	2	54	23	42	18	24	29	26	49	28	28
JLS	0	0	16	5	10	2	1	8	0	4	4
JRTE	0	5	14	4	14	10	6	16	14	2	8
TETR	203	19	7	9	12	53	4	30	30	19	2

Article counts by journal and by topic (22)

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Chapter 4

Research Questions and Their Answers



Research Question 1

Which specific journals were cited most frequently during the time period determined for this study (Jan 1995–Dec 2014)?

To answer this question, we visited the platform *The SCImago Journal & Country Rank*, a publicly available portal that includes the journals and country scientific indicators developed from the information contained in the Scopus® database (Elsevier B.V.). These indicators can be used to assess and analyze scientific domains.

Journal Metrics—Data collected for the nine journals selected for the study that are indexed, from 1999 to 2014:

- SNIP—*Source Normalized Impact per Paper*
- IPP—*The Impact per Publication*
- SJR—*SCImago Journal Ranks*—Accounts for both, the number of citations received by the journal and the importance or prestige of the journals where such citations come from = average prestige per article.

h-Index

The *h-index* is a journal-level metric that attempts to measure both the productivity and citation impact of the publications of a scholarly journal. The *h-index* reflects both the number of publications and the number of citations per publication.

The *h-index* is intended to measure simultaneously the quality and quantity of scientific output, whereas other bibliometric indicators, such as total number of papers (which does not account for the quality of scientific publications), or total number of citations (which can be disproportionately affected by factors such as a single publication of major influence; papers proposing successful new techniques, or methods; or many publications with few citations each).

The *h-index* expresses the journal's number of articles (*h*) that have received at least *h* citations. It quantifies both journal scientific productivity and scientific impact.

Tables 4.1, 4.2 and 4.3 show the Journals Metrics (SNIP, IPP and SJR) as well as the *h-Index* for the nine of the ten journals selected for this study which were indexed at the time this research was completed. Table 4.1: Educational Technology Research and Development; Instructional Science and Journal of the Learning Sciences. Table 4.2: TechTrends; Journal of Educational Technology and Society and Computers and Education. Table 4.3: The British Journal of Educational Technology; Journal of Educational Computing Research and Journal of Research on Technology in Education.

Table 4.1 Journal Metrics: SNIP, IPP, and SJR

	Educational Technology Research and Development			Instructional Science			Journal of the Learning Sciences		
	SNIP	IPP	SJR	SNIP	IPP	SJR	SNIP	IPP	SJR
Year	1999	1999	1999	1999	1999	1999	1999	1999	1999
	1.198	0.545	0.444	1.03	0.567	0.315	1.792	1.412	1.392
Year	2000	2000	2000	2000	2000	2000	2000	2000	2000
	1.506	1.00	0.422	1.091	0.803	0.441	2.346	1.438	1.112
Year	2001	2001	2001	2001	2001	2001	2001	2001	2001
	1.123	0.633	0.50	1.11	0.55	0.645	1.95	1.515	1.646
Year	2002	2002	2002	2002	2002	2002	2002	2002	2002
	1.897	0.855	0.515	1.246	0.632	0.475	3.251	1.647	1.383
Year	2003	2003	2003	2003	2003	2003	2003	2003	2003
	1.559	1.00	0.824	0.74	0.534	0.50	2.616	1.838	2.506
Year	2004	2004	2004	2004	2004	2004	2004	2004	2004
	1.891	0.909	0.847	1.021	0.651	0.432	3.495	2.2	1.982
Year	2005	2005	2005	2005	2005	2005	2005	2005	2005
	1.328	0.761	0.60	1.688	1.25	0.773	2.77	2.189	3.16
Year	2006	2006	2006	2006	2006	2006	2006	2006	2006
	1.384	0.908	0.954	1.555	1.561	1.442	3.323	2.73	2.717
Year	2007	2007	2007	2007	2007	2007	2007	2007	2007
	2.322	1.198	1.152	1.637	1.607	1.311	3.493	2.667	3.09
Year	2008	2008	2008	2008	2008	2008	2008	2008	2008
	2.336	1.627	1.546	1.568	1.61	1.361	4.677	3.283	4.355
Year	2009	2009	2009	2009	2009	2009	2009	2009	2009
	2.295	1.663	1.09	1.689	1.59	1.184	3.51	2.646	2.221
Year	2010	2010	2010	2010	2010	2010	2010	2010	2010
	1.853	1.644	1.495	1.325	1.276	0.774	2.373	2.022	1.758
Year	2011	2011	2011	2011	2011	2011	2011	2011	2011
	2.108	2.009	1.787	1.422	1.571	1.179	2.239	2.511	2.337
Year	2012	2012	2012	2012	2012	2012	2012	2012	2012
	2.231	1.584	1.205	1.78	1.858	1.623	2.678	2.638	2.344
Year	2013	2013	2013	2013	2013	2013	2013	2013	2013
	2.293	2.288	1.703	1.892	2.103	1.607	3.509	3.521	2.764
Year	2014	2014	2014	2014	2014	2014	2014	2014	2014
	1.752	1.786	1.609	1.294	1.631	1.907	2.468	2.538	2.68

* Educational Technology, Research and Development—58 *h-Index*

* Instructional Sciences—46 *h-Index*

* Journal of the Learning Sciences—65 *h-Index*

Table 4.2 Journal Metrics: SNIP, IPP, and SJR

	TechTrends			Journal of Educational Technology and Society			Computers and Education		
	SNIP	IPP	SJR	SNIP	IPP	SJR	SNIP	IPP	SJR
Year	1999	1999	1999	1999	1999	1999	1999	1999	1999
	0	0	0.101	0	0	0.143	0.867	0.411	0.35
Year	2000	2000	2000	2000	2000	2000	2000	2000	2000
	0	0	0	0	0	0.16	1.028	0.538	0.418
Year	2001	2001	2001	2001	2001	2001	2001	2001	2001
	0	0	0.102	0.595	0.208	0.229	1.197	0.556	0.518
Year	2002	2002	2002	2002	2002	2002	2002	2002	2002
	0	0	0.102	0.791	0.27	0.257	1.49	0.639	0.493
Year	2003	2003	2003	2003	2003	2003	2003	2003	2003
	0	0	0.102	0.754	0.335	0.363	1.831	0.911	0.668
Year	2004	2004	2004	2004	2004	2004	2004	2004	2004
	0	0	0	0.677	0.321	0.27	1.783	0.827	0.58
Year	2005	2005	2005	2005	2005	2005	2005	2005	2005
	0	0	0	0.89	0.324	0.222	1.545	0.828	0.702
Year	2006	2006	2006	2006	2006	2006	2006	2006	2006
	0	0	0	1.08	0.494	0.329	2.539	1.347	1.096
Year	2007	2007	2007	2007	2007	2007	2007	2007	2007
	0.138	0.189	0.218	1.349	0.67	0.513	2.775	1.595	1.34
Year	2008	2008	2008	2008	2008	2008	2008	2008	2008
	0.432	0.208	0.216	1.52	0.732	0.462	2.913	1.978	1.291
Year	2009	2009	2009	2009	2009	2009	2009	2009	2009
	0.527	0.342	0.231	1.427	1.056	0.681	2.298	2.134	1.366
Year	2010	2010	2010	2010	2010	2010	2010	2010	2010
	0.46	0.331	0.366	1.166	1.072	0.84	2.49	2.637	1.592
Year	2011	2011	2011	2011	2011	2011	2011	2011	2011
	0.704	0.531	0.431	1.609	1.466	1.237	3.127	3.327	2.265
Year	2012	2012	2012	2012	2012	2012	2012	2012	2012
	0.519	0.575	0.432	1.926	1.803	1.37	3.313	3.738	2.77
Year	2013	2013	2013	2013	2013	2013	2013	2013	2013
	0.835	0.536	0.274	1.854	1.7	0.98	3.493	3.917	2.469
Year	2014	2014	2014	2014	2014	2014	2014	2014	2014
	1.301	0.894	0.477	1.528	1.457	0.919	3.247	3.585	2.578

* TechTrends—18 *h-Index** Journal of Educational Technology and Society—47 *h-Index** Computers & Education—93 *h-Index*

Table 4.3 Journal Metrics: SNIP, IPP, and SJR

	The British Journal of Educational Technology			Journal of Educational Computing Research			Journal of Research on Technology in Education		
	SNIP	IPP	SJR	SNIP	IPP	SJR	SNIP	IPP	SJR
Year	1999	1999	1999	1999	1999	1999	1999	1999	1999
	0.718	0.243	0.259	0.536	0.426	0.361	0	0	0
Year	2000	2000	2000	2000	2000	2000	2000	2000	2000
	0.74	0.321	0.278	0.428	0.232	0.231	0	0	0
Year	2001	2001	2001	2001	2001	2001	2001	2001	2001
	1.251	0.563	0.463	0.436	0.362	0.348	0	0	0
Year	2002	2002	2002	2002	2002	2002	2002	2002	2002
	1.255	0.346	0.214	0.728	0.5	0.406	0	0	0
Year	2003	2003	2003	2003	2003	2003	2003	2003	2003
	1.093	0.312	0.366	0.651	0.415	0.319	0	0	0
Year	2004	2004	2004	2004	2004	2004	2004	2004	2004
	1.618	0.425	0.409	0.542	0.299	0.268	0	0	0
Year	2005	2005	2005	2005	2005	2005	2005	2005	2005
	1.171	0.593	0.633	0.691	0.476	0.39	0	0	0
Year	2006	2006	2006	2006	2006	2006	2006	2006	2006
	1.252	0.615	0.482	0.767	0.528	0.407	0	0	0
Year	2007	2007	2007	2007	2007	2007	2007	2007	2007
	1.613	0.792	0.733	0.934	0.617	0.708	0	0	0
Year	2008	2008	2008	2008	2008	2008	2008	2008	2008
	1.715	1.114	1.11	0.819	0.723	0.677	0	0	0
Year	2009	2009	2009	2009	2009	2009	2009	2009	2009
	1.653	1.105	0.735	0.863	0.639	0.422	0	0	0
Year	2010	2010	2010	2010	2010	2010	2010	2010	2010
	1.976	1.445	1.151	0.901	0.808	0.575	0	0	0
Year	2011	2011	2011	2011	2011	2011	2011	2011	2011
	2.245	1.989	1.595	0.734	0.634	0.573	0	0	0
Year	2012	2012	2012	2012	2012	2012	2012	2012	2012
	1.741	1.976	1.801	0.752	0.711	0.581	0	0	0
Year	2013	2013	2013	2013	2013	2013	2013	2013	2013
	1.889	2.035	1.501	1.036	1.086	0.841	0.067	0.167	0.17
Year	2014	2014	2014	2014	2014	2014	2014	2014	2014
	1.735	1.813	1.51	0.995	1.017	0.867	1.194	0.828	0.533

* British Journal of Educational Technology—55 *h-Index*

* Journal of Educational Computing Research—39 *h-Index*

* Journal of Research on Technology in Education—8 *h-Index*

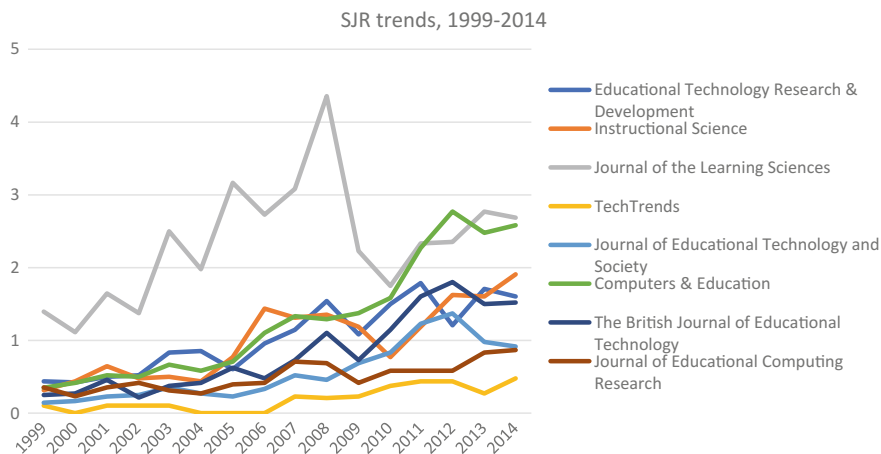


Fig. 4.1 The SJR (the SCImago Journal Rank) for the journals: *Computers and Education*, *Journal of the Learning Sciences*, *Educational Technology Research and Development*, *the British Journal of Educational Technology*, *Educational Technology and Society*, *Instructional Science*, *Journal of Educational Computer Research* and *TechTrends*

SJR (SCImago Journal Rank) Indicator

It expresses the average number of weighted citations received in the selected year by the documents published in the selected journal in the three previous years, i.e., weighted citations received in year X to documents published in the journal in years $X - 1$, $X - 2$ and $X - 3$. Figure 4.1 shows the journals rank indicators from 1999 to 2014.

Research Question 2

What specific research articles were cited more frequently overall in each journal during the time period determined for this study (Jan 1995–Dec 2014)?

The answer to this question is shown in Table 4.4, where the most-cited research article's title and author(s) in each journal, published from 1995 to 2014, are listed; as well as the total number of citations earned and, very important, the year the articles was first published. We also added a column to include the total number of high-cited papers per journal (those which had received 200 or more cites at the time this study was done) in that time span. Table 4.5 shows the total number of authors (748) of high-cited papers and their total highest HIP (high-Impact-Paper Count).

Note: The ten specific research articles which were cited more frequently in each of the journals and in a 5-year period of time are reported in this book in chapter titled: The Ten Journals Selected for This Study: (Tables # 2.2, 2.4, 2.6, 2.8, 2.10, 2.12, 2.14, 2.16, 2.18, 2.19; and Appendices A–S).

Table 4.4 Most-cited research article in each journal, published from 1995 to 2014; and the total number of years passed from first published to the year the paper had earned the highest number of citation in that particular journal

Journal	Author(s)	Article title	Total citations	Year first published	Total high-cited papers
British Journal of Educational Technology (BJET)	Sue Bennett, Karl Maton, and Lisa Kervin	The 'digital natives' debate: A critical review of the evidence	1951	2008 (6 years)	38
Journal of the Learning Sciences	Brigitte Jordan and Austin Henderson	"Interaction analysis: Foundations and practice"	1819	1995 (19 years)	53
Educational Technology Research and Development (ETR&D)	Peggy A. Ertmer	Teacher pedagogical beliefs: The final frontier in our quest for technology integration?	1433	2005 (9 years)	64
Instructional Science	Noriko Hara, Curtis Jay Bonk, and Charoula Angeli	Content analysis of online discussion in an applied educational psychology course	1063	2000 (14 years)	25
TechTrends	David H. Jonassen, Chad Carr, and Hsiu-Ping Yueh	Computers as mindtools for engaging learners in critical thinking	556	1998 (16 years)	3
Journal of Educational Technology and Society	Rob Koper and Bill Oliver	Representing the learning design of units of learning	469	2004 (10 years)	17
Computers and Education	Pei-Chen Sun, Ray J. Tsai, Glenn Finger, Yueh-Yang Chen, and Downing Yeh	What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction	1036	2008 (6 years)	134

(continued)

Table 4.4 (continued)

Journal	Author(s)	Article title	Total citations	Year first published	Total high-cited papers
Journal of Educational Computing Research	Charlotte N. Gunawardena, Constance A. Lowe, and Terry Anderson	Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing	1492	1997 (17 years)	17
Journal of Research on Technology in Education	PA Ertmer, AT Ottenbreit-Leftwich	Teacher technology change: How knowledge, confidence, beliefs, and culture intersect	630	2010 (4 years)	19

The last column lists the total number of High-cited papers per journal (those which had received 200 or more cites at the time this study was done)

Table 4.5 Total number of authors with the highest HIP index (High-Impact-Paper Count)

Total HIP articles	# of authors
8	1
7	1
6	2
5	3
4	9
3	10
2	76
1	646
Grand total	748

Research Question 3

Who has published HIP (High-Impact Paper) research articles in Educational Technology in multiple of these ten journals during the past 20 years (Jan 1995–Dec 2014)?

The total number of authors who had published three or more High-Impact-Papers, at the time this study was done was 26. Those are the authors listed in Tables 4.6 and 4.7. Table 4.7 also shows the journals where those authors’ HIP research articles were published.

Note Authors who had published three or more High-Impact-Papers, at the time this study was done, were 26. Those are the Authors listed in Tables 4.6 and 4.7.

Table 4.6 Authors’ names with the highest HIP index (High-Impact-Paper Count), having published three or more

Author’s name		Author’s name	
Jonassen, David H.	8	Pea, Roy D.	4
Ertmer, Peggy A.	7	Resnick, Mitchel	4
Hannafin, Michael J.	6	Soloway, Elliot	4
Land, Susan M.	6	Angeli, Charoula	3
Barab, Sasha A.	5	Barron, Brigid	3
Squire, Kurt D.	5	Brush, Thomas A.	3
Valcke, Martin	5	Dickey, Michele D.	3
Azevedo, Roger	4	Jochems, Wim M. G.	3
Hmelo-Silver, Cindy E.	4	Kirschner, Paul A.	3
Hwang, Gwo-Jen	4	Tondeur, Jo	3
Koehler, Matthew J.	4	Tsai, Chin-Chung	3
Krajcik, Joseph	4	van Merrienboer, Jeroen J. G.	3
Mishra, Punya	4	Yang, Stephen J. H.	3

Table 4.7 Authors who have published high-loaded research articles in multiple of these ten journals

Author's name	Total	BIET	CE	ETRD	IS	JECR	JETS	JLS	JRTE	TETR	Total
Jonassen, David H.	8			ETRD, ETRD, ETRD, ETRD, ETRD, ETRD					JRTE	TETR	8
Angeli, Charoula	3	BIET	CE		IS						3
Azevedo, Roger	4			ETRD	IS	JECR, JECR					4
Barab, Sasha A.	5			ETRD, ETRD, ETRD				JLS, JLS			5
Barron, Brigid	3							JLS, JLS, JLS			3
Brush, Thomas A.	3		CE	ETRD, ETRD							3
Dickey, Michele D.	3	BIET		ETRD, ETRD							3
Ertmer, Peggy A.	7		CE	ETRD, ETRD	IS				JRTEJRTEJRTE		7
Hannafin, Michael J.	6			ETRD, ETRD, ETRD, ETRD, ETRD	IS						6
Hmelo-Silver, Cindy E.	4		CE	ETRD				JLS, JLS			4
Hwang, Gwo-Jen	4		CE, CE, CE				JETS				4
Jochems, Wim M. G.	3		CE, CE				JETS				3
Kirschner, Paul A.	3			ETRD, ETRD			JETS				3
	4		CE			JECR			JRTEJRTE		4

(continued)

Table 4.7 (continued)

Author's name	Total	BJET	CE	ETRD	IS	JECR	JETS	JLS	JRTE	TETR	Total
Kochler, Matthew J.											
Krajcik, Joseph	4							JLS, JLS JLS, JLS			4
Land, Susan M.	6			ETRD, ETRD, ETRD, ETRD	IS						6
Mishra, Punya	4		CE			JECR			JRTEJRTE		4
Pea, Roy D.	4							JLS, JLS JLS, JLS			4
Resnick, Mitchel	4			ETRD				JLS, JLS, JLS			4
Soloway, Elliot	4							JLS, JLS, JLS	JRTE		4
Squire, Kurt D.	5			ETRD, ETRD				JLS, JLS, JLS			5
Tondeur, Jo	3		CE, CE, CE								3
Tsai, Chin-Chung	3		CE		IS		JETS				3
Valcke, Martin	5		CE, CE, CE, CE, CE								5
van Merriënboer, Jeroen J G	3			ETRD, ETRD, ETRD							3
Yang, Stephen J. H.	3		CE				JETS, JETS				3

Note The authors whose article totals are highlighted in italic published the total number of their highly cited articles in one of the journals, not in multiple

Research Question 4

Which specific authors were cited most frequently overall, and which ones were most frequently cited by 5-year periods of time in each of the journals during the 20 years (Jan 1995–Dec 2014) in the top journals in Educational Technology selected for this study?

Tables 4.8, 4.9, 4.10, 4.11, 4.12, 4.13, 4.14, 4.15 and 4.16 list the authors who were the most cited (200 times minimum) for the high-impact research papers used for this analysis within the Educational Technology discipline. The authors are presented beginning from the highest number of citations received, that is, from Jonassen, David H. with 5457 (Table 4.8); continuing down up to five authors who received 200 citations each: Ben-Bassat Levy, Ronit; Gerjets, Peter; Grabowski, Barbara; Scheiter, Katharina; and Uronen, Pekka A. (Table 4.16).

Table 4.8 The most-cited authors from the High-Impact Papers (from 5457 to 759 citations)

	Author's name	HIC-Index		Author's name	HIC-Index
1	Jonassen, David H.	5457	46	Oliver, Ron	1047
2	Ertmer, Peggy A.	4713	47	Hwang, Gwo-Jen	1043
3	Barab, Sasha A.	2946	48	Chen, Yueh-Yang	1036
4	Hannafin, Michael J.	2938	49	Finger, Glenn	1036
5	Squire, Kurt D.	2357	50	Tsai, Ray J.	1036
6	Koehler, Matthew J.	2200	51	Yeh, Dowming	1036
7	Mishra, Punya	2200	52	van Keer, Hilde	1019
8	Koedinger, Kenneth R.	2138	53	van Merrienboer, Jeroen J G	1007
9	Land, Susan M.	1946	54	Kirschner, Paul A.	983
10	Bennett, Sue	1915	55	Resnick, Mitchel	968
11	Kervin, Lisa	1915	56	Papastergiou, Marina	966
12	Maton, Karl	1915	57	Rieber, Lloyd, P.	955
13	Valcke, Martin	1890	58	Kolodner, Janet L.	950
14	Chi, Michelene T. H.	1874	59	Rohrer-Murphy, Lucia	946
15	Angeli, Charoula	1826	60	Azevedo, Roger	945
16	Henderson, Austin	1819	61	Fischer, Frank	914
17	Jordan, Brigitte	1819	62	Weinberger, Armin	914
18	Anderson, John R.	1793	63	Davis, Elizabeth A.	913
19	Corbett, Albert T.	1793	64	Huang, Hsiu-Mei	903
20	Pelletier, Ray	1793	65	Jacobson, Michael J.	895
21	Anderson, Terry	1758	66	Wang, Feng	891
22	Brush, Thomas A.	1677	67	Ottenbreit-Leftwich, Anne T.	890

(continued)

Table 4.8 (continued)

	Author's name	HIC-Index		Author's name	HIC-Index
23	Bielaczyc, Katerine	1568	68	Sharples, Mike	885
24	Krajcik, Joseph	1542	69	Selim, Hassan M.	881
25	Barron, Brigid	1541	70	Yang, Stephen J. H.	879
26	Gunawardena, Charlotte N	1492	71	Ainsworth, Shaaron	875
27	Lowe, Constance A.	1492	72	Chou, Chien	862
28	Pea, Roy D.	1480	73	Pelgrum, W. J.	861
29	Soloway, Elliot	1467	74	Liaw, Shu-Sheng	840
30	Sun, Pei-Chen	1395	75	Tondeur, Jo	835
31	Collins, Allan	1364	76	Mayer, Richard E.	824
32	Joseph, Diana	1364	77	Schraw, Gregory	816
33	Merrill, M. David	1332	78	Hill, Janette R.	809
34	Bonk, Curtis Jay	1311	79	Becker, Henry Jay	805
35	Edelson, Daniel C.	1300	80	Carteaux, Robert	798
36	Hmelo-Silver, Cindy E.	1276	81	Dodge, Tyler	798
37	Hew, Khe Foon	1133	82	Thomas, Michael	798
38	Tüzün, Hakan	1113	83	De Wever, B.	796
39	Dickey, Michele D.	1110	84	Boyle, James M.	793
40	Reiser, Brian J.	1105	85	Newby, Timothy J.	783
41	Nussbaum, Miguel	1076	86	Reiser, Robert A.	781
42	Hara, Noriko	1063	87	Tsai, Chin-Chung	773
43	Jochems, Wim M. G.	1061	88	Ritchie, Donn C.	764
44	Schellens, Tammy	1055	89	Valanides, Nicos	763
45	Herrington, Jan	1047	90	Oliver, Martin	759

Research Question 5

What trends in Educational Technology research areas have these top ten journals followed in their publications during the past 20 years (Jan 1995–Dec 2014)?

Table 4.9 The most cited authors from the High-Impact Papers (from 746 to 472 citations)

	Author's name	HIC-Index		Author's name	HIC-Index
91	Baylor, Amy L.	746	136	Carr, Chad	556
92	So, Hyo-Jeong	739	137	Yueh, Hsiu-Ping	556
93	Ebner, Martin	738	138	Camp, Paul J.	549
94	Martens, Rob L.	699	139	Crismond, David	549
95	Strijbos, Jan-Willem	699	140	Fasse, Barbara	549
96	Kreijns, Karel	691	141	Gray, Jackie	549
97	Lee, Mark J. W.	681	142	Holbrook, Jennifer	549
98	Dalgarno, Barney	675	143	Puntambekar, Sadhana	549
99	de Freitas, Sara	675	144	Ryan, Mike	549
100	Motiwalla, Luvai F.	622	145	Tangney, Brendan	549
101	Chen, Gwo-Dong	621	146	van Braak, Johan	549
102	Marx, Ronald W.	618	147	Shea, Peter	542
103	Wang, Yi-Shun	614	148	Baran, Evrim	533
104	Tor Busch	610	149	Schmidt, Denise A.	533
105	Duncan, Ravit Golan	608	150	Shin, Tae S.	533
106	Fretz, Eric	608	151	Thompson, Ann D.	533
107	Kyza, Eleni	608	152	Wilensky, Uri	532
108	Quintana, Chris	608	153	Clark, Richard E.	521
109	García, Enrique	607	154	de Croock, Marcel B M	521
110	Romero, Cristóbal	607	155	Zurita, Gustavo	515
111	Ventura, Sebastián	607	156	Dori, Yehudit Judy	506
112	Hsiao, Ming-Chun	604	157	Yahya, Kurnia	503
113	Kozma, Robert B.	599	158	Boyle, Elizabeth A.	502
114	Lin, Xiaodong	592	159	Connolly, Thomas M.	502
115	Conole, Gráinne	587	160	Hainey, Thomas	502
116	Evans, Chris	584	161	MacArthur, Ewan	502
117	Kay, Robin H.	578	162	Warburton, Steven	501
118	Spiro, R. J.	575	163	Reeves, Thomas C.	499
119	Chen, Chih-Ming	564	164	Albirini, Abdulkafi	498
120	Demetriadis, Stavros	564	165	Hammer, David	491
121	Pomportsis, Andreas	564	166	Littlejohn, Allison	488
122	Moreno, Roxana	563	167	Margaryan, Anoush	488
123	Correa, Mónica	561	168	Vojt, Gabrielle	488
124	Cumsille, Patricio	561	169	Rourke, Liam	485
125	Flores, Patricia	561	170	Lee, Yao-kuei	483
126	Grau, Valeska	561	171	Pituch, Keenan A.	483
127	Lagos, Francisca	561	172	Chan, Y. H. C.	480
128	López, Verónica	561	173	Ngai, E. W. T.	480
129	López, Ximena	561	174	Poon, J. K. L.	480
130	Marianov, Vladimir	561	175	Lowther, Deborah L.	478

(continued)

Table 4.9 (continued)

	Author's name	HIC-Index		Author's name	HIC-Index
131	Rodriguez, Patricio	561	176	Addison, Paul	477
132	Rosas, Ricardo	561	177	Lane, Molly	477
133	Salinas, Marcela	561	178	Ross, Eva	477
134	Harris, Judith	560	179	Woods, Denise	477
135	Klopfers, Eric	557	180	McLoughlin, Catherine	472

Table 4.10 The most cited authors from the High-Impact Papers (from 469 to 357 citations)

	Author's name	HIC-Index		Author's name	HIC-Index
181	Koper, Rob	469	226	Holton, Douglas L.	401
182	Olivier, Bill	469	227	Yildirim, Soner	400
183	Cross, Simon	466	228	Prins, Frans J.	399
184	Healing, Graham	466	229	Nicholls, Craig	397
185	Jones, Chris	466	230	Pena-Shaff, Judith B.	397
186	Ramanau, Ruslan	466	231	Levy, Yair	392
187	Li, Tanya Beran Qing	462	232	Tam, Maureen	389
188	Schepers, Jeroen J. L.	457	233	Guzdial, Mark	387
189	van Raaij, Erik M.	457	234	Turns, Jennifer	387
190	Messina, Richard	456	235	Bowers, Clint A.	385
191	Reeve, Richard	456	236	Cannon-Bowers, Jan	385
192	Scardamalia, Marlene	456	237	Muse, Kathryn	385
193	Zhang, Jianwei	456	238	Vogel, David S.	385
194	Bong, Mimi	454	239	Vogel, Jennifer J.	385
195	Choi, Ha-Jeen	454	240	Wright, Michelle	385
196	Young-Ju, Joo	454	241	Wang, Hsiu-Yuan	384
197	Junco, Reynol	452	242	We, Ming-Cheng	384
198	Choi, Jeong-Im	448	243	Hernandez-Serrano, Julian	381
199	Pierson, Melissa E.	444	244	Lienhardt, Conrad	377
200	Hirumi, Atsusi	442	245	Meyer, Iris	377
201	Kebritchi, Mansureh	442	246	Rohs, Matthias	377
202	Amory, Alan	441	247	Schrire, Sarah	374
203	Naicker, Kevin	441	248	Fried, Carrie B.	371
204	Vincent, Jacky	441	249	Ravitz, Jason	370
205	Cromley, Jennifer G.	440	250	Fordham, Nancy	369
206	Winters, Fielding I.	440	251	Vannatta, Rachel A.	369

(continued)

Table 4.10 (continued)

	Author's name	HIC-Index		Author's name	HIC-Index
207	Pintrich, Paul R.	437	252	Ertl, Bernhard	368
208	Wolters, Christopher A.	437	253	Bartsch, Robert A.	366
209	Anderson, Ronald E.	435	254	Cobern, Kristi M.	366
210	Dexter, Sara L.	435	255	Park, Sung Youl	366
211	Ke, Fengfeng	435	256	Cho, Kyoo-Lak	365
212	Wheeler, Dawn	431	257	de la Fuente, P.	363
213	Wheeler, Steve	431	258	Dimitriadis, Y.	363
214	Yeomans, Peter	431	259	Gómez, E.	363
215	Catrambone, Richard	430	260	Martínez, A.	363
216	Christensen, Rhonda	430	261	Rubia, B.	363
217	Cole, Melissa	426	262	Mazman, Sacide Güzin	362
218	Kwan, Hyug Il	421	263	Usluel, Yasemin Koçak	362
219	Rovai, Alfred P.	412	264	Holzinger, Andreas	361
220	Penuel, William R.	406	265	Lee, Ming-Chi	360
221	Goodyear, Peter	405	266	Chiu, Chao-Min	359
222	Salmon, Gilly	405	267	Hsu, Meng-Hsiang	359
223	Spector, J. Michael	405	268	Lin, Tung-Ching	359
224	Steeple, Christine	405	269	Sun, Szu-Yuan	359
225	Tickner, Sue	405	270	Flanagan, Andrew J.	357

Table 4.11 The most cited authors from the High-Impact Papers (from 357 to 303 citations)

	Author's Name	HIC-Index		Author's Name	HIC-Index
271	Metzger, Miriam J.	357	316	Maher, Greg	329
272	Zwarun, Lara	357	317	Pelz, William	329
273	Kirkup, Gill	355	318	Pickett, Alexandra	329
274	Li, Nai	355	319	Swan, Karen	329
275	Maddison, Sarah	354	320	Hermans, R.	326
276	Mazzolini, Margaret	354	321	Jarmon, Leslie	326
277	Fabry, Dee L.	352	322	Mayrath, Michael	326
278	Higgs, John R.	352	323	Mueller, Julie	326
279	Cunningham, Donald J.	348	324	Ross, Craig	326
280	MaKinster, James G.	348	325	Specht, Jacqueline	326
281	Moore, Julie A.	348	326	Traphagan, Tomoko	326
282	Cobb, Paul	345	327	Trivedi, Avani	326
283	di Sessa, Andrea A.	345	328	Willoughby, Teena	326

(continued)

Table 4.11 (continued)

	Author's Name	HIC-Index		Author's Name	HIC-Index
284	Nathan, Mitchell J.	345	329	Wood, Eileen	326
285	Cassidy, Simon	343	330	Colella, V.	323
286	Chen, Ya-Hui	343	331	Nichols, Mark	322
287	Davies, Jo	343	332	Schwartz, Daniel L.	320
288	Eachus, Peter	343	333	Drent, Marjolein	318
289	Graff, Martin	343	334	Meelissen, Martina	318
290	Lee, Hahn-Ming	343	335	Culp, Katie Mcmillan	316
291	Teo, Timothy	343	336	Honey, Margaret	316
292	Ge, Xun	341	337	Katsionis, George	316
293	Sandoval, William A.	340	338	Kupperman, Jeff	316
294	Chen, Sherry Y.	339	339	Mandinach, Ellen	316
295	Ford, Nigel	339	340	Manos, Konstantinos	316
296	Poole, Dawn M.	338	341	Virvou, Maria	316
297	Bower, Gregory	336	342	Wallace, Raven McCrory	316
298	Kinzer, Charles K.	336	343	İnal, Yavuz	315
299	Mars, Rebecca	336	344	Karakuş, Türkan	315
300	Secules, Teresa J.	336	345	Kızılkaya, Gonca	315
301	Steinhoff, Kathryn	336	346	Saye, John W.	315
302	Yang, Shih-Hsien	336	347	Yılmaz-Soylu, Meryem	315
303	Alonso, Fernando	335	348	Shashaani, Lily	308
304	López, Genoveva	335	349	Schrum, Lynne	306
305	Manrique, Daniel	335	350	Chin, Elaine	305
306	Sweller, John	334	351	De Lucia, Andrea	305
307	Lizotte, David J.	331	352	Francesse, Rita	305
308	McNeill, Katherine L.	331	353	Marx, Nancy	305
309	Hundhausen, Christopher D.	330	354	Passero, Ignazio	305
310	Suthers, Daniel D.	330	355	Russell, Joel	305
311	Beers, Pieter Jelle	329	356	Tortora, Genoveffa	305
312	Fletcher-Flinn, Claire M.	329	357	Deters, Ralph	304
313	Fredericksen, Eric	329	358	Vassileva, Julita	304
314	Gravatt, Breon	329	359	Rummel, Nikol	303
315	Jan-Willem Strijbos	329	360	Spada, Hans	303

Table 4.12 The most-cited authors from the High-Impact Papers (from 302 to 267 citations)

	Author's Name	HIC-Index		Author's Name	HIC-Index
361	Asensio-Pérez, Juan I.	302	406	Szabo, Attila	285
362	Hernández-Leo, Davinia	302	407	Choi, Hee Jun	282
363	Villasclaras-Fernández, Eloy D.	302	408	Karagiorgi, Yiasemina	282
364	Derry, Sharon J.	301	409	Park, Ji-Hye	282
365	Dyke, M.	301	410	Symeou, Loizos	282
366	Engle, Randi A.	301	411	Barbour, Michael K.	279
367	Erickson, Frederick	301	412	Churchill, Daniel	279
368	Goldman, Ricki	301	413	Arauz, R.M.	277
369	Hall, Rogers	301	414	Wells, G.	277
370	Koschmann, Timothy	301	415	Annetta, Leonard A.	276
371	Lemke, Jay L.	301	416	Cheng, Meng-Tzu	276
372	Seale, J.	301	417	Holmes, Shawn Y.	276
373	Sherin, Bruce L.	301	418	Klimczak, Aimee K.	276
374	Sherin, Miriam Gamoran	301	419	Marra, Rose M.	276
375	Arnedillo Sánchez, Inmaculada	300	420	Minogue, James	276
376	Cavus, Nadire	300	421	Moore, Joi L.	276
377	Ibrahim, Dogan	300	422	De Jong, Ton	275
378	Patten, Bryan	300	423	Hannafin, Kathleen M.	275
379	Xun, G. E.	300	424	Oliver, Kevin	275
380	Murphy, Karen, L.	297	425	Brown, Scott W.	274
381	Thach, Elizabeth, C.	297	426	Kim, Hyung Nam	274
382	Triantafillou, Evangelos	297	427	Lawless, Kimberly A.	274
383	LeSage, Ann	296	428	Minstrell, Jim	273
384	Cho, Hichang	295	429	Strudler, Neal	273
385	Dabbagh, Nada	295	430	Wetzel, Keith	273
386	Davidson, Barry	295	431	Zee, Emily van	273
387	Gay, Geri	295	432	Blin, Françoise	271
388	Gilbert, Patricia K.	295	433	Elby, Andrew	271
389	Ingraffea, Anthony	295	434	Graham, Leah	271
390	Macdonald, Janet	293	435	Lee, Shinwoong	271
391	Bastiaens, Theo J.	292	436	Liu, Min	271
392	Gulikers, Judith T. M.	292	437	Moore, Zena	271
393	Sadik, Alaa	292	438	Munro, Morag	271
394	Smeets, Ed	292	439	Chen, Wenli	269
395	Tolmie, Andrew	291	440	Looi, Chee-Kit	269
396	Gros, Begoña	290	441	Seow, Peter	269
397	Blumenfeld, Phyllis	287	442	Wong, Lung-Hsiang	269
398	Fishman, Barry	287	443	Zhang, BaoHui	269

(continued)

Table 4.12 (continued)

	Author's Name	HIC-Index		Author's Name	HIC-Index
399	Braak, Johan van	286	444	Barbas, A.	267
400	Darby, Jonathan	286	445	Dyck, Jennifer L.	267
401	de Laat, Maarten	286	446	Luber, Elise S.	267
402	Dillon, Teresa	286	447	McKinney, Dani	267
403	Sang, Guoyuan	286	448	Molohides, A.	267
404	Hastings, Nigel	285	449	Palaiogeorgiou, G.	267
405	Sternberg, Robert J.	285	450	Psillos, D.	267

Table 4.13 The most-cited authors from the High-Impact Papers (from 267 to 245 citations)

	Author's Name	HIC-Index		Author's Name	HIC-Index
451	Tsoukalas, I.	267	496	García, Patricio	257
452	Vlahavas, I.	267	497	Schiaffino, Silvia	257
453	Berg, Robbie	265	498	Woody, William Douglas	257
454	Eisenberg, Michael	265	499	Laurillard, Diana	256
455	Chittaro, Luca	264	500	Mumtaz, Shazia	256
456	Ranon, Roberto	264	501	Norris, Cathleen	256
457	de-Marcos, Luis	263	502	Poirot, James	256
458	Domínguez, Adrián	263	503	Sullivan, Terry	256
459	Fernández-Sanz, Luis	263	504	Chan, Tak-Wai	255
460	Martínez-Herráiz, José-Javier	263	505	Chou, Chih-Yueh	255
461	Pagés, Carmen	263	506	Lin, Chi-Jen	255
462	Saenz-de-Navarrete, Joseba	263	507	Guthrie, John T.	254
463	Carr-Chellman, Alison	262	508	Issroff, Kim	254
464	Dawson, Shane	262	509	Jones, Ann	254
465	Duchastel, Philip	262	510	Moller, Leslie	254
466	Macfadyen, Leah P.	262	511	Rogers, Patricia L.	254
467	Sadik, Olgun	260	512	Seibert, Diane	254
468	Sendurur, Emine	260	513	Zohar, Anat	254
469	Sendurur, Polat	260	514	Belcher, John	252
470	Chang, Hsun-Fang	259	515	Bernard, Robert M.	251
471	Cho, Kwangsu	259	516	Shaffer, David W.	251
472	Duschl, Richard A.	259	517	Ayres, Paul	250
473	Glaser, Robert	259	518	Goldstone, Robert L.	250
474	John, Jenny	259	519	Greene, Barbara A.	250
475	Macher, Daniel	259	520	Son, Ji Y.	250
476	Maier, Brigitte	259	521	Brinkerhoff, Jonathan	249
477	Paechter, Manuela	259	522	Dolog, Peter	249

(continued)

Table 4.13 (continued)

	Author's Name	HIC-Index		Author's Name	HIC-Index
478	Schauble, Leona	259	523	Henze, Nicola	249
479	Schulze, Sharon	259	524	Hewitt, Jim	249
480	Schunn, Christian D.	259	525	Liao, Hsiu-Li	249
481	Barron, Ann E.	258	526	Liu, Su-Houn	249
482	Harmes, Christine	258	527	Markett, C.	249
483	Jimoyiannis, Athanassios	258	528	Nejdl, Wolfgang	249
484	Kalaydjian, Kimberly	258	529	Pratt, Jean A.	249
485	Kemker, Kate	258	530	Sánchez, I. Arnedillo	249
486	Komis, Vassilis	258	531	Weber, S.	249
487	Marton, Ference	258	532	Martín-Blas, Teresa	248
488	Nordin, Zaimuarifuddin Shukri	258	533	Serrano-Fernández, Ana	248
489	Othman, Abang Ekhsan Abang	258	534	Reynolds, David	247
490	Pang, Ming Fai	258	535	Treharne, Dave	247
491	Sam, Hong Kian	258	536	Trip, Helen	247
492	Amandi, Analía	257	537	Bebell, Damian	245
493	Baker, Crystal A.	257	538	Coles, Louisa	245
494	Campo, Marcelo	257	539	O'Dwyer, Laura	245
495	Daniel, David B.	257	540	Russell, Michael	245

Table 4.14 The most-cited authors from the High-Impact Papers (from 245 to 223 citations)

	Author's name	HIC-Index		Author's name	HIC-Index
541	Williams, Dorothy	245	586	Wang, Qiyun	231
542	Wilson, Kay	245	587	Yang, Yuqin	231
543	Gordin, Douglas N.	244	588	Yoon, Jeong-Ok	231
544	Morrison-Shetlar, Alison I.	242	589	Byrne, Michael D.	230
545	Sanders, Diana W.	242	590	Chen, Pu-Shih Daniel	230
546	Cheung, Wing Sum	241	591	Guidry, Kevin R.	230
547	Henderson, Lyn	241	592	Lambert, Amber D.	230
548	Higgins, Steve	240	593	Shee, Daniel Y.	230
549	Hsia, Tzyh-Lih	240	594	Stasko, John T.	230
550	Smith, Heather	240	595	Benson Soong, M. H.	229
551	Tennyson, Robert D.	240	596	Chai Chua, Boon	229
552	Wall, Kate	240	597	Chuan Chan, Hock	229
553	Wu, Jen-Her	240	598	Fong Loh, Koah	229
554	Baker, Michael	239	599	Lee, Min-Hsien	229
555	Inan, Fethi A.	239	600	Parrish, Patrick E.	229
556	Lund, Kristine	239	601	Greene, Jeffrey A.	228

(continued)

Table 4.14 (continued)

	Author's name	HIC-Index		Author's name	HIC-Index
557	Morrison, Gary M.	239	602	McInerney, Joanne M.	228
558	Ropp, Margaret Merlyn	239	603	Moos, Daniel C.	228
559	Ross, Steven M.	239	604	Roberts, Tim S.	228
560	Vries, Erica de	239	605	Berrett, Jared V.	226
561	Doering, Aaron	237	606	Chiarelli, Stephannie	226
562	Huffman, Doug	237	607	Howells, Cathrin	226
563	Hughes, Joan	237	608	Johnson, Scott D.	226
564	Muir-Herzig, Rozalind G.	237	609	La Fleur, Jason	226
565	Campbell, Mark	236	610	McAlpine, Lynn	226
566	Concannon, Fiona	236	611	Robertson, Judy	226
567	Darabi, A. Aubteen	236	612	Suriya, Chanidprapa	226
568	Flynn, Antoinette	236	613	Weston, Cynthia B.	226
569	Koseler, Refika	236	614	Whipp, Joan L.	226
570	Ozkan, Sevgi	236	615	Won Yoon, Seung	226
571	Paas, Fred	236	616	Chen, Meng Chang	225
572	Roblyer, Md	236	617	Killi, Kristian	225
573	Selwyn, Neil	236	618	Kuo, Chin-Hwa	225
574	Tuovinen, Juhani E.	236	619	Liu, I-Fan	225
575	Fu, Fong-Ling	233	620	Pitrik, Renate Motschnig	225
576	Su, Rong-Chang	233	621	Sun, Yeali S.	225
577	Yu, Sheng-Chin	233	622	Wible, David	225
578	Rice, Kerry Lynn	232	623	Granger, Mary J.	224
579	Wood, D.	232	624	Murray, Tom	224
580	Wood, H.	232	625	Passerini, Katia	224
581	Lang Quek, Choon	231	626	Wang, Ling	224
582	Lee, Byoung-Chan	231	627	Bai, Haiyan	223
583	Lee, In	231	628	Chang, Su-Chao	223
584	Lit Woo, Huay	231	629	Davis, N. E.	223
585	Liu, Mei	231	630	Gikandi, J. W.	223

Table 4.15 The most-cited authors from the High-Impact Papers (from 223 to 206 citations)

	Author's name	HIC-Index		Author's name	HIC-Index
631	Keller, John M.	223	676	Young, Betty J.	211
632	Lahav, Orly	223	677	Baek, Youngkyun	210
633	Mioduser, David	223	678	Kim, Bokyeong	210
634	Morrow, D.	223	679	Park, Hyungsung	210

(continued)

Table 4.15 (continued)

	Author's name	HIC-Index		Author's name	HIC-Index
635	Nachmias, Rafi	223	680	Carswell, Linda	209
636	Oren, Avigail	223	681	Chi-Wai Kwok, Ron	209
637	Psotka, Joseph	223	682	Erkens, Gijsbert	209
638	Song, Sang H.	223	683	Janssen, Jeroen	209
639	Tung, Feng-Cheng	223	684	Jaspers, Jos	209
640	Hoffman, Bob	222	685	Kanselaar, Gellof	209
641	Barnett, Michael	221	686	Petre, Marian	209
642	Chung, Ching-Ju	221	687	Thomas, Pete	209
643	Riding, R. J.	221	688	Tian, Stella Wen	209
644	Sadler-Smith, Eugene	221	689	Vogel, Douglas	209
645	Hsieh, Chang-tseh	220	690	Yu, Angela Yan	209
646	Lin, Binshan	220	691	Chang, C. K.	208
647	Ruberg, Lorena F.	220	692	Murray, Orrin T.	208
648	Susskind, Joshua E.	220	693	Olcese, Nicole R.	208
649	Bertolotto, Michela	219	694	Wang, C. Y.	208
650	Kanuka, Heather	219	695	Zhu, Erping	208
651	Laflamme, Elaine	219	696	Avgeriou, Paris	207
652	McArdle, Gavin	219	697	Brem, Sarah	207
653	Monahan, Teresa	219	698	Dunlap, Joanna C.	207
654	Neumann, Tim	217	699	Ferguson, Ronald W.	207
655	Bruce, BC	216	700	Forbus, Kenneth D.	207
656	Levin, JA	216	701	Gentner, Dedre	207
657	Okan, Zühal	216	702	Heemskerk, Irma	207
658	Biemans, Harm	215	703	Hrastinski, Stefan	207
659	Brown, Margaret I.	215	704	Kuiper, Els	207
660	Draper, Stephen W.	215	705	Levidow, Björn B.	207
661	Henderson, Fiona P.	215	706	Markman, Arthur B.	207
662	Mahdizadeh, Hossein	215	707	Papasalouros, Andreas	207
663	McAteer, Erica	215	708	Retalis, Symeon	207
664	Mulder, Martin	215	709	Skordalakis, Manolis	207
665	Berson, Michael J.	214	710	van Eck, Edith	207
666	Engstrom, Mary E.	214	711	Volman, Monique	207
667	Jewett, Dusty	214	712	Wolff, Phillip	207
668	Bidjerano, Temi	213	713	Durndell, A.	206
669	Chan, Anthony	213	714	Laffey, James	206
670	Ayersman, David J.	212	715	Musser, Dale	206
671	Bayraktar, Sule	212	716	Richey, Rita C.	206
672	Lonn, Steven	211	717	Tessmer, Martin	206
673	Tabak, Iris	211	718	Thomson, K.	206
674	Teasley, Stephanie D.	211	719	Tupper, Thomas	206
675	Valdez, Alfred	211	720	Wedman, John	206

Table 4.16 The most-cited authors from the High-Impact Papers (from 205 to 200 citations)

	Author's Name	HIC-Index
721	Clariana, Roy	205
722	Hoskins, Sherria L.	205
723	van Hooff, Johanna C.	205
724	Wallace, Patricia	205
725	Crook, Charles	204
726	Kim, Yanghee	204
727	Price, Sara	204
728	Rogers, Yvonne	204
729	Plowman, Lydia	203
730	Stephen, Christine	203
731	Yang, Tzu-Chi	203
732	Boshuizen, Henny P. A.	202
733	Chen, Chun-Yu	202
734	Dueber, William	202
735	Grave, Willem S. de	202
736	Huang, Sih-Han	202
737	Jim Wu, Yen-Chun	202
738	Kao, Hao-Yun	202
739	Lin, Che-Hung	202
740	Schmidt, Henk G.	202
741	Wu, Wen-Hsiung	202
742	Lamon, Mary	201
743	Ben-Ari, Mordechai	200
744	Ben-Bassat Levy, Ronit	200
745	Gerjets, Peter	200
746	Grabowski, Barbara	200
747	Scheiter, Katharina	200
748	Uronen, Pekka A.	200

We will present the answer to this particular research question in the next chapter, where we will explain in detail the process followed to identify the 22 extracted factors representing research topics, identified by the LSA analysis, performed to all the published research articles from the ten journals selected for this study, in a period of 20 years (from January 1995 to December 2014). The trends in these research topics will be displayed using time series plots.

Chapter 5

Research Topics and Trends in Educational Technology



A trend is a shift or tendency within a system. Some trends may present an opportunity for advancement of an idea, while others may disrupt, challenge or threaten advancement. Some technological innovations may result in fads or temporary novelties, while others may endure for many years while receiving little attention. Schools may be unable to control the direction in which some trends may lead, but they may be able to leverage other trends to improve teaching and learning. Educational technologies may not cause complete changes in trends in education but are necessary for innovation and improvement. Spector (2013) stated in *Emerging Educational Technologies and Research Directions*: “the implications for schools really are ground-shaking in the sense that significant transformations need to occur if schools are to be responsive to such trends” (p. 22).

Given the various technological innovations and changes in learning and instruction involving technology that have been occurring, it seemed reasonable to look at persistent trends and technologies that have had an impact on learning. To see what those educational technologies might have been, one approach was to examine the work that educational technology researchers had published.

Research Question 5

What trends in Educational Technology research areas have these top ten journals followed in their publications during the past 20 years (Jan 1995–Dec 2014)?

As mentioned earlier, three different sources for each of the 22 factors were examined: the list of high-loaded terms revealed by the LSA and SVD analysis, WordMaps created from the top 25 of the high-loaded articles, and WordMaps created from the titles of those articles. Tables 3.1–3.3 list the high-loaded terms identified by the LSA analysis executed for each of the 22 factors. The topics

Table 5.1 Factor labels (22 factors) and the number of research articles addressing those factors published in the ten top journals selected for this study from January 1995 to December 2014

Factor	Label	Article count
F22.1	Learning and instruction	1786
F22.2	Student learning	1369
F22.3	Learning systems and tools	714
F22.4	Learning experiences	585
F22.5	Faculty training and adult education	563
F22.6	Online learning	520
F22.7	Teacher preparation and professional development	435
F22.8	Learning environments	352
F22.9	Distance education	318
F22.10	Game-based learning	308
F22.11	The internet and digital literacy	400
F22.12	Professional meetings and associations	217
F22.13	Mobile learning	225
F22.14	Problem-solving	266
F22.15	Assessment and feedback	275
F22.16	Childhood education	261
F22.17	Learning with multimedia	268
F22.18	ICT in learning & instruction	225
F22.19	Experiential learning	186
F22.20	Reading comprehension	310
F22.21	Virtual environments	246
F22.22	Concept mapping	151

generated by the 22-factor solution and the total number of published articles addressing each of the research topics are shown in Table 5.1. Naming the factors was done by the researchers in an open discussion based on the three different sources. As a consequence, the names of the factors were somewhat arbitrary although that which is represented by that factor is based on the latent semantic analysis findings.

Educational Technology Trends

The high-loading articles are defined as articles whose loading exceeds a certain threshold (Kulkarni et al. 2014). For this study, the threshold was the articles which had been cited 200 or more times. The time series plots shown in Fig. 5.1 display the percentage of all articles published in the ten journals, for each of the 22 topics, per year, between 1995 and 2014 (20 years). The first chart in Fig. 5.1, F22.1 shows that the research topic *Learning and Instruction*, including papers that

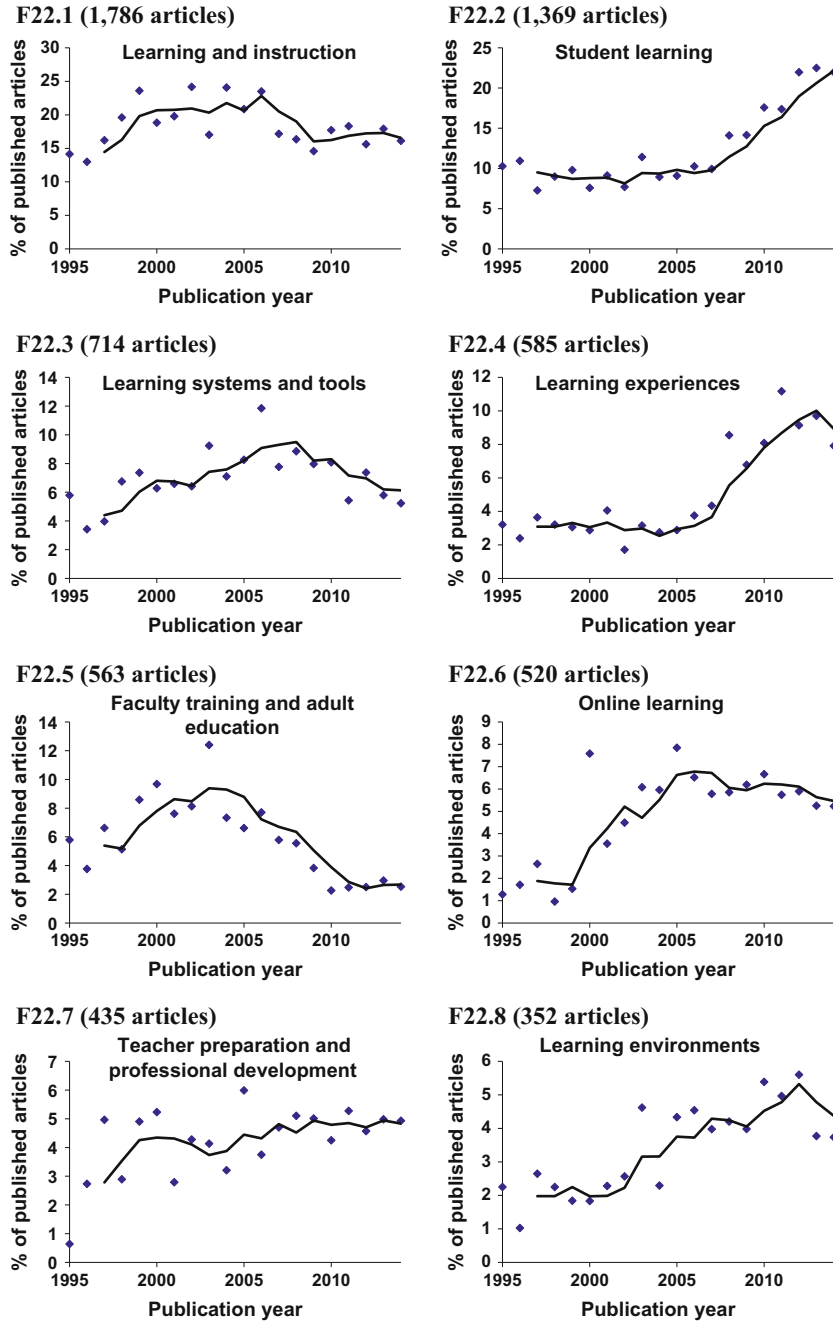


Fig. 5.1 Time series plots: percentage of all articles published per year in the ten journals, for each of the 22 topics

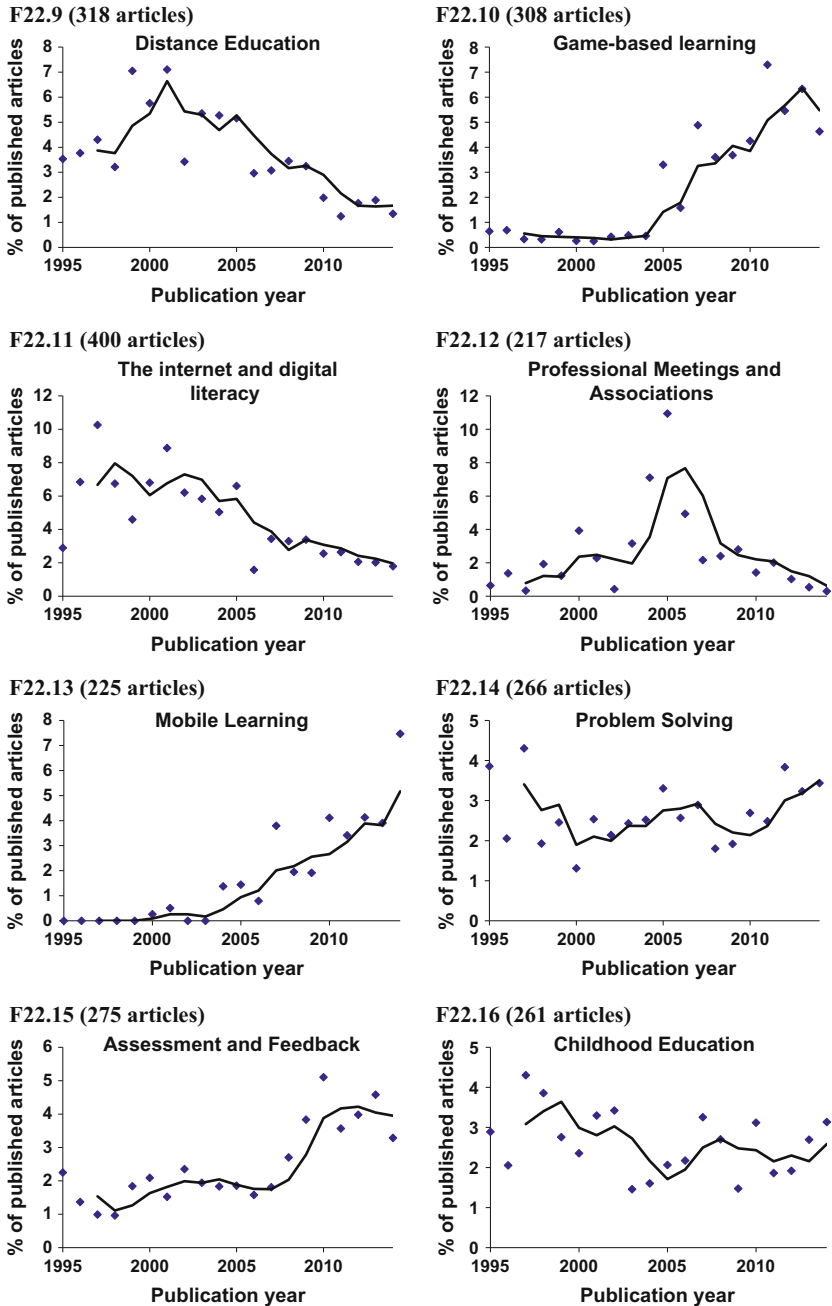


Fig. 5.1 (continued)

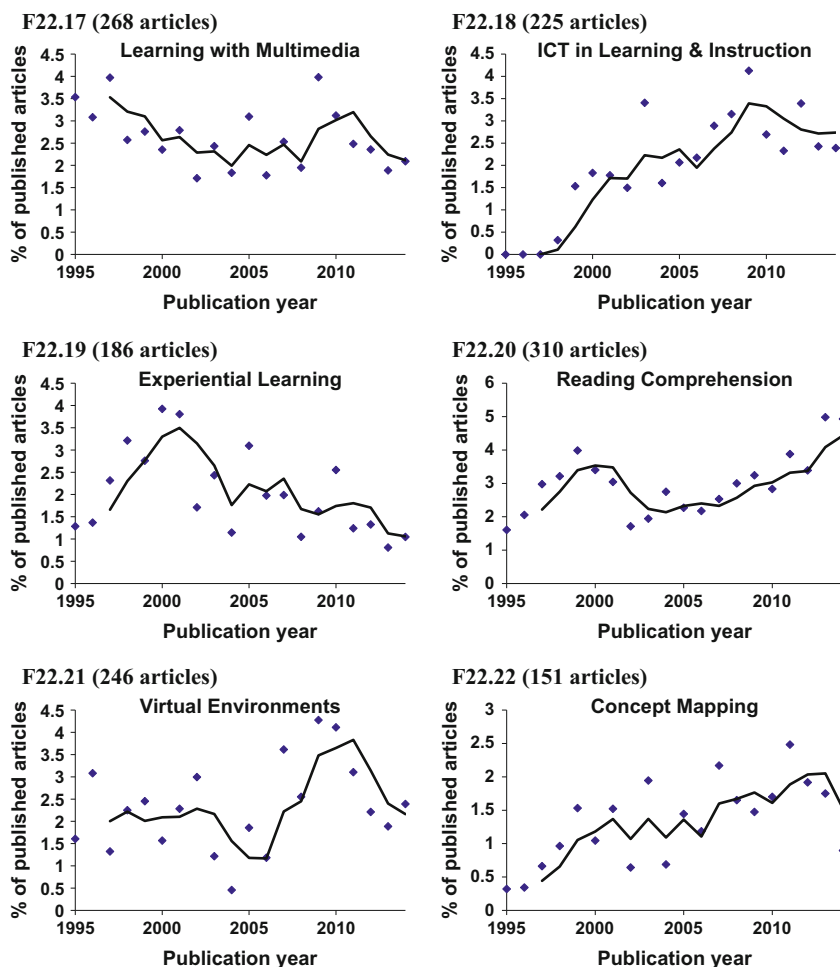


Fig. 5.1 (continued)

address research, educational systems, knowledge, design, educational theories and technology, has been consistently studied and reported on in publications during the last 20 years.

Studies on issues in the research topic of *Teacher Preparation and Professional Development*, shown in F22.7, such as preservice, in-service, integration, TPACK, and development, have remained relatively steady in number over the course of the study period after peaking at the beginning of 2000. Similarly, publications in the research topic of *Learning Systems and Tools*, F22.3, which include papers on web-based learning, authoring, adaptive technologies, resources and systems, have remained fairly stable in number since the end of 1999 and beginning of 2000.

The time series plots F22.2, F22.13, and F22.20, however, tell a quite different story. Interest from a research perspective in the research topic of *Student Learning*, F22.2, increased dramatically after a steady period from 1995 to 2005 and appears to keep rising. The research topic of *Mobile Learning*, F22.13, shows a similar trend; yet, it started with very few publications, and that trend was quite steady from 1995 to 2003; and then an intense proliferation of publications led to an increasing trend that has continued since then. The research topic of *Reading Comprehension*, F22.20, with studies about students' performance, EFL, storybooks, and reading and listening skills, shows a fast increase from 1995 to 2001, then a slight decrease until the end of 2003 and since then, a stable rise.

Probably the most dramatic change in all the 22 time series plots can be observed in F22.10, on the research topic of *Game-Based Learning*. Research and publications on the utilization and effect of games and digital tools in teaching, learning, and training were very few (0.5%) during the first 9 years of this study (1995–2004); then there was an extraordinarily high rise in interest in the field of educational technology beginning in 2004 and continuing up to 2012, when a peak of interest at 7% was reached, after which that momentum started to diminish in 2014. A similar trend, but not as dramatic, is revealed in F22.4, on the research topic of *Learning Experiences*. Issues addressed in publications in that research topic include students' perceptions, intentions, attitudes, acceptance, and self-efficacy about technology's influence and usefulness. We can see a relatively balanced number of publications on these topics from 1995 to 2005 and then a very rapid increase until 2012, when the interest seems to have started to decline.

The research topic of *Learning Environments*, F22.8, including publications on e-learning, web-based strategies, and personalized and self-regulated learning, does not show a steady pace of publication during a period of time like those of *Game-based Learning* and *Learning Experiences*. F22.8 graph shows, instead, a consistent rise from 1996 to 2012, when the publication of papers started to decelerate.

Nearly the same pattern is presented for the research topic of *Concept Mapping*, F22.22, including articles of knowledge, strategy, collaborative approach, computer-supported education, and analysis. There was a trend of steadily increasing numbers of publications from 1995 till 2012, and from then to the end of 2014 a decrease in popularity became the trend.

Three of the time series plots present a similar pattern: studies on issues associated with *Faculty Training and Adult Education*, F22.5, such as online programs, instructional design, distance learning, and technology development programs; *Distance Education*, F22.9, such as online courses, learner-centered techniques, and educational technology; and *The Internet and Digital Literacy*, F22.11, such as web learning, technology information and resources, and students' attitudes towards online learning. These three research topics reveal in their graphs a steadily declining trend in the number of research papers published during the last 20 years. The research topic of *Faculty Training and Adult Education*, F22.5, had its peak year in 2003, reaching 12% of the published articles in educational technology; then, from 2003 to 2010, its percentage dropped to 2%, where it has remained for the last 4 years. *Distance Education*, F22.9, had its peak at the end of 2001,

reaching 7%; from then to the end of 2014, the percentage dropped to 1%. The peak for the research topic of *The Internet and Digital Literacy*, F22.11, was at the end of 1996 and beginning of 1997, when it had almost 10%; then its percentage diminished, reaching 2% at the end of 2014.

F22.12 shows a unique trend, different from all the others. Interest in the research topic of *Professional Meetings and Associations*, including issues such as educational conventions, conferences, national and international associations, leadership, divisions, intern opportunities, and lifelong learning, started increasing around 2000, and then a dramatic increase in popularity took place from 2002 to 2006 (from 3 to 8%); then the popularity suddenly and dramatically decreased from 2006 to 2009 (falling from 8 to 3%) and has continued dropping during the last 4 years to almost 0% of published articles.

After peaking in the early 1996, 1997, the number of published studies in the research topic of *Experiential Learning*, F22.19, covering topics like multimedia, management, project-based instruction, software, team development, and interactive learning, declined to where they had started, at 1.5%, and have remained steady since then between 1 and 2%. Trends for studies in the research topic of *Childhood Education*, F22.16, addressing issues such as the early use of technology and the Internet, children's attitudes towards learning, literacy intervention, and parents' involvement, follow a similar pattern, starting at approximately 3.5%, then dropping to 1.5%; since then, the number of published articles has been relatively constant, between 1.5 and 2.5%.

Studies in the research topic of *Learning with Multimedia*, F22.17, surged in early 1995 to 3.5% with publications related to multimedia presentations, design, and delivery, and showed a drop during the first 5 years (1995–2000) but have largely maintained the momentum between 2 and 3% for the last 15 years. Nevertheless, the research topic of *Online Learning*, F22.6, with research studies and publications on issues like asynchronous and face-to-face instruction, collaborative learning, online discussion, and social participation; and that of *ICT in Learning & Instruction*, F22.18, with issues associated with technology integration, student and teacher education, and information and communication technology skills and usage, started with very few research publications and suddenly exhibited a rapid increase in interest which has steadily waxed.

Articles published in the research topic of *Problem Solving*, F22.14, which include papers on complex, ill-structured and well-structured, problems solving strategies, as well as on learning systems, have remained relatively steady, with a slight upward momentum during the last 5 years of the study period. The research topic of *Virtual Environments*, F22.21, including topics like learning environments, simulations, research, virtual worlds, communication and collaboration, and immersive and interactive learning, maintained a solid interest from 1996 to 2005, when publications on these topics quickly gained preference from 2005 to 2010. Nevertheless, the results indicate that this research topic has been losing attention during the last 3 years.

Discussion

We have explored, described, studied, and analyzed the published research articles from ten of the top journals in the Educational Technology field and found that during the last decades, the exponential growth of technology usage in education has influenced the focus and importance of educational technology research. Educational communication and technology researchers' work has greatly impacted both learners and all educational technology stakeholders, including instructors, designers, and development specialists and funding agencies.

It is then reasonable to continue to look at persistent trends and technologies that might have a positive impact on learning. This will ensure the conversation continues in the dynamic and diverse system of scholarly communication. The approach taken was examining what educational technology scholars had been publishing by means of analyzing the published research articles in the multidisciplinary domain of educational technology, to better understand where the discipline has been, where it is now, and where it may be headed.

All ten of these journals have attracted widespread international contributors and all have significant status within the educational technology field. We have shown you which topic areas and trends they have followed, along with their most-cited articles, most-cited authors in each journal, and the experts who have published in more than one journal. Upon analyzing the high-loaded terms, we can view the framework of the intellectual structure of educational technology.

Overall, this study discloses several interesting findings that help us understand the major conversations in the field. First, the results strongly emphasize learning environments that integrate technology (e.g., technology-related issues, distance education, communication strategies and instructional methods, and learning experiences). The development of teachers, who will then teach children, has been frequently studied in these ten journals; an important challenge to fulfill the needs of today's students. Teachers development has also been researched and considered vital by the more than 400 technology professionals, campus technologists, faculty leaders from colleges and universities, and representatives of leading corporations from around the world who explore and forecast the impact of emerging technologies across all learning sectors, as shown in Table 5.2, emerging technologies and the challenges to adopt them from the Horizon Reports from the last 10 years (2004–2014).

Scholars are reacting to the tremendous developments in the last decades in the area of computer technologies, but the heightened interest in this area might also reflect the wishes of researchers and practitioners to have as much influence as possible on proactively developing the systems, models, pedagogies, policies, and technologies so as to improve the learning process in the twenty-first century.

These ten journals were found to be full of relevant and insightful articles for our field. We hope that the findings of this study will be of great interest and influence on the broader community of educational technologists. The conclusions from this exploratory and descriptive study will inform researchers, practitioners and

Table 5.2 The 3 years that received the highest number of citations for the five top-cited articles published in each of the journals

Journal	Year number of citations	Year number of citations	Year number of citations
<i>British Journal of Educational Technology (BJET)</i>	2005 1627	2008 2960	2009 1656
<i>Journal of the Learning Sciences (JLS)</i>	2000 1882	2003 2308	2004 4517
<i>Educational Technology Research and Development</i>	1999 2991	2000 3076	2005 3779
<i>Instructional Science</i>	1998 2197	2000 1691	2004 1670
<i>TechTrends</i>	1998 842	2004 647	2005 583
<i>Journal of Educational Technology and Society</i>	2004 1309	2005 1227	2009 4517
<i>Computers and Education</i>	2006 2781	2007 2538	2008 3154
<i>Journal of Educational Computing Research</i>	1995 1895	1997 2475	2005 1551
<i>Journal of Research on Technology in Education</i>	2003 1299	2006 1366	2009 1479

Most of the journals had one of their top-cited articles published in 2004 or 2005.

stakeholders about trends that might lead to initiatives for special issues, which will disseminate findings on important and emerging phenomena.

Recommendations for Further Research

Future research could improve upon this study by targeting and analyzing sub-disciplines within the field; for example, it may be interesting to carry out a similar analysis of these ten top journals in relation to technology integration issues, distance education, or training and development. As it happens two related studies are now underway at the University of North Texas based on the findings of this study. One focuses entirely on e-learning and the other includes an analysis of New Media Consortium Horizon Reports to see how well a less rigorous academic and practitioner-oriented venue compares with the academic studies.

Comparing the findings of a similar analysis of the New Media Consortium's Horizon Reports on Higher Education since 2002 with regard to trends and emerging technologies with the findings of this study would be very valuable.

As mentioned before, this research has limitations in relation to the journals chosen for this study. Other journals, e.g., those aimed at special audiences, practitioners, and broader audiences, including second tier journals, might provide different answers to questions of who, what, where, and when in educational

technology publications, and finding similarities and differences could expand and develop the outcomes of the present study. Also, a study comparing information on reputable websites reporting trends as well as other less rigorous sources with these findings could unveil information about what is being studied, researched, and published in a much wider range.

A deeper analysis of the content of papers could be conducted as a complimentary effort because one weakness of LSA as implemented in our study is that it does not provide an in-depth analysis of a paper or text. To further explore and elaborate specific areas, complimentary studies could be carried out using such methods as Watson analytics (<http://www.ibm.com/analytics/watson-analytics/>).

Another area worthy of further investigation would be a careful examination of the possible reasons why most of the journals included in the present study had one of their top-cited articles published in 2004 or 2005 (see Table 5.2) and even to scrutinize whether there is a correlation with what might have happened in the specific years where more than one of the ten journals analyzed in this study showed the same or similar changes in the trends recognized in relation to the 22 concepts that arose from the present analysis.

In addition, it might be worthwhile to explore what might have happened around 2004 to create so many changes in the trends in these international research journals. That question has been asked multiple times at national and international conferences without any obvious answer or explanation emerging.

One more worthwhile study would be to identify the hypes (where there are hypes) of the maturity and adoption of the technologies and their applications researched and published in the educational technology field and how they have been and/or can be in theory relevant to solving problems and finding new opportunities in education. The Gartner Hype Cycle methodology can provide an interpretation of how a technology or application will evolve over time (see: <http://www.gartner.com/technology/research/methodologies/hype-cycle.jsp>).

This exploratory study may be considered the tip of a fascinating iceberg: the small and perceptible but significant part of the “who, what, where, and when” in educational technology publications, of a much larger and more complex amount of data that remains hidden, inviting and seducing researchers to unveil its accumulated treasures.

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Chapter 6

Epilogue



Without a doubt, the effects of technology are overwhelming. The rapid pace of the changes that educational technology experience constantly, create a burden on educators, instructional designers, and even researchers.

Given the various technological innovations and changes in learning and instruction involving technology that have been occurring, it seemed reasonable to look at persistent trends and technologies that might have had a positive impact on learning. To see what those educational technologies might be, our approach was to examine the work that educational technology researchers had published in a period of 20 years (1995–2014).

After this research was completed, two of the ten very important Educational Technology Journals that were selected for the study, have been discontinued: *Educational Technology & Society* (ETS), because the editors felt they had accomplished their purpose; and *Educational Technology—The Magazine for Managers of Change in Education* because the editor and publisher, Larry Lipsitz, passed away in 2016.

Both are a huge loss to the professional community and to educational technology researchers. ETS was recognized as the top peer-reviewed open source journal in our field, it was an indexed and peer-reviewed open-access journal free to all with no charge to authors to publish. It was sponsored by IEEE (Institute of Electrical and Electronic Engineers). *Educational Technology—The Magazine for Managers of Change in Education*, commonly known as EdTech, had been publishing since the early 1960s, even before the worldwide web came into full swing, and was probably the most widely read scholarly publication in the field.

This is a book that captures the trends in many research streams within the discipline of educational technology and identifies the point in time when massive changes took place. This is a significant achievement, given that, in epistemology and philosophy of science, there have always been discussions of paradigm shifts, but researchers would always identify them qualitatively. This work is the first one to identify a paradigm shift using rigorous quantitative methods.

Even so, in the enterprise of educational technology publications, the one-guaranteed constant is change, and the pace of that change is accelerating, and so are the trends that are driving that change. Some trends may present opportunity for advancement of an idea, while others may disrupt, challenge, or threaten advancement. Technology innovations may result in fads or temporary novelties, while others may endure for many years with little attention.

We are constantly reflecting on these changes and on new trends appearing in the field of educational technology and want to mention a few of them here. An interest trend is happening regarding educational technology publications; new journals are appearing. Some notable titles include: *Smart Learning Environments*—Springer Open Journal (<https://slejournal.springeropen.com>); its aim is to help various stakeholders of smart learning environments better understand each other's role in the overall process of education and how they may support each other.

Another example is the *International Journal of Smart Technology and Learning* (INDERSCIENCE Publishers: Linking academia, business and industry through research: <http://www.inderscience.com/>). The objectives of IJSmartTL are to map new frontiers in emerging and developing technologies in research related to smart learning, from aspects of design, application and assessment to linking with research centers of excellence worldwide.

Due to the growing interest of educational technologists to focus their research more into the depths of educational sociology, new journals are emerging in this field also, like the international journal *Learning, Culture and Social Interaction*, (Elsevier: <https://www.journals.elsevier.com/learning-culture-and-social-interaction>) which particular focus is on understanding how learning and development are embedded in social and cultural activities, and how individuals and collective practices are transformed through learning.

This trend, to try to understand how much of the most important learning happens through social interaction, has also been recently approached in “The Handbook of Research on Educational Communications and Technology,” fourth edition, edited by Spector, Merrill, Bishop and Elen, regarded as the most comprehensive, definitive, and accurate single-volume overview available in the field of educational communication and technology, in two chapters of the book: one by Patricia A. Young, Chapter 28: “The Presence of Culture in Learning,” about cultural aspects of educational technology, where she establishes an evident connection of technology education and culture in the field, and points out the necessity to acknowledge that culture matters in educating learners. Chapter 72, by Robert B. Kozma and Wayan Surya Vota, “ICT in Developing Countries: Policies, Implementation, and Impact,” presents educational technology through a sociological lens by discussing the issues involved in the implementation of ICT in developing countries, and the available research on the impact of ICT investments.

Because of the vast increase in research production, and researchers collaborating across borders and disciplines, Elsevier, along with the research community, decided to offer a new choice to scholars to publish their work, and created an online open-access journal covering all disciplines, and named it *Heliyon*, inspired from Helios—the Greek god of the sun—symbolizing the light the journal will

shine on important research. Its scope is multidisciplinary, any paper reporting original and comprehensive results of primary research, which observes accepted ethical and scientific publishing standards, will be published regardless of its perceived impact www.heliyon.com. Articles published in *Heliyon*, will be indexed by PubMed, Scopus, and Web of Science™ Emerging Sources Citation Index (ESCI). Their Editorial Board is composed of 900 members from all disciplines.

There are scholars and practitioners all around the world who devote a great amount of their time and effort to help other scholars and practitioners by sharing their knowledge, experiences, and guidance. An example of these great resources, available free online, was developed many years ago and is periodically updated by Ross A. Perkins. It is a comprehensive database that lists journals and publications in educational technology, instructional design, and distance learning. The database contains more than 260 titles now. It was created with the aim to offer people a reliable source of information they might access to either read or publish their scholarship, <http://www.edtechjournals.org>. The link also contains subscriptions and open journals.

The Association for Educational Communications and Technology, AECT, has offered its members, since 2014, a Tenure and Promotion Guide which provides a general set of guidelines to help faculty seeking tenure or promotion and directs them to other resources relevant to their specific situations (http://c.ymcdn.com/sites/aect.site-ym.com/resource/collection/AD6CAA0B-8342-40E4-AB23-641A7078802B/The_AECT_Tenure_and_Promotion_Guide-v12.pdf). Contributors to this document include Mike Spector, Chuck Hodges, Andy Gibbons, Jan Elen, Elizabeth Boling, Sharon Smaldino, Ana Donaldson, Jonathan McKeown among others. It is a work in progress and is periodically updated.

Even though publications in a peer-reviewed journal remain the standard means of disseminating scientific and research results, the existence of other methods of communication is altering how scientists share and receive information. Posters, abstracts, lectures at professional gatherings, and proceedings volumes are being used more often to present preliminary results before full review (Hendler 2007). Preprints and computer networks are increasing the ease and speed of scientific communications. To the extent that they speed and improve communication and revision, they will strengthen science. However, if publication practices, either new or traditional, bypass quality control mechanisms, they risk weakening requirements that have served science well (Bontis and Serenko 2009).

Unfortunately, as the number of open-access journals increased, the potential for abuse became evident. Uneasiness with the publication of *junk* journals, which have lower publishing standards, is a growing concern of the open-access movement. The *junk* journals often have names similar to well-established journals. They solicit articles via email and charge the author to publish the article. Now more and more predatory publishers run also bogus conferences to target researchers into submitting papers for a nonrefundable fee (see: http://allfakejournals.blogspot.mx/2013_01_01_archive.html), “All Fake Journals: The genuine and fair list of all the fake, bogus, mock, spurious, junk publishers.”

Reviewing ten of the top educational technology journals, highly recognized, as selected at a National Technology Leadership Summits by the journal editors who meet every year, provided an opportunity to survey the terrain of educational research through high-quality published research studies. Our most important goal was to potentially provide the most comprehensive and detailed analysis to make a significant contribution to the field of learning technologies and to offer some guidance to other scholars by making available our data source to build on and expand in their work.

Two doctoral dissertations have been written and defended building their research on the data, methodology, and results from this study: Educational Technology: “A comparison of ten academic journals and the New Media Consortium Horizon Reports for the period of 2000–2017,” by Gwendolyn M. Morel; and “Using a text mining approach to examine online learning research trends of the past 20 years (1995–2016),” by Heather Lynn Keahey. We are happy and proud to say that we are reaching our goals.

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Appendix A

British Journal of Educational Technology (BJET)

Articles cited 200 or more times. Published between January 1995 and December 2014

Cites	Authors	Title	Year
1915	S Bennett, K Maton, L Kervin	The 'digital natives' debate: A critical review of the evidence	2008
501	S Warburton	Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching	2009
490	HM Huang	Toward constructivism for adult learners in online learning environments	2002
468	B Dalgarno, MJW Lee	What are the learning affordances of 3-D virtual environments?	2010
441	A Amory, K Naicker, J Vincent...	The use of computer games as an educational tool: identification of appropriate game types and game elements	1999
431	S Wheeler, P YEoMANs...	The good, the bad and the wiki: Evaluating student-generated content for collaborative learning	2008
414	MD Dickey	Three-dimensional virtual worlds and distance learning: two case studies of Active Worlds as a medium for distance education	2005
384	YS Wang, MC Wu, HY Wang	Investigating the determinants and age and gender differences in the acceptance of mobile learning	2009
343	J Davies, M Graff	Performance in e-learning: online participation and student grades	2005
339	N Ford, SY Chen	Matching/mismatching revisited: an empirical study of learning and teaching styles	2001
335	F Alonso, G López, D Manrique...	An instructional model for web-based e-learning education with a blended learning process approach	2005
304	J Vassileva, R Deters	Dynamic courseware generation on the WWW	1998
300	N Cavus, D Ibrahim	m-Learning: An experiment in using SMS to support learning new English language words	2009
295	PK Gilbert, N Dabbagh	How to structure online discussions for meaningful discourse: A case study	2005
279	D Churchill	Educational applications of Web 2.0: Using blogs to support teaching and learning	2009

(continued)

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Cites	Authors	Title	Year
269	CK Looi, P Seow, BH Zhang, HJ So...	Leveraging mobile technology for sustainable seamless learning: a research agenda	2010
262	A Carr-Chellman, P Duchastel	The ideal online course	2000
259	C McLoughlin	Culturally responsive technology use: developing an on-line community of learners	1999
258	C Chou	Interactivity and interactive functions in web-based learning systems: a technical framework for designers	2003
256	D Laurillard	Multimedia and the changing experience of the learner	1995
248	C Angeli, N Valanides, CJ Bonk	Communication in a Web-based conferencing system: The quality of computer-mediated interactions	2003
247	D Reynolds, D Treharne, H Tripp	ICT—the hopes and the reality	2003
245	D Williams, L Coles, K Wilson...	Teachers and ICT: Current use and future needs	2000
241	KF Hew, WS Cheung	Use of three-dimensional (3-D) immersive virtual worlds in K-12 and higher education settings: A review of the research	2010
240	K Wall, S Higgins, H Smith	'The visual helps me understand the complicated things': pupil views of teaching and learning with interactive whiteboards	2005
236	F Concannon, A Flynn...	What campus-based students think about the quality and benefits of e-learning	2005
231	Q Wang, HL Woo, CL Quek, Y Yang...	Using the Facebook group as a learning management system: An exploratory study	2012
225	K Kiili	Foundation for problem-based gaming	2007
223	SC Chang, FC Tung	An empirical investigation of students' behavioural intentions to use the online learning course websites	2008
219	H Kanuka, L Rourke, E Laflamme	The influence of instructional methods on the quality of online discussion	2007
216	Z Okan	Edutainment: is learning at risk?	2003
213	MJW Lee, C McLoughlin, A Chan	Talk the talk: Learner-generated podcasts as catalysts for knowledge creation	2008
209	L Carswell, P Thomas, M Petre, B Price...	Distance education via the Internet: The student experience	2000
207	B Dalgarno		2001

(continued)

(continued)

Cites	Authors	Title	Year
		Interpretations of constructivism and consequences for computer assisted learning	
205	SL Hoskins, JC Van Hooff	Motivation and ability: which students use online learning and what influence does it have on their achievement?	2005
205	R Clariana, P Wallace	Paper-based versus computer-based assessment: key factors associated with the test mode effect	2002
203	L Plowman, C Stephen	Children, play, and computers in pre-school education	2005
200	F Ke, B Grabowski	Gameplaying for maths learning: cooperative or not?	2007

Appendix B

British Journal of Educational Technology (BJET)—5 Top-Cited Articles

The five top-cited articles published per year from 1995 to 2014

Cites	Authors	Title	Year
256	D Laurillard	Multimedia and the changing experience of the learner	1995
149	D Rowntree	Teaching and learning online: a correspondence education for the 21st century?	1995
44	D Rowntree	The tutor's role in teaching via computer conferencing	1995
35	P Whalley	Imagining with multimedia	1995
24	H Tomlinson, W Henderson	Computer supported collaborative learning in schools: a distributed approach	1995
121	M Wild	Technology refusal: Rationalising the failure of student and beginning teachers to use computers	1996
97	L Plowman	Narrative, linearity and interactivity: making sense of interactive multimedia	1996
58	S Faseyitan, JN Libii...	An in service model for enhancing faculty computer self-efficacy	1996
38	R Oliver, H Oliver	Information access and retrieval with hypermedia information systems	1996
28	M Pitt	The use of electronic mail in undergraduate teaching	1996
160	M Avgerinou, J Ericson	A review of the concept of visual literacy	1997
79	B Collis, J Moonen...	Flexibility as a key construct in European training: Experiences from the TeleScopia Project	1997
61	N Selwyn	The continuing weaknesses of educational computing research	1997
47	D Lee	Factors influencing the success of computer skills learning among in-service teachers	1997
35	J Scott, J Buchanan, N Haigh	Reflections on student-centred learning in a large class setting	1997
304	J Vassileva, R Deters	Dynamic courseware generation on the WWW	1998
173	A Barron	Designing Web-based training	1998
131	SJ Bostock	Constructivism in mass higher education: a case study	1998

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Cites	Authors	Title	Year
128	M Wild, C Quinn	Implications of educational theory for the design of instructional multimedia	1998
125	C McLoughlin, R Oliver	Maximising the language and learning link in computer learning environments	1998
441	A Amory, K Naicker, J Vincent...	The use of computer games as an educational tool: identification of appropriate game types and game elements	1999
259	C McLoughlin	Culturally responsive technology use: developing an on-line community of learners	1999
185	B Collis	Designing for differences: Cultural issues in the design of WWW-based course-support sites	1999
177	AY Chen, A Mashhadi, D Ang...	Cultural issues in the design of technology-enhanced learning systems	1999
171	R Riding, M Grimley	Cognitive style, gender and learning from multi-media materials in 11-year-old children	1999
262	A Carr-Chellman, P Duchastel	The ideal online course	2000
245	D Williams, L Coles, K Wilson...	Teachers and ICT: Current use and future needs	2000
209	L Carswell, P Thomas, M Petre, B Price...	Distance education via the Internet: The student experience	2000
92	M Collins	Comparing Web, correspondence and lecture versions of a second-year non-major biology course	2000
77	L Lynch, AJ Fawcett, RI Nicolson	Computer-assisted reading intervention in a secondary school: an evaluation study	2000
339	N Ford, SY Chen	Matching/mismatching revisited: an empirical study of learning and teaching styles	2001
207	B Dalgarno	Interpretations of constructivism and consequences for computer assisted learning	2001
195	I Jung	Building a theoretical framework of web-based instruction in the context of distance education	2001
173	S Mitra, V Rana	Children and the Internet: Experiments with minimally invasive education in India	2001
132	CC Chang	A study on the evaluation and effectiveness analysis of web-based learning portfolio (WBLP)	2001
490	HM Huang	Toward constructivism for adult learners in online learning environments	2002
205	R Clariana, P Wallace	Paper-based versus computer-based assessment: key factors associated with the test mode effect	2002
174	M Freeman, J McKenzie	SPARK, a confidential web-based template for self and peer assessment of student teamwork: benefits of evaluating across different subjects	2002
165	J Trindade, C Fiolhais, L Almeida	Science learning in virtual environments: a descriptive study	2002

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Cites	Authors	Title	Year
158	M Peat, S Franklin	Supporting student learning: the use of computer-based formative assessment modules	2002
258	C Chou	Interactivity and interactive functions in web-based learning systems: a technical framework for designers	2003
248	C Angeli, N Valanides, CJ Bonk	Communication in a Web-based conferencing system: The quality of computer-mediated interactions	2003
247	D Reynolds, D Treharne, H Tripp	ICT—the hopes and the reality	2003
216	Z Okan	Edutainment: is learning at risk?	2003
199	P Brusilovsky	Adaptive navigation support in educational hypermedia: the role of student knowledge level and the case for meta-adaptation	2003
198	E Murphy	Recognising and promoting collaboration in an online asynchronous discussion	2004
175	R Koper, J Manderveld	Educational modelling language: modelling reusable, interoperable, rich and personalised units of learning	2004
156	E Sadler-Smith, PJ Smith	Strategies for accommodating individuals' styles and preferences in flexible learning programmes	2004
142	R Mason, C Pegler, M Weller	E-portfolios: an assessment tool for online courses	2004
122	R Koper, C Tattersall	New directions for lifelong learning using network technologies	2004
414	MD Dickey	Three-dimensional virtual worlds and distance learning: two case studies of Active Worlds as a medium for distance education	2005
343	J Davies, M Graff	Performance in e-learning: online participation and student grades	2005
335	F Alonso, G López, D Manrique...	An instructional model for web-based e-learning education with a blended learning process approach	2005
295	PK Gilbert, N Dabbagh	How to structure online discussions for meaningful discourse: A case study	2005
240	K Wall, S Higgins, H Smith	'The visual helps me understand the complicated things': pupil views of teaching and learning with interactive whiteboards	2005
170	CP Lim, D Nonis, J Hedberg	Gaming in a 3D multiuser virtual environment: Engaging students in science lessons	2006
165	N Shin	Online learner's 'flow' experience: an empirical study	2006
147	RE Ferdig	Assessing technologies for teaching and learning: understanding the importance of technological pedagogical content knowledge	2006
128	D Dicheva, C Dichev	TM4L: Creating and browsing educational topic maps	2006
107	E Melis, G Goguadze, M Homik...	Semantic-aware components and services of ActiveMath	2006

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Cites	Authors	Title	Year
225	K Kiili	Foundation for problem-based gaming	2007
219	H Kanuka, L Rourke, E Laflamme	The influence of instructional methods on the quality of online discussion	2007
200	F Ke, B Grabowski	Gameplaying for maths learning: cooperative or not?	2007
189	J Tondeur, J Van Braak...	Curricula and the use of ICT in education: Two worlds apart?	2007
187	S Grimshaw, N Dungworth...	Electronic books: Children's reading and comprehension	2007
1915	S Bennett, K Maton, L Kervin	The 'digital natives' debate: A critical review of the evidence	2008
431	S Wheeler, P YEoMAnS...	The good, the bad and the wiki: Evaluating student-generated content for collaborative learning	2008
223	SC Chang, FC Tung	An empirical investigation of students' behavioural intentions to use the online learning course websites	2008
213	MJW Lee, C McLoughlin, A Chan	Talk the talk: Learner-generated podcasts as catalysts for knowledge creation	2008
178	R Wood, J Ashfield	The use of the interactive whiteboard for creative teaching and learning in literacy and mathematics: A case study	2008
501	S Warburton	Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching	2009
384	YS Wang, MC Wu, HY Wang	Investigating the determinants and age and gender differences in the acceptance of mobile learning	2009
300	N Cavus, D Ibrahim	m-Learning: An experiment in using SMS to support learning new English language words	2009
279	D Churchill	Educational applications of Web 2.0: Using blogs to support teaching and learning	2009
192	M Wang, R Shen, D Novak...	The impact of mobile learning on students' learning behaviours and performance: Report from a large blended classroom	2009
468	B Dalgarno, MJW Lee	What are the learning affordances of 3-D virtual environments?	2010
269	CK Looi, P Seow, BH Zhang, HJ So...	Leveraging mobile technology for sustainable seamless learning: a research agenda	2010
241	KF Hew, WS Cheung	Use of three-dimensional (3-D) immersive virtual worlds in K-12 and higher education settings: A review of the research	2010
189	DJ Ketelhut, BC Nelson, J Clarke...	A multi-user virtual environment for building and assessing higher order inquiry skills in science	2010
168	S De Freitas, G Rebolledo-Mendez...	Learning as immersive experiences: Using the four-dimensional framework for designing and evaluating immersive learning experiences in a virtual world	2010

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Cites	Authors	Title	Year
145	Z Akyol, DR Garrison	Understanding cognitive presence in an online and blended community of inquiry: Assessing outcomes and processes for deep approaches to learning	2011
145	GJ Hwang, CC Tsai	Research trends in mobile and ubiquitous learning: A review of publications in selected journals from 2001 to 2010	2011
128	GJ Hwang, YR Shi, HC Chu	A concept map approach to developing collaborative Mindtools for context-aware ubiquitous learning	2011
106	JL Shih, HC Chu, GJ Hwang	An investigation of attitudes of students and teachers about participating in a context-aware ubiquitous learning activity	2011
72	DC Brooks	Space matters: The impact of formal learning environments on student learning	2011
231	Q Wang, HL Woo, CL Quek, Y Yang...	Using the Facebook group as a learning management system: An exploratory study	2012
125	SY Park, MW Nam, SB Cha	University students' behavioral intention to use mobile learning: Evaluating the technology acceptance model	2012
98	GJ Hwang, PH Wu	Advancements and trends in digital game-based learning research: a review of publications in selected journals from 2001 to 2010	2012
96	LH Wong	A learner-centric view of mobile seamless learning	2012
89	R Edmunds, M Thorpe, G Conole	Student attitudes towards and use of ICT in course study, work and social activity: A technology acceptance model approach	2012
119	R Junco, CM Elavsky...	Putting twitter to the test: Assessing outcomes for student collaboration, engagement and success	2013
45	F Wang, JK Burton	Second Life in education: A review of publications from its launch to 2011	2013
38	GJ Hwang, HY Sung, CM Hung...	A knowledge engineering approach to developing educational computer games for improving students' differentiating knowledge	2013
38	W Ng, H Nicholas	A framework for sustainable mobile learning in schools	2013
35	J McPake, L Plowman...	Pre-school children creating and communicating with digital technologies in the home	2013
64	TD Cochrane	Critical success factors for transforming pedagogy with mobile Web 2.0	2014

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Cites	Authors	Title	Year
39	I Mayer, G Bekebrede, C Harteveld...	The research and evaluation of serious games: Toward a comprehensive methodology	2014
29	CM Kim, SW Park, J Cozart	Affective and motivational factors of learning in online mathematics courses	2014
25	J Castaño-Muñoz, JM Duarte...	The Internet in face-to-face higher education: Can interactive learning improve academic achievement?	2014
24	SN Şad, Ö Göktaş	Preservice teachers' perceptions about using mobile phones and laptops in education as mobile learning tools	2014

Appendix C

Journal of the Learning Sciences

Articles cited 200 or more times. Published between January 1995 and December 2014

Cites	Authors	Title	Year
1819	B Jordan, A Henderson	Interaction analysis: Foundations and practice	1995
1793	JR Anderson, AT Corbett, KR Koedinger...	Cognitive tutors: Lessons learned	1995
1377	S Barab, K Squire	Design-based research: Putting a stake in the ground	2004
1364	A Collins, D Joseph, K Bielaczyc	Design research: Theoretical and methodological issues	2004
1291	MTH Chi	Quantifying qualitative analyses of verbal data: A practical guide	1997
786	B Barron	When smart groups fail	2003
692	DC Edelson	Design research: What we learn when we engage in design	2002
670	RD Pea	The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity	2004
608	C Quintana, BJ Reiser, EA Davis, J Krajcik...	A scaffolding design framework for software to support science inquiry	2004
583	MTH Chi	Commonsense conceptions of emergent processes: Why some misconceptions are robust	2005
549	JL Kolodner, PJ Camp, D Crismond...	Problem-based learning meets case-based reasoning in the middle-school science classroom: Putting learning by design TM into practice	2003
497	BJ Reiser	Scaffolding complex learning: The mechanisms of structuring and problematizing student work	2004
454	B Barron	Achieving coordination in collaborative problem-solving groups	2000
401	CE Hmelo, DL Holton, JL Kolodner	Designing to learn about complex systems	2000
387	M Guzdial, J Turns	Effective discussion through a computer-mediated anchored forum	2000

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Cites	Authors	Title	Year
345	KR Koedinger, MJ Nathan	The real story behind story problems: Effects of representations on quantitative reasoning	2004
345	AA DiSessa, P Cobb	Ontological innovation and the role of theory in design experiments	2004
340	WA Sandoval	Conceptual and epistemic aspects of students' scientific explanations	2003
331	KL McNeill, DJ Lizotte, J Krajcik...	Supporting students' construction of scientific explanations by fading scaffolds in instructional materials	2006
330	DD Suthers, CD Hundhausen	An experimental study of the effects of representational guidance on collaborative learning processes	2003
323	V Colella	Participatory simulations: Building collaborative understanding through immersive dynamic modeling	2000
320	DL Schwartz	The emergence of abstract representations in dyad problem solving	1995
320	MJ Jacobson, U Wilensky	Complex systems in education: Scientific and educational importance and implications for the learning sciences	2006
316	R McCrory Wallace, J Kupperman...	Science on the Web: Students online in a sixth-grade classroom	2000
306	CE Hmelo	Problem-based learning: Effects on the early acquisition of cognitive skill in medicine	1998
305	R Kozma, E Chin, J Russell, N Marx	The roles of representations and tools in the chemistry laboratory and their implications for chemistry learning	2000
305	EA Davis	Prompting middle school science students for productive reflection: Generic and directed prompts	2003
303	N Rummel, H Spada	Learning to collaborate: An instructional approach to promoting collaborative problem solving in computer-mediated settings	2005
301	SJ Derry, RD Pea, B Barron, RA Engle...	Conducting video research in the learning sciences: Guidance on selection, analysis, technology, and ethics	2010
287	B Fishman, RW Marx, P Blumenfeld...	Creating a framework for research on systemic technology innovations	2004
277	G Wells, RM Arauz	Dialogue in the classroom	2006
273	E Van Zee, J Minstrell	Using questioning to guide student thinking	1997
271	D Hammer, A Elby	Tapping epistemological resources for learning physics	2003
265	M Resnick, R Berg, M Eisenberg	Beyond black boxes: Bringing transparency and aesthetics back to scientific investigation	2000
265	A Kelly	Design research in education: Yes, but is it methodological?	2004

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Cites	Authors	Title	Year
263	M Resnick	Beyond the centralized mindset	1996
259	L Schauble, R Glaser, RA Duschl...	Students' understanding of the objectives and procedures of experimentation in the science classroom	1995
258	F Marton, MF Pang	On some necessary conditions of learning	2006
255	J Zhang, M Scardamalia, R Reeve...	Designs for collective cognitive responsibility in knowledge-building communities	2009
254	A Zohar, YJ Dori	Higher order thinking skills and low-achieving students: Are they mutually exclusive?	2003
252	YJ Dori, J Belcher	How does technology-enabled active learning affect undergraduate students' understanding of electromagnetism concepts?	2005
250	RL Goldstone, JY Son	The transfer of scientific principles using concrete and idealized simulations	2005
249	J Hewitt	Toward an understanding of how threads die in asynchronous computer conferences	2005
244	DN Gordin, RD Pea	Prospects for scientific visualization as an educational technology	1995
239	E De Vries, K Lund, M Baker	Computer-mediated epistemic dialogue: Explanation and argumentation as vehicles for understanding scientific notions	2002
224	T Murray	Authoring knowledge-based tutors: Tools for content, instructional strategy, student model, and interface design	1998
221	SA Barab, M Barnett, K Squire	Developing an empirical account of a community of practice: Characterizing the essential tensions	2002
220	D Hammer	Misconceptions or p-prims: How may alternative perspectives of cognitive structure influence instructional perceptions and intentions	1996
212	M Resnick, U Wilensky	Diving into complexity: Developing probabilistic decentralized thinking through role-playing activities	1998
211	I Tabak	Synergy: A complement to emerging patterns of distributed scaffolding	2004
207	D Gentner, S Brem, RW Ferguson...	Analogical reasoning and conceptual change: A case study of Johannes Kepler	1997
205	K Squire, E Klopfer	Augmented reality simulations on handheld computers	2007
204	K Bielaczyc	Designing social infrastructure: Critical issues in creating learning environments with technology	2006

Appendix D

Journal of the Learning Sciences—5

Top-Cited Articles

Five most-cited articles per year (1995–2014)

Cites	Authors	Title	Year
244	DN Gordin, RD Pea	Prospects for scientific visualization as an educational technology	1995
260	L Schauble, R Glaser, RA Duschl...	Students' understanding of the objectives and procedures of experimentation in the science classroom	1995
320	DL Schwartz	The emergence of abstract representations in dyad problem solving	1995
1793	JR Anderson, AT Corbett, KR Koedinger...	Cognitive tutors: Lessons learned	1995
1819	B Jordan, A Henderson	Interaction analysis: Foundations and practice	1995
162	WM Roth	Art and artifact of children's designing: A situated cognition perspective	1996
164	NB Songer	Exploring learning opportunities in coordinated network-enhanced classrooms: A case of kids as global scientists	1996
176	G Hume, J Michael, A Rovick...	Hinting as a tactic in one-on-one tutoring	1996
220	D Hammer	Misconceptions or p-prims: How may alternative perspectives of cognitive structure influence instructional perceptions and intentions	1996
263	M Resnick	Beyond the centralized mindset	1996
91	GEA Solomon	Conceptual change and wine expertise	1997
123	EB Coleman, AL Brown, ID Rivkin	The effect of instructional explanations on learning from scientific texts	1997
207	D Gentner, S Brem, RW Ferguson...	Analogical reasoning and conceptual change: A case study of Johannes Kepler	1997
274	E Van Zee, J Minstrell	Using questioning to guide student thinking	1997
1291	MTH Chi	Quantifying qualitative analyses of verbal data: A practical guide	1997

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Cites	Authors	Title	Year
30	J Roschelle	Activity theory: A foundation for designing learning technology?	1998
48	JN Moschkovich	Resources for refining mathematical conceptions: Case studies in learning about linear functions	1998
212	M Resnick, U Wilensky	Diving into complexity: Developing probabilistic decentralized thinking through role-playing activities	1998
224	T Murray	Authoring knowledge-based tutors: Tools for content, instructional strategy, student model, and interface design	1998
308	CE Hmelo	Problem-based learning: Effects on the early acquisition of cognitive skill in medicine	1998
21	R Lehrer, M Lee, A Jeong	Reflective teaching of Logo	1999
55	AM Shapiro	The relevance of hierarchies to learning biology from hypertext	1999
59	T Chaney-Cullen, TM Duffy	Strategic teaching framework: Multimedia to support teacher change	1999
83	R Ploetzner, E Fehse, C Kneser...	Learning to relate qualitative and quantitative problem representations in a model-based setting for collaborative problem solving	1999
87	K VanLehn	Rule-learning events in the acquisition of a complex skill: An evaluation of CASCADE	1999
316	R McCrory Wallace, J Kupperman...	Science on the Web: Students online in a sixth-grade classroom	2000
323	V Colella	Participatory simulations: Building collaborative understanding through immersive dynamic modeling	2000
387	M Guzdial, J Turns	Effective discussion through a computer-mediated anchored forum	2000
401	CE Hmelo, DL Holton, JL Kolodner	Designing to learn about complex systems	2000
455	B Barron	Achieving coordination in collaborative problem-solving groups	2000
129	M Umaschi Bers	Identity construction environments: Developing personal and moral values through the design of a virtual city	2001
154	SA Barab, KE Hay...	Constructing networks of action-relevant episodes: An in situ research methodology	2001
163	SA Barab, D Kirshner	Guest editors' introduction: Rethinking methodology in the learning sciences	2001
164	M Guzdial, J Rick, C Kehoe	Beyond adoption to invention: Teacher-created collaborative activities in higher education	2001
184	KJ Kurtz, CH Miao, D Gentner	Learning by analogical bootstrapping	2001

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Cites	Authors	Title	Year
136	D Carraher, A Schliemann	The transfer dilemma	2002
197	S Ainsworth, P Bibby, D Wood	Examining the effects of different multiple representational systems in learning primary mathematics	2002
220	SA Barab, M Barnett, K Squire	Developing an empirical account of a community of practice: Characterizing the essential tensions	2002
239	E De Vries, K Lund, M Baker	Computer-mediated epistemic dialogue: Explanation and argumentation as vehicles for understanding scientific notions	2002
692	DC Edelson	Design research: What we learn when we engage in design	2002
305	EA Davis	Prompting middle school science students for productive reflection: Generic and directed prompts	2003
330	DD Suthers, CD Hundhausen	An experimental study of the effects of representational guidance on collaborative learning processes	2003
340	WA Sandoval	Conceptual and epistemic aspects of students' scientific explanations	2003
549	JL Kolodner, PJ Camp, D Crismond...	Problem-based learning meets case-based reasoning in the middle-school science classroom: Putting learning by design (tm) into practice	2003
787	B Barron	When smart groups fail	2003
497	BJ Reiser	Scaffolding complex learning: The mechanisms of structuring and problematizing student work	2004
608	C Quintana, BJ Reiser, EA Davis, J Krajcik...	A scaffolding design framework for software to support science inquiry	2004
670	RD Pea	The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity	2004
1365	A Collins, D Joseph, K Bielaczyc	Design research: Theoretical and methodological issues	2004
1377	S Barab, K Squire	Design-based research: Putting a stake in the ground	2004
249	J Hewitt	Toward an understanding of how threads die in asynchronous computer conferences	2005
250	RL Goldstone, JY Son	The transfer of scientific principles using concrete and idealized simulations	2005
252	YJ Dori, J Belcher	How does technology-enabled active learning affect undergraduate students' understanding of electromagnetism concepts?	2005
304	N Rummel, H Spada	Learning to collaborate: An instructional approach to promoting collaborative problem solving in computer-mediated settings	2005
582	MTH Chi	Commonsense conceptions of emergent processes: Why some misconceptions are robust	2005

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Cites	Authors	Title	Year
204	K Bielaczyc	Designing social infrastructure: Critical issues in creating learning environments with technology	2006
258	F Marton, MF Pang	On some necessary conditions of learning	2006
279	G Wells, RM Arauz	Dialogue in the classroom	2006
320	MJ Jacobson, U Wilensky	Complex systems in education: Scientific and educational importance and implications for the learning sciences	2006
331	KL McNeill, DJ Lizotte, J Krajcik...	Supporting students' construction of scientific explanations by fading scaffolds in instructional materials	2006
113	S Barab, T Dodge, MK Thomas...	Our designs and the social agendas they carry	2007
137	J van Aalst, CKK Chan	Student-directed assessment of knowledge building using electronic portfolios	2007
158	A Sfard	When the rules of discourse change, but nobody tells you: Making sense of mathematics learning from a commognitive standpoint	2007
166	CE Hmelo-Silver, S Marathe, L Liu	Fish swim, rocks sit, and lungs breathe: Expert-novice understanding of complex systems	2007
205	K Squire, E Klopfer	Augmented reality simulations on handheld computers	2007
90	RL Goldstone, U Wilensky	Promoting transfer by grounding complex systems principles	2008
104	MM Chiu	Flowing toward correct contributions during group problem solving: A statistical discourse analysis	2008
126	NS Nasir, V Hand	From the court to the classroom: Opportunities for engagement, learning, and identity in basketball and classroom mathematics	2008
138	JN Bailenson, N Yee, J Blascovich...	The use of immersive virtual reality in the learning sciences: Digital transformations of teachers, students, and social context	2008
172	N Mercer	The seeds of time: Why classroom dialogue needs a temporal analysis	2008
56	EA van Es	Participants' roles in the context of a video club	2009
69	KL McNeill, J Krajcik	Synergy between teacher practices and curricular scaffolds to support students in using domain-specific and domain-general knowledge in writing arguments to ...	2009
83	MS Gresalfi	Taking up opportunities to learn: Constructing dispositions in mathematics classrooms	2009
96	P Cobb, Q Zhao, C Dean	Conducting design experiments to support teachers' learning: A reflection from the field	2009
256	J Zhang, M Scardamalia, R Reeve...	Designs for collective cognitive responsibility in knowledge-building communities	2009

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Cites	Authors	Title	Year
76	A Gupta, D Hammer, EF Redish	The case for dynamic models of learners' ontologies in physics	2010
84	E Etkina, A Karelina, M Ruibal-Villasenor...	Design and reflection help students develop scientific abilities: Learning in introductory physics laboratories	2010
91	C Chin, J Osborne	Supporting argumentation through students' questions: Case studies in science classrooms	2010
102	AC Barton, E Tan	We be burnin'! Agency, identity, and science learning	2010
301	SJ Derry, RD Pea, B Barron, RA Engle...	Conducting video research in the learning sciences: Guidance on selection, analysis, technology, and ethics	2010
36	BB Schwarz, CS Asterhan	E-moderation of synchronous discussions in educational settings: A nascent practice	2011
37	KE Metz	Disentangling robust developmental constraints from the instructionally mutable: Young children's epistemic reasoning about a study of their own design	2011
42	EM Nussbaum, OV Edwards	Critical questions and argument stratagems: A framework for enhancing and analyzing students' reasoning practices	2011
65	J Zhang, HY Hong, M Scardamalia...	Sustaining knowledge building as a principle-based innovation at an elementary school	2011
164	MPJ Habgood, SE Ainsworth	Motivating children to learn effectively: Exploring the value of intrinsic integration in educational games	2011
35	P Cobb, K Jackson	Analyzing educational policies: A learning design perspective	2012
42	R Nemirovsky, C Rasmussen, G Sweeney...	When the classroom floor becomes the complex plane: Addition and multiplication as ways of bodily navigation	2012
51	DM Belenky, TJ Nokes-Malach	Motivation and transfer: The role of mastery-approach goals in preparation for future learning	2012
106	MW Alibali, MJ Nathan	Embodiment in mathematics teaching and learning: Evidence from learners' and teachers' gestures	2012
113	M Kapur, K Bielaczyc	Designing for productive failure	2012
21	NA Shea, RG Duncan	From theory to data: The process of refining learning progressions	2013
21	FS Azevedo	The tailored practice of hobbies and its implication for the design of interest-driven learning environments	2013

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Cites	Authors	Title	Year
31	JD Gobert, M Sao Pedro, J Raziuddin...	From log files to assessment metrics: Measuring students' science inquiry skills using educational data mining	2013
43	F Jeppsson, J Haglund, TG Amin...	Exploring the use of conceptual metaphors in solving problems on entropy	2013
43	MT Hora, JJ Ferrare	Instructional systems of practice: A multidimensional analysis of math and science undergraduate course planning and classroom teaching	2013
49	W Sandoval	Conjecture mapping: An approach to systematic educational design research	2014
18	M Kapur	Comparing learning from productive failure and vicarious failure	2014
18	C Bereiter	Principled practical knowledge: Not a bridge but a ladder	2014
16	P Blikstein, M Worsley, C Piech, M Sahami...	Programming pluralism: Using learning analytics to detect patterns in the learning of computer programming	2014
15	D Hammer, LK Berland	Confusing claims for data: A critique of common practices for presenting qualitative research on learning	2014

Appendix E

Educational Technology Research and Development (ETR&D)

Articles cited 200 or more times. Published between January 1995 and December 2014

Cites	Authors	Title	Year
1433	PA Ertmer	Teacher pedagogical beliefs: The final frontier in our quest for technology integration?	2005
1332	MD Merrill	First principles of instruction	2002
1280	DH Jonassen	Toward a design theory of problem solving	2000
1254	DH Jonassen	Instructional design models for well-structured and III-structured problem-solving learning outcomes	1997
1130	PA Ertmer	Addressing first-and second-order barriers to change: Strategies for technology integration	1999
955	LP Rieber	Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games	1996
946	DH Jonassen, L Rohrer-Murphy	Activity theory as a framework for designing constructivist learning environments	1999
892	KF Hew, T Brush	Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research	2007
891	F Wang, MJ Hannafin	Design-based research and technology-enhanced learning environments	2005
827	J Herrington, R Oliver	An instructional design framework for authentic learning environments	2000
798	S Barab, M Thomas, T Dodge, R Carteaux...	Making learning fun: Quest Atlantis, a game without guns	2005
521	JJG Van Merriënboer, RE Clark...	Blueprints for complex learning: The 4C/ID-model	2002
470	JR Hill, MJ Hannafin	Cognitive strategies and learning from the World Wide Web	1997
454	YJ Joo, M Bong, HJ Choi	Self-efficacy for self-regulated learning, academic self-efficacy, and Internet self-efficacy in Web-based instruction	2000
448	JI Choi, M Hannafin	Situated cognition and learning environments: Roles, structures, and implications for design	1995

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Cites	Authors	Title	Year
443	RA Reiser	A history of instructional design and technology: Part I: A history of instructional media	2001
421	DH Jonassen, H Kwon II	Communication patterns in computer mediated versus face-to-face group problem solving	2001
412	AP Rovai	Building classroom community at a distance: A case study	2001
407	MD Dickey	Engaging by design: How engagement strategies in popular computer and video games can inform instructional design	2005
405	P Goodyear, G Salmon, JM Spector, C Steeples...	Competences for online teaching: A special report	2001
381	DH Jonassen, J Hernandez-Serrano	Case-based reasoning and instructional design: Using stories to support problem solving	2002
365	KL Cho, DH Jonassen	The effects of argumentation scaffolds on argumentation and problem solving	2002
352	E Klopfer, K Squire	Environmental Detectives—the development of an augmented reality platform for environmental simulations	2008
348	SA Barab, JG MaKinster, JA Moore...	Designing and building an on-line community: The struggle to support sociability in the inquiry learning forum	2001
341	X Ge, SM Land	Scaffolding students' problem-solving processes in an ill-structured task using question prompts and peer interactions	2003
339	JR Hill, MJ Hannafin	Teaching and learning in digital environments: The resurgence of resource-based learning	2001
338	RA Reiser	A history of instructional design and technology: Part II: A history of instructional design	2001
336	X Lin, C Hmelo, CK Kinzer, TJ Secules	Designing technology to support reflection	1999
336	RE Mayer, K Steinhoff, G Bower, R Mars	A generative theory of textbook design: Using annotated illustrations to foster meaningful learning of science text	1995
329	P Kirschner, JW Strijbos, K Kreijns, PJ Beers	Designing electronic collaborative learning environments	2004
315	JW Saye, T Brush	Scaffolding critical reasoning about history and social issues in multimedia-supported learning environments	2002
306	L Schrum	Technology professional development for teachers	1999
300	GE Xun, SM Land	A conceptual framework for scaffolding III-structured problem-solving processes using question prompts and peer interactions	2004

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Cites	Authors	Title	Year
297	EC Thach, KL Murphy	Competencies for distance education professionals	1995
292	JTM Gulikers, TJ Bastiaens, PA Kirschner	A five-dimensional framework for authentic assessment	2004
292	A Sadik	Digital storytelling: A meaningful technology-integrated approach for engaged student learning	2008
289	MD Dickey	Game design and learning: A conjectural analysis of how massively multiple online role-playing games (MMORPGs) foster intrinsic motivation	2007
276	RM Marra, JL Moore, AK Klimczak	Content analysis of online discussion forums: A comparative analysis of protocols	2004
275	MJ Hannafin, KM Hannafin, SM Land...	Grounded practice and the design of constructivist learning environments	1997
273	N Strudler, K Wetzel	Lessons from exemplary colleges of education: Factors affecting technology integration in preservice programs	1999
266	L Rourke, T Anderson	Validity in quantitative content analysis	2004
265	SM Land	Cognitive requirements for learning with open-ended learning environments	2000
256	X Lin	Designing metacognitive activities	2001
254	L Moller	Designing communities of learners for asynchronous distance education	1998
250	SM Land, BA Greene	Project-based learning with the World Wide Web: A qualitative study of resource integration	2000
250	JJG Van Merriënboer, P Ayres	Research on cognitive load theory and its design implications for e-learning	2005
241	L Henderson	Instructional design of interactive multimedia: A cultural critique	1996
239	DL Lowther, SM Ross, GM Morrison	When each one has one: The influences on teaching strategies and student achievement of using laptops in the classroom	2003
239	FA Inan, DL Lowther	Factors affecting technology integration in K-12 classrooms: A path model	2010
236	F Paas, JE Tuovinen, JJG Van Merrienboer...	A motivational perspective on the relation between mental effort and performance: Optimizing learner involvement in instruction	2005
229	PE Parrish	The trouble with learning objects	2004
228	M Resnick	Technologies for lifelong kindergarten	1998
228	R Azevedo, DC Moos, JA Greene, FI Winters...	Why is externally-facilitated regulated learning more effective than self-regulated learning with hypermedia?	2008
226	JL Whipp, S Chiarelli	Self-regulation in a web-based course: A case study	2004

(continued)

(continued)

Cites	Authors	Title	Year
223	SH Song, JM Keller	Effectiveness of motivationally adaptive computer-assisted instruction on the dynamic aspects of motivation	2001
220	TC Reeves, J Herrington, R Oliver	A development research agenda for online collaborative learning	2004
219	O Park, J Lee	Adaptive instructional systems	2003
211	R Moreno, A Valdez	Cognitive load and learning effects of having students organize pictures and words in multimedia environments: The role of student interactivity and feedback	2005
207	JC Dunlap	Problem-based learning and self-efficacy: How a capstone course prepares students for a profession	2005
206	J Laffey, T Tupper, D Musser, J Wedman	A computer-mediated support system for project-based learning	1998
206	M Tessmer, RC Richey	The role of context in learning and instructional design	1997
204	Y Kim, AL Baylor	A social-cognitive framework for pedagogical agents as learning companions	2006
202	SA Barab, KD Squire, W Dueber	A co-evolutionary model for supporting the emergence of authenticity	2000
201	J Zhang, M Scardamalia, M Lamon, R Messina...	Socio-cognitive dynamics of knowledge building in the work of 9-and 10-year-olds	2007

Appendix F

Educational Technology Research and Development (ETR&D)—5 Top-Cited Articles

Five most-cited articles per year (1995–2014)

Cites	Authors	Title	Year
448	JI Choi, M Hannafin	Situated cognition and learning environments: Roles, structures, and implications for design	1995
336	RE Mayer, K Steinhoff, G Bower, R Mars	A generative theory of textbook design: Using annotated illustrations to foster meaningful learning of science text	1995
297	EC Thach, KL Murphy	Competencies for distance education professionals	1995
150	LP Rieber	A historical review of visualization in human cognition	1995
114	RD Hannafin, HJ Sullivan	Learner control in full and lean CAI programs	1995
955	LP Rieber	Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games	1996
241	L Henderson	Instructional design of interactive multimedia: A cultural critique	1996
170	SM Land, MJ Hannafin	A conceptual framework for the development of theories-in-action with open-ended learning environments	1996
133	JD Young	The effect of self-regulated learning strategies on performance in learner controlled computer-based instruction	1996
131	LP Rieber	Animation as feedback in a computer-based simulation: Representation matters	1996
1254	DH Jonassen	Instructional design models for well-structured and III-structured problem-solving learning outcomes	1997
470	JR Hill, MJ Hannafin	Cognitive strategies and learning from the World Wide Web	1997
275	MJ Hannafin, KM Hannafin, SM Land...	Grounded practice and the design of constructivist learning environments	1997

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Cites	Authors	Title	Year
206	M Tessmer, RC Richey	The role of context in learning and instructional design	1997
156	TB Means, DH Jonassen, FM Dwyer	Enhancing relevance: Embedded ARCS strategies vs. purpose	1997
254	L Moller	Designing communities of learners for asynchronous distance education	1998
228	M Resnick	Technologies for lifelong kindergarten	1998
206	J Laffey, T Tupper, D Musser, J Wedman	A computer-mediated support system for project-based learning	1998
191	J Petraglia	The real world on a short leash: The (mis) application of constructivism to the design of educational technology	1998
107	TA Brush	Embedding cooperative learning into the design of integrated learning systems: rationale and guidelines	1998
1130	PA Ertmer	Addressing first-and second-order barriers to change: Strategies for technology integration	1999
946	DH Jonassen, L Rohrer-Murphy	Activity theory as a framework for designing constructivist learning environments	1999
336	X Lin, C Hmelo, CK Kinzer, TJ Secules	Designing technology to support reflection	1999
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315	JW Saye, T Brush	Scaffolding critical reasoning about history and social issues in multimedia-supported learning environments	2002
341	X Ge, SM Land	Scaffolding students' problem-solving processes in an ill-structured task using question prompts and peer interactions	2003
239	DL Lowther, SM Ross, GM Morrison	When each one has one: The influences on teaching strategies and student achievement of using laptops in the classroom	2003
219	O Park, J Lee	Adaptive instructional systems	2003
197	S Pedersen, M Liu	Teachers' beliefs about issues in the implementation of a student-centered learning environment	2003
170	T Brush, K Glazewski, K Rutowski, K Berg...	Integrating technology in a field-based teacher training program: The PT3@ ASU project	2003
329	P Kirschner, JW Strijbos, K Kreijns, PJ Beers	Designing electronic collaborative learning environments	2004
300	GE Xun, SM Land	A conceptual framework for scaffolding III-structured problem-solving processes using question prompts and peer interactions	2004
292	JTM Gulikers, TJ Bastiaens, PA Kirschner	A five-dimensional framework for authentic assessment	2004
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798	S Barab, M Thomas, T Dodge, R Carteaux...	Making learning fun: Quest Atlantis, a game without guns	2005

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Cites	Authors	Title	Year
407	MD Dickey	Engaging by design: How engagement strategies in popular computer and video games can inform instructional design	2005
250	JJG Van Merriënboer, P Ayres	Research on cognitive load theory and its design implications for e-learning	2005
204	Y Kim, AL Baylor	A social-cognitive framework for pedagogical agents as learning companions	2006
191	MD Dickey	Game design narrative for learning: Appropriating adventure game design narrative devices and techniques for the design of interactive learning environments	2006
128	JM Brill, MJ Bishop, AE Walker	The competencies and characteristics required of an effective project manager: A web-based Delphi study	2006
126	Y Lou, RM Bernard, PC Abrami	Media and pedagogy in undergraduate distance education: A theory-based meta-analysis of empirical literature	2006
111	Y Kim, AL Baylor, PALS Group	Pedagogical agents as learning companions: The role of agent competency and type of interaction	2006
892	KF Hew, T Brush	Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research	2007
289	MD Dickey	Game design and learning: A conjectural analysis of how massively multiple online role-playing games (MMORPGs) foster intrinsic motivation	2007
201	J Zhang, M Scardamalia, M Lamon, R Messina...	Socio-cognitive dynamics of knowledge building in the work of 9-and 10-year-olds	2007
180	RE West, G Waddoups, CR Graham	Understanding the experiences of instructors as they adopt a course management system	2007
168	A Amory	Game object model version II: a theoretical framework for educational game development	2007
352	E Klopfer, K Squire	Environmental Detectives—the development of an augmented reality platform for environmental simulations	2008
292	A Sadik	Digital storytelling: A meaningful technology-integrated approach for engaged student learning	2008
228	R Azevedo, DC Moos, JA Greene, FI Winters...	Why is externally-facilitated regulated learning more effective than self-regulated learning with hypermedia?	2008
157	GA Gunter, RF Kenny, EH Vick	Taking educational games seriously: using the RETAIN model to design endogenous fantasy into standalone educational games	2008

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Cites	Authors	Title	Year
135	F Ke	Computer games application within alternative classroom goal structures: cognitive, metacognitive, and affective evaluation	2008
157	KF Hew	Use of audio podcast in K-12 and higher education: A review of research topics and methodologies	2009
95	PE Parrish	Aesthetic principles for instructional design	2009
85	I Choi, K Lee	Designing and implementing a case-based learning environment for enhancing ill-structured problem solving: Classroom management problems for prospective ...	2009
84	HY Hong, FR Sullivan	Towards an idea-centered, principle-based design approach to support learning as knowledge creation	2009
81	RH Kay, L Knaack	Assessing learning, quality and engagement in learning objects: the Learning Object Evaluation Scale for Students (LOES-S)	2009
239	FA Inan, DL Lowther	Factors affecting technology integration in K-12 classrooms: A path model	2010
150	T Traphagan, JV Kucsera, K Kishi	Impact of class lecture webcasting on attendance and learning	2010
115	TJ Kopcha	A systems-based approach to technology integration using mentoring and communities of practice	2010
98	P Pirnay-Dummer, D Ifenthaler, JM Spector	Highly integrated model assessment technology and tools	2010
91	B Hoffman, L Nadelson	Motivational engagement and video gaming: A mixed methods study	2010
107	Y Lee, J Choi	A review of online course dropout research: implications for practice and future research	2011
94	W Hung	Theory to reality: A few issues in implementing problem-based learning	2011
69	MP Amone, RV Small, SA Chauncey...	Curiosity, interest and engagement in technology-pervasive learning environments: a new research agenda	2011
57	M Liu, L Horton, J Olmanson, P Toprac	A study of learning and motivation in a new media enriched environment for middle school science	2011
56	AL Baylor	The design of motivational agents and avatars	2011
110	S Aydin	A review of research on Facebook as an educational environment	2012
95	YM Huang, TH Liang, YN Su, NS Chen	Empowering personalized learning with an interactive e-book learning system for elementary school students	2012

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Cites	Authors	Title	Year
60	GJ Hwang, HY Sung, CM Hung, I Huang...	Development of a personalized educational computer game based on students' learning styles	2012
42	P Nedungadi, R Raman	A new approach to personalization: integrating e-learning and m-learning	2012
39	DH Jonassen	Designing for decision making	2012
116	RS Davies, DL Dean, N Ball	Flipping the classroom and instructional technology integration in a college-level information systems spreadsheet course	2013
86	S Abramovich, C Schunn, RM Higashi	Are badges useful in education?: it depends upon the type of badge and expertise of learner	2013
41	G Veletsianos, R Kimmons, KD French	Instructor experiences with a social networking site in a higher education setting: Expectations, frustrations, appropriation, and compartmentalization	2013
27	S Greiff, S Wüstenberg, DV Holt, F Goldhammer...	Computer-based assessment of Complex Problem Solving: concept, implementation, and application	2013
22	JR Segedy, JS Kinnebrew, G Biswas	The effect of contextualized conversational feedback in a complex open-ended learning environment	2013
25	S Järvelä, PA Kirschner, E Panadero...	Enhancing socially shared regulation in collaborative learning groups: designing for CSCL regulation tools	2014
22	GJ Hwang, CM Hung, NS Chen	Improving learning achievements, motivations and problem-solving skills through a peer assessment-based game development approach	2014
19	YM Huang, SH Huang, TT Wu	Embedding diagnostic mechanisms in a digital game for learning mathematics	2014
13	SK Wang, HY Hsu, T Campbell, DC Coster...	An investigation of middle school science teachers and students use of technology inside and outside of classrooms: considering whether digital natives are more ...	2014
12	JA Hyman, MT Moser, LN Segala	Electronic reading and digital library technologies: understanding learner expectation and usage intent for mobile learning	2014

Appendix G

Instructional Science

Articles cited 200 or more times. Published between January 1995 and December 2014

Cites	Authors	Title	Year
1063	N Hara, CJ Bonk, C Angeli	Content analysis of online discussion in an applied educational psychology course	2000
816	G Schraw	Promoting general metacognitive awareness	1998
605	F Paas, A Renkl, J Sweller	Cognitive load theory: Instructional implications of the interaction between information structures and cognitive architecture	2004
559	PA Ertmer, TJ Newby	The expert learner: Strategic, self-regulated, and reflective	1996
515	MJ Hannafin, SM Land	The foundations and assumptions of technology-enhanced student-centered learning environments	1997
488	RE Mayer	Cognitive, metacognitive, and motivational aspects of problem solving	1998
437	CA Wolters, PR Pintrich	Contextual differences in student motivation and self-regulated learning in mathematics, English, and social studies classrooms	1998
368	A Weinberger, B Ertl, F Fischer, H Mandl	Epistemic and social scripts in computer-supported collaborative learning	2005
360	DW Surry, JD Farquhar	Diffusion theory and instructional technology	1997
352	R Moreno	Decreasing cognitive load for novice students: Effects of explanatory versus corrective feedback in discovery-based multimedia	2004
340	JC Taylor	Fifth generation distance education	2001
334	J Sweller	Instructional design consequences of an analogy between evolution by natural selection and human cognitive architecture	2004
285	RJ Sternberg	Metacognition, abilities, and developing expertise: What makes an expert student?	1998
275	T De Jong	Cognitive load theory, educational research, and instructional design: some food for thought	2010

(continued)

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Cites	Authors	Title	Year
274	KA Lawless, SW Brown	Multimedia learning environments: Issues of learner control and navigation	1997
267	R Azevedo, AF Hadwin	Scaffolding self-regulated learning and metacognition–Implications for the design of computer-based scaffolds	2005
229	MH Lee, CC Tsai	Exploring teachers' perceived self-efficacy and technological pedagogical content knowledge with respect to educational use of the World Wide Web	2010
226	L McAlpine, C Weston	Reflection: Issues related to improving professors' teaching and students' learning	2000
223	J Psotka	Immersive training systems: Virtual reality and education and training	1995
222	BOB Hoffmann, D Ritchie	Using multimedia to overcome the problems with problem based learning	1997
221	E Sadler-Smith, R Riding	Cognitive style and instructional preferences	1999
212	R Azevedo, JG Cromley, FI Winters, DC Moos...	Adaptive human scaffolding facilitates adolescents' self-regulated learning with hypermedia	2005
208	E Zhu	Interaction and cognitive engagement: An analysis of four asynchronous online discussions	2006
202	WS De Grave, HPA Boshuizen, HG Schmidt	Problem based learning: Cognitive and metacognitive processes during problem analysis	1996
200	P Gerjets, K Scheiter, R Catrambone	Designing instructional examples to reduce intrinsic cognitive load: Molar versus modular presentation of solution procedures	2004

Appendix H

Instructional Science—5 Top-Cited Articles

Five most-cited articles per year (1995–2014)

Cites	Authors	Title	Year
223	J Psotka	Immersive training systems: Virtual reality and education and training	1995
65	RS Perez, JF Johnson, CD Emery	Instructional design expertise: A cognitive model of design	1995
54	M Chen	A methodology for characterizing computer-based learning environments	1995
53	Y San Chee	Cognitive apprenticeship and its application to the teaching of Smalltalk in a multimedia interactive learning environment	1995
46	OC Park, SS Gittelman	Dynamic characteristics of mental models and dynamic visual displays	1995
559	PA Ertmer, TJ Newby	The expert learner: Strategic, self-regulated, and reflective	1996
202	WS De Grave, HPA Boshuizen, HG Schmidt	Problem based learning: Cognitive and metacognitive processes during problem analysis	1996
192	C Howell-Richardson, H Mellar	A methodology for the analysis of patterns of participation within computer mediated communication courses	1996
141	G Dall’Alba, J Sandberg	Educating for competence in professional practice	1996
134	WR Klemm, JR Snell	Enriching computer-mediated group learning by coupling constructivism with collaborative learning	1996
515	MJ Hannafin, SM Land	The foundations and assumptions of technology-enhanced student-centered learning environments	1997
360	DW Surry, JD Farquhar	Diffusion theory and instructional technology	1997
274	KA Lawless, SW Brown	Multimedia learning environments: Issues of learner control and navigation	1997
222	BOB Hoffmann, D Ritchie	Using multimedia to overcome the problems with problem based learning	1997
141	CE Hmelo, GS Gotterer, JD Bransford	A theory-driven approach to assessing the cognitive effects of PBL	1997

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Cites	Authors	Title	Year
816	G Schraw	Promoting general metacognitive awareness	1998
488	RE Mayer	Cognitive, metacognitive, and motivational aspects of problem solving	1998
437	CA Wolters, PR Pintrich	Contextual differences in student motivation and self-regulated learning in mathematics, English, and social studies classrooms	1998
285	RJ Sternberg	Metacognition, abilities, and developing expertise: What makes an expert student?	1998
171	AF Gourgey	Metacognition in basic skills instruction	1998
221	E Sadler-Smith, R Riding	Cognitive style and instructional preferences	1999
110	R Cox, J McKendree, R Tobin, J Lee, T Mayes	Vicarious learning from dialogue and discourse	1999
95	A Balcytiene	Exploring individual processes of knowledge construction with hypertext	1999
52	J Rouet, JM Passerault	Analyzing learner-hypermedia interaction: An overview of online methods	1999
43	S Naidu, M Oliver	Critical incident-based computer supported collaborative learning	1999
1063	N Hara, CJ Bonk, C Angeli	Content analysis of online discussion in an applied educational psychology course	2000
226	L McAlpine, C Weston	Reflection: Issues related to improving professors' teaching and students' learning	2000
168	H Astleitner	Designing emotionally sound instruction: The FEASP-approach	2000
138	L Mason, P Boscolo	Writing and conceptual change. What changes?	2000
96	L Cooper	On-line courses: Tips for making them work	2000
340	JC Taylor	Fifth generation distance education	2001
141	T Anderson, C Howe, R Soden, J Halliday, J Low	Peer interaction and the learning of critical thinking skills in further education students	2001
123	SP Lajoie, C Guerrero, SD Munsie, NC Lavigne	Constructing knowledge in the context of BioWorld	2001
122	NM Seel	Epistemology, situated cognition, and mental models: 'Like a bridge over troubled water'	2001
120	CKK Chan	Peer collaboration and discourse patterns in learning from incompatible information	2001
128	MA Dahlgren, LO Dahlgren	Portraits of PBL: Students' experiences of the characteristics of problem-based learning in physiotherapy, computer engineering and psychology	2002
100	R Azevedo	Beyond intelligent tutoring systems: Using computers as METAcognitive tools to enhance learning?	2002

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Cites	Authors	Title	Year
98	HM Cuevas, SM Fiore, RL Oser	Scaffolding cognitive and metacognitive processes in low verbal ability learners: Use of diagrams in computer-based training environments	2002
94	JAR Arts, WH Gijssels, MSR Segers	Cognitive effects of an authentic computer-supported, problem-based learning environment	2002
67	B Dalgarno	The potential of 3D virtual learning environments: A constructivist analysis	2002
176	MF Pang, F Marton	Beyond“lesson study”: Comparing two ways of facilitating the grasp of some economic concepts	2003
158	M De Laat, V Lally	Complexity, theory and praxis: Researching collaborative learning and tutoring processes in a networked learning community	2003
120	PG Schrader, DJ Leu Jr, CK Kinzer, R Ataya...	Using Internet delivered video cases, to support pre-service teachers’ understanding of effective early literacy instruction: An exploratory study	2003
103	RM Pilkington, SA Walker	Facilitating debate in networked learning: Reflecting on online synchronous discussion in higher education	2003
99	MM Recker, A Walker, K Lawless	What do you recommend? Implementation and analyses of collaborative information filtering of web resources for education	2003
605	F Paas, A Renkl, J Sweller	Cognitive load theory: Instructional implications of the interaction between information structures and cognitive architecture	2004
352	R Moreno	Decreasing cognitive load for novice students: Effects of explanatory versus corrective feedback in discovery-based multimedia	2004
334	J Sweller	Instructional design consequences of an analogy between evolution by natural selection and human cognitive architecture	2004
200	P Gerjets, K Scheiter, R Catrambone	Designing instructional examples to reduce intrinsic cognitive load: Molar versus modular presentation of solution procedures	2004
179	A Renkl, RK Atkinson, CS Große	How fading worked solution steps works—a cognitive load perspective	2004
368	A Weinberger, B Ertl, F Fischer, H Mandl	Epistemic and social scripts in computer-supported collaborative learning	2005
267	R Azevedo, AF Hadwin	Scaffolding self-regulated learning and metacognition—Implications for the design of computer-based scaffolds	2005
212	R Azevedo, JG Cromley, FI Winters, DC Moos...	Adaptive human scaffolding facilitates adolescents’ self-regulated learning with hypermedia	2005

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Cites	Authors	Title	Year
172	I Choi, SM Land, AJ Turgeon	Scaffolding peer-questioning strategies to facilitate metacognition during online small group discussion	2005
143	N Dabbagh, A Kitsantas	Using web-based pedagogical tools as scaffolds for self-regulated learning	2005
208	E Zhu	Interaction and cognitive engagement: An analysis of four asynchronous online discussions	2006
112	D Gijbels, G Van De Watering, F Dochy...	New learning environments and constructivism: The students' perspective	2006
80	G Corbalan, L Kester, JJG Van Merriënboer	Towards a personalized task selection model with shared instructional control	2006
68	LM Ling, P Chik, MF Pang	Patterns of variation in teaching the colour of light to Primary 3 students	2006
64	YH Guan, CC Tsai, FK Hwang	Content analysis of online discussion on a senior-high-school discussion forum of a virtual physics laboratory	2006
150	KD Simons, JD Klein	The impact of scaffolding and student achievement levels in a problem-based learning environment	2007
139	M De Laat, V Lally, L Lipponen, RJ Simons	Online teaching in networked learning communities: A multi-method approach to studying the role of the teacher	2007
133	R Luppici	Review of computer mediated communication research for education	2007
113	H Jeong, MTH Chi	Knowledge convergence and collaborative learning	2007
100	B Kim, TC Reeves	Reframing research on learning with technology: In search of the meaning of cognitive tools	2007
145	RD Roscoe, MTH Chi	Tutor learning: The role of explaining and responding to questions	2008
127	SMM Loyens, D Gijbels	Understanding the effects of constructivist learning environments: Introducing a multi-directional approach	2008
117	LJ Zhang	Constructivist pedagogy in strategic reading instruction: Exploring pathways to learner development in the English as a second language (ESL) classroom	2008
97	D Gijbels, M Segers, E Struyf	Constructivist learning environments and the (im) possibility to change students' perceptions of assessment demands and approaches to learning	2008
95	TS Hilbert, A Renkl	Concept mapping as a follow-up strategy to learning from texts: what characterizes good and poor mappers?	2008
166	MM Nelson, CD Schunn	The nature of feedback: How different types of peer feedback affect writing performance	2009

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Cites	Authors	Title	Year
88	K Berthold, THS Eysink, A Renkl	Assisting self-explanation prompts are more effective than open prompts when learning with multiple representations	2009
77	S Llinares, J Valls	The building of pre-service primary teachers' knowledge of mathematics teaching: interaction and online video case studies	2009
54	PA Howard-Jones, S Demetriou	Uncertainty and engagement with learning games	2009
54	S Lam, RW Cheng, WYK Ma	Teacher and student intrinsic motivation in project-based learning	2009
275	T De Jong	Cognitive load theory, educational research, and instructional design: some food for thought	2010
229	MH Lee, CC Tsai	Exploring teachers' perceived self efficacy and technological pedagogical content knowledge with respect to educational use of the World Wide Web	2010
99	KF Hew, WS Cheung, CSL Ng	Student contribution in asynchronous online discussion: A review of the research and empirical exploration	2010
93	M Kapur	Productive failure in mathematical problem solving	2010
75	L Mason, A Boldrin, N Ariasi	Searching the Web to learn about a controversial topic: are students epistemically active?	2010
80	P Van den Bossche, W Gijssels, M Segers...	Team learning: building shared mental models	2011
75	D Ifenthaler, I Masduki, NM Seel	The mystery of cognitive structure and how we can detect it: tracking the development of cognitive structures over time	2011
74	JH Kaufman, CD Schunn	Students' perceptions about peer assessment for writing: their origin and impact on revision work	2011
73	M Holmqvist	Teachers' learning in a learning study	2011
59	M Kapur	A further study of productive failure in mathematical problem solving: Unpacking the design components	2011
63	M Kapur	Productive failure in learning the concept of variance	2012
51	J Lu, N Law	Online peer assessment: effects of cognitive and affective feedback	2012
47	MF Pang, LM Ling	Learning study: Helping teachers to use theory, develop professionally, and produce new knowledge to be shared	2012
38	K Stegmann, C Wecker, A Weinberger, F Fischer	Collaborative argumentation and cognitive elaboration in a computer-supported collaborative learning environment	2012
36	M Bannert, P Reimann	Supporting self-regulated hypermedia learning through prompts	2012

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Cites	Authors	Title	Year
43	AF Wise, J Speer, F Marbouti, YT Hsiao	Broadening the notion of participation in online discussions: examining patterns in learners' online listening behaviors	2013
28	NC DiDonato	Effective self-and co-regulation in collaborative learning groups: An analysis of how students regulate problem solving of authentic interdisciplinary tasks	2013
22	JHL Koh, CS Chai, CC Tsai	Examining practicing teachers' perceptions of technological pedagogical content knowledge (TPACK) pathways: a structural equation modeling approach	2013
22	G Olympiou, Z Zacharias	Making the invisible visible: Enhancing students' conceptual understanding by introducing representations of abstract objects in a simulation	2013
20	L Mason, P Boscolo, MC Tornatora, L Ronconi	Besides knowledge: A cross-sectional study on the relations between epistemic beliefs, achievement goals, self-beliefs, and achievement in science	2013
26	G Blomberg, MG Sherin, A Renkl, I Glogger...	Understanding video as a tool for teacher education: investigating instructional strategies to promote reflection	2014
11	KD Könings, T Seidel, S Brand-Gruwel...	Differences between students' and teachers' perceptions of education: profiles to describe congruence and friction	2014
10	NG Holmes, J Day, AHK Park, DA Bonn, I Roll	Making the failure more productive: scaffolding the invention process to improve inquiry behaviors and outcomes in invention activities	2014
10	K Loibl, N Rummel	The impact of guidance during problem-solving prior to instruction on students' inventions and learning outcomes	2014
9	TK Rogat, KR Adams-Wiggins	Other-regulation in collaborative groups: implications for regulation quality	2014

Appendix I

TechTrends—5 Top-Cited Articles

Five most-cited articles per year (1995–2014)

Cites	Authors	Title	Year
60	M Simonson, C Schlosser	More than fiber distance education in Iowa	1995
47	M Simonson	Does anyone really want to learn at a distance?	1995
26	TS Pool, SM Blanchard, SA Hale	From over the Internet	1995
17	MA Bruce, RA Shade	Effective Teaching and Learning Strategies Using	1995
14	G Davidson, MM Maurer	Leadership in instructional technology	1995
98	LL Wolcott	Distant, but not distanced	1996
49	J Repman, S Logan	Interactions at a distance	1996
40	AA Carr	Distinguishing systemic from systematic	1996
39	PM Jenlink, CM Reigeluth, AA Carr, LM Nelson	An expedition for change: Facilitating the systemic change process in school districts	1996
35	BO Barker, MW Dickson	Distance learning technologies in K-12 schools	1996
38	JA Duffield	Trials, tribulations, and minor successes	1997
36	L McHenry, M Bozik	From a distance student voices from the interactive video classroom	1997
26	R Muffoletto	Reflections on designing and producing an Internet-based course	1997
24	D Tiene	Student perspectives on distance learning with interactive television	1997
24	A Kovalchick	Technology portfolios as instructional strategy	1997
556	DH Jonassen, C Carr, HP Yueh	Computers as mindtools for engaging learners in critical thinking	1998
151	SA Barab, KE Hay, TM Duffy	Grounded constructions and how technology can help	1998
102	WP Leggett, KA Persichitte	Blood, sweat, and TEARS: 50 years of technology implementation obstacles	1998

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Cites	Authors	Title	Year
18	KL Peck	Ready... fire... aim! Toward meaningful technology standards for educators and students	1998
15	DL Lowther, GR Morrison	The NTeQ model: A framework for technology integration	1998
54	M Simonson	Equivalency theory and distance education	1999
50	S Smaldino	Instructional design for distance education	1999
26	GC Rakes	Teaching visual literacy in a multimedia age	1999
23	RV Price	Designing a college Web-based course using a modified personalized system of instruction (PSI) model	1999
18	C Schlosser, M Burmeister	Best of both worlds: The Nova ITDE model of distance education	1999
60	K Krueger, L Hansen, S Smaldino	Preservice teacher technology competencies	2000
55	NH Dabbagh	The challenges of interfacing between face-to-face and online instruction	2000
34	J Summerville	WebQuests	2000
33	R Foshay, C Bergeron	Web-based education: A reality check	2000
32	MA Zisow	Teaching style and technology	2000
153	RF Branon, C Essex	Synchronous and asynchronous communication tools in distance education	2001
113	ZL Berge, L Muilenburg	Obstacles faced at various stages of capability regarding distance education in institutions of higher education	2001
91	L Whetstone, AA Carr-Chellman	Preparing preservice teachers to use technology: Survey results	2001
38	KB Hopper	Is the internet a classroom?	2001
36	B Akkoyunlu, F Orhan	The use of computers in K-12 Schools in Turkey	2001
188	PR Albion, PA Ertmer	Beyond the foundations: The role of vision and belief in teachers' preparation for integration of technology	2002
64	J Moore, S Barab	The inquiry learning forum	2002
64	M Thomas, M Mitchell, R Joseph	A cultural embrace	2002
49	S Mandell, DH Sorge, JD Russell	Tips for technology integration	2002
43	T Pearson	A technology crisis facing minority students	2002
95	S Cox, RT Osguthorpe	How do instructional design professionals spend their time?	2003
87	AS Gibbons	What and how do designers design?	2003
82	N Dabbagh	Scaffolding: An important teacher competency in online learning	2003

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Cites	Authors	Title	Year
55	B Cameron	The effectiveness of simulation in a hybrid and online networking course	2003
51	A Ali	Instructional design and online instruction	2003
190	T Martindale, DA Wiley	Using weblogs in scholarship and teaching	2004
142	SE Kirkley, JR Kirkley	Creating next generation blended learning environments using mixed reality, video games and simulations	2004
123	A Carstens, J Beck	Get ready for the gamer generation	2004
116	E Klopfer, S Yoon	Developing games and simulations for today and tomorrow's tech savvy youth	2004
76	N DeKanter	Gaming redefines interactivity for learning	2004
214	ME Engstrom, D Jewett	Collaborative learning the wiki way	2005
147	K Squire, L Giovanetto, B Devane, S Durga	From users to designers: Building a self-organizing game-based learning environment	2005
95	J Robertson, J Good	Children's narrative development through computer game authoring	2005
73	SS Elizabeth	Evolution in the classroom: What teachers need to know about the video game generation	2005
54	E Hayes	Women, video gaming and learning: Beyond stereotypes	2005
148	GM Johnson	Synchronous and asynchronous text-based CMC in educational contexts: A review of recent research	2006
105	B Beatty, C Ulasewicz	Faculty perspectives on moving from Blackboard to the Moodle learning management system	2006
72	C Mims, D Polly, C Shepherd, F Inan	Examining PT3 projects designed to improve preservice education	2006
64	JC Dunlap	Using guided reflective journaling activities to capture students' changing perceptions	2006
63	RE West, G Wright, B Gabbitas, CR Graham	Reflections from the introduction of blogs and RSS feeds into a preservice instructional technology course	2006
142	WR Watson, SL Watson	What are learning management systems, what are they not, and what should they become?	2007
77	EW Black, D Beck, K Dawson, S Jinks, M DiPietro	Considering implementation and use in the adoption of an LMS in online and blended learning environments	2007
62	DA Falvo, BF Johnson	The use of learning management systems in the United States	2007
62	JC Dunlap, D Sobel, DI Sands	Designing for deep and meaningful student-to-content interactions	2007
41	D Steinman	Educational experiences and the online student	2007

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Cites	Authors	Title	Year
136	DM Casey	The historical development of distance education through technology	2008
105	A Artino	Practical guidelines for online instructors	2008
95	RC Richey, KH Silber, DP Ely	Reflections on the 2008 AECT Definitions of the Field	2008
80	SK Wang, HY Hsu	Reflections on using blogs to expand in-class	2008
78	L Moller, W Foshay, J Huett	Implications for instructional design on the potential of the web	2008
191	S Cox, CR Graham	Using an elaborated model of the TPACK framework to analyze and depict teacher knowledge	2009
189	RC Graham, N Burgoyne, P Cantrell, L Smith, L St Clair...	Measuring the TPACK confidence of inservice science teachers	2009
105	LB Holcomb	Results & lessons learned from1: 1 laptop initiatives: A collective review	2009
97	P Mishra, MJ Koehler, K Kerehuik	Looking back to the future of educational technology	2009
82	MM Snyder	Instructional-design theory to guide the creation of online learning communities for adults	2009
40	P Lowenthal, BG Wilson	Labels do matter! A critique of AECT's redefinition of the field	2010
33	LB Holcomb, CM Beal	Capitalizing on Web 2.0 in the social studies context	2010
31	A Hirumi, B Appelman, L Rieber, R Van Eck	Preparing instructional designers for game-based learning: Part 1	2010
27	SB Steinweg, SC Williams, JN Stapleton	Faculty use of tablet PCs in teacher education and K-12 settings	2010
25	WC Allan, JL Erickson, P Brookhouse, JL Johnson	Teacher professional development through a collaborative curriculum project—an example of TPACK in Maine	2010
208	OT Murray, NR Olcese	Teaching and learning with iPads, ready or not?	2011
95	B Teclehaimanot, T Hickman	Student-teacher interaction on Facebook: What students find appropriate	2011
89	CM Walker, BR Sockman, S Koehn	An exploratory study of cyberbullying with undergraduate university students	2011
57	RS Davies	Understanding technology literacy: A framework for evaluating educational technology integration	2011
42	RD Morris	Web 3.0: Implications for online learning	2011
128	B McClanahan, K Williams, E Kennedy, S Tate	A breakthrough for Josh: How use of an iPad facilitated reading improvement	2012
84	K Lee	Augmented reality in education and training	2012

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Cites	Authors	Title	Year
48	DW Denton	Enhancing instruction through constructivism, cooperative learning, and cloud computing	2012
37	CH Tu, L Sujo-Montes, CJ Yen, JY Chan, M Blocher	The integration of personal learning environments & open network learning environments	2012
27	S Fuegen	The impact of mobile technologies on distance education	2012
66	J Enfield	Looking at the impact of the flipped classroom model of instruction on undergraduate multimedia students at CSUN	2013
41	MFG Lin, ES Hoffman, C Borengasser	Is social media too social for class? A case study of Twitter use	2013
30	C Roseth, M Akcaoglu, A Zellner	Blending synchronous face-to-face and computer-supported cooperative learning in a hybrid doctoral seminar	2013
27	P Mishra, A Yadav	Rethinking technology & creativity in the 21 st century	2013
23	C Shaltry, D Henriksen, ML Wu, WP Dickson	Situated learning with online portfolios, classroom websites and Facebook	2013
16	M Dunleavy	Design principles for augmented reality learning	2014
13	HT Zimmerman, SM Land	Facilitating place-based learning in outdoor informal environments with mobile computers	2014
12	SA Yoon, J Wang	Making the invisible visible in science museums through augmented reality devices	2014
12	E Baran, AP Correia	A professional development framework for online teaching	2014
11	R Kimmons	Social networking sites, literacy, and the authentic identity problem	2014

Appendix J

Journal of Educational Technology & Society

Articles cited 200 or more times. Published between January 1998 and December 2014

Cites	Authors	Title	Year
469	R Koper, B Olivier	Representing the learning design of units of learning	2004
389	M Tam	Constructivism, instructional design, and technology: Implications for transforming distance learning	2000
366	SY Park	An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning	2009
362	K Kreijns, PA Kirschner, W Jochems	The sociability of computer-supported collaborative learning environment	2002
341	GJ Hwang, CC Tsai, SJH Yang	Criteria, strategies and research issues of context-aware ubiquitous learning	2008
336	SH Yang	Using blogs to enhance critical reflection and community of practice	2009
335	SJH Yang	Context aware ubiquitous learning environments for peer-to-peer collaborative learning	2006
322	M Nichols	A theory for eLearning	2003
316	M Virvou, G Katsionis, K Manos	Combining software games with education: Evaluation of its educational effectiveness	2005
302	D Hernández-Leo, ED Villasclaras-Fernández...	COLLAGE: A collaborative Learning Design editor based on patterns	2006
282	Y Karagiorgi, L Symeou	Translating constructivism into instructional design: Potential and limitations	2005
282	JH Park, HJ Choi	Factors influencing adult learners' decision to drop out or persist in online learning	2009
258	HK Sam, AEA Othman, ZS Nordin	Computer self-efficacy, computer anxiety, and attitudes toward the Internet: A study among undergraduates in Unimas	2005
249	N Henze, P Dolog, W Nejdl	Reasoning and ontologies for personalized e-learning in the semantic web	2004
228	JM McInnerney, TS Roberts	Online learning: Social interaction and the creation of a sense of community	2004

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Cites	Authors	Title	Year
225	R Motschnig-Pitrik, A Holzinger	Student-centered teaching meets new media: Concept and case study	2002
207	P Avgeriou, A Papasalouros, S Retalis...	Towards a pattern language for learning management systems	2003

Appendix K

Journal of Educational Technology & Society—5 Top-Cited Articles

Five most-cited articles per year (1998–2014)

Cites	Authors	Title	Year
43	A Pincas	Successful online course design: Virtual frameworks for discourse construction	1998
11	K Luchini	Problems and potentials in web-based instruction, with particular focus on distance learning	1998
2	P Wiesner	Web delivery of training and education for industry: Some thoughts	1998
2	TP Abeles	Remember the future, imagine the past	1998
1	JR Layton	Integrating Computer Technology into the Classroom	1998
169	KE Dooley	Towards a holistic model for the diffusion of educational technologies: An integrative review of educational innovation studies	1999
128	TH Spotts	Discriminating factors in faculty use of instructional technology in higher education	1999
97	SM Miller, KL Miller	Using instructional theory to facilitate communication in web-based courses	1999
79	SH Lee	Usability testing for developing effective interactive multimedia software: Concepts, dimensions, and procedures	1999
68	CJ Brahler, NS Peterson, EC Johnson	Developing on-line learning materials for higher education: An overview of current issues	1999
389	M Tam	Constructivism, instructional design, and technology: Implications for transforming distance learning	2000
185	J Rogers	Communities of practice: A framework for fostering coherence in virtual learning communities	2000
165	M Oliver	An introduction to the evaluation of learning technology	2000
116	C Quinn, S Hobbs	Learning objects and instruction components	2000
99	R Nachmias, D Mioduser, A Oren, J Ram	Web-supported emergent-collaboration in higher education courses	2000

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Cites	Authors	Title	Year
127	YJ Dori, M Barak	Virtual and physical molecular modeling: Fostering model perception and spatial understanding	2001
120	M Moallem	Applying constructivist and objectivist learning theories in the design of a web-based course: Implications for practice	2001
105	M Martinez	Key design considerations for personalized learning on the web	2001
93	M Neo, KTK Neo	Innovative teaching: Using multimedia in a problem-based learning environment	2001
88	C Ziguras	Educational technology in transnational higher education in South East Asia: the cultural politics of flexible learning	2001
362	K Kreijns, PA Kirschner, W Jochems	The sociability of computer-supported collaborative learning environment	2002
225	R Motschnig-Pitrik, A Holzinger	Student-centered teaching meets new media: Concept and case study	2002
136	C Cope, P Ward	Integrating learning technology into classrooms: The importance of teachers' perceptions	2002
117	D Sampson, C Karagiannidis, F Cardinali	An architecture for web-based e-learning promoting re-usable adaptive educational e-content	2002
117	D Eseryel	Approaches to evaluation of training: Theory & practice	2002
322	M Nichols	A theory for eLearning	2003
207	P Avgeriou, A Papasalouros, S Retalis...	Towards a pattern language for learning management systems	2003
137	KS Hong, KW Lai, D Holton	Students' satisfaction and perceived learning with a web-based course	2003
130	JS Lee, H Cho, G Gay, B Davidson...	Technology acceptance and social networking in distance learning	2003
121	KS Hong, AA Ridzuan, MK Kuek	Students' attitudes toward the use of the Internet for learning: A study at a university in Malaysia	2003
469	R Koper, B Olivier	Representing the learning design of units of learning	2004
249	N Henze, P Dolog, W Nejdl	Reasoning and ontologies for personalized e-learning in the semantic web	2004
228	JM McInnerney, TS Roberts	Online learning: Social interaction and the creation of a sense of community	2004
191	L Aroyo, D Dicheva	The new challenges for e-learning: The educational semantic web	2004
172	W Sugar, F Crawley, B Fine	Examining teachers' decisions to adopt new technology	2004
316	M Virvou, G Katsionis, K Manos	Combining software games with education: Evaluation of its educational effectiveness	2005

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Cites	Authors	Title	Year
282	Y Karagiorgi, L Symeou	Translating constructivism into instructional design: Potential and limitations	2005
258	HK Sam, AEA Othman, ZS Nordin	Computer self-efficacy, computer anxiety, and attitudes toward the Internet: A study among undergraduates in Unimas	2005
187	I Jung	ICT-pedagogy integration in teacher training: application cases worldwide	2005
184	P Karampiperis, D Sampson	Adaptive learning resources sequencing in educational hypermedia systems	2005
335	SJH Yang	Context aware ubiquitous learning environments for peer-to-peer collaborative learning	2006
302	D Hernández-Leo, ED Villasclaras-Fernández...	COLLAGE: A collaborative Learning Design editor based on patterns	2006
187	A Delwiche	Massively multiplayer online games (MMOs) in the new media classroom	2006
172	R Koper	Editorial: Current research in learning design	2006
157	P Nokelainen	An empirical assessment of pedagogical usability criteria for digital learning material with elementary school students	2006
196	R Klamma, MA Chatti, E Duval, H Hummel...	Social software for life-long learning	2007
196	E Yukselturk, S Bulut	Predictors for student success in an online course	2007
156	M Wolpers, J Najjar, K Verbert, E Duval	Tracking actual usage: the attention metadata approach	2007
150	TL Leacock, JC Nesbit	A framework for evaluating the quality of multimedia learning resources	2007
135	G Paquette	An ontology and a software framework for competency modeling and management	2007
341	GJ Hwang, CC Tsai, SJH Yang	Criteria, strategies and research issues of context-aware ubiquitous learning	2008
189	T Amiel, TC Reeves	Design-based research and educational technology: Rethinking technology and the research agenda	2008
151	N Wagner, K Hassanein, M Head	Who is responsible for e-learning success in higher education? A stakeholders' analysis	2008
141	B Akkoyunlu, MY Soylu	A study of student's perceptions in a blended learning environment based on different learning styles	2008
126	T Teo, WS Luan, CC Sing	A cross-cultural examination of the intention to use technology between Singaporean and Malaysian pre-service teachers: an application of the Technology ...	2008
366	SY Park	An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning	2009

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Cites	Authors	Title	Year
336	SH Yang	Using blogs to enhance critical reflection and community of practice	2009
282	JH Park, HJ Choi	Factors influencing adult learners' decision to drop out or persist in online learning	2009
166	L Shen, M Wang, R Shen	Affective e-learning: Using "emotional" data to improve learning in pervasive learning environment	2009
158	IYL Chen, NS Chen, Kinshuk	Examining the factors influencing participants' knowledge sharing behavior in virtual learning communities	2009
198	CS Chai, JHL Koh, CC Tsai	Facilitating preservice teachers' development of technological, pedagogical, and content knowledge (TPACK)	2010
194	MOM El-Hussein, JC Cronje	Defining mobile learning in the higher education landscape	2010
115	YL Jeng, TT Wu, YM Huang, Q Tan, SJH Yang	The add-on impact of mobile applications in learning strategies: A review study	2010
111	JL Shih, CW Chuang, GJ Hwang	An inquiry-based mobile learning approach to enhancing social science learning effectiveness	2010
95	AG Almekhlafi, FA Almeqdadi	Teachers' perceptions of technology integration in the United Arab Emirates school classrooms	2010
120	YH Lee, YC Hsieh, CN Hsu	Adding innovation diffusion theory to the technology acceptance model: Supporting employees' intentions to use e-learning systems	2011
83	M Woo, S Chu, A Ho, X Li	Using a wiki to scaffold primary-school students' collaborative writing	2011
81	O El-Gayar, M Moran, M Hawkes	Students' acceptance of tablet PCs and implications for educational institutions	2011
75	N Tselios, S Daskalakis, M Papadopoulou	Assessing the acceptance of a blended learning university course	2011
60	SS Vattam, AK Goel, S Rugaber...	Understanding complex natural systems by articulating structure-behavior-function models	2011
162	SB Shum, R Ferguson	Social learning analytics	2012
139	W Greller, H Drachsler	Translating learning into numbers: A generic framework for learning analytics	2012
95	YK Türel, TE Johnson	Teachers' belief and use of interactive whiteboards for teaching and learning	2012
83	AL Dyckhoff, D Zielke, M Bültmann, MA Chatti...	Design and implementation of a learning analytics toolkit for teachers	2012
72	C Zhu	Student satisfaction, performance, and knowledge construction in online collaborative learning	2012
77	CS Chai, JHL Koh, CC Tsai	A review of technological pedagogical content knowledge	2013
46	S Flumerfelt, G Green	Using lean in the flipped classroom for at risk students	2013

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Cites	Authors	Title	Year
41	S Wright, A Fugett, F Caputa	Using e-readers and Internet resources to support comprehension	2013
40	PH Hung, GJ Hwang, YF Lin, TH Wu, IH Su	Seamless connection between learning and assessment-applying progressive learning tasks in mobile ecology inquiry	2013
40	X Gu, Y Zhu, X Guo	Meeting the “Digital Natives”: Understanding the acceptance of technology in classrooms	2013
31	HC Chu	Potential negative effects of mobile learning on students’ learning achievement and cognitive load —a format assessment perspective	2014
24	GJ Hwang, PH Hung, NS Chen, GZ Liu	Mindtool-Assisted In-Field Learning (MAIL): an advanced ubiquitous learning project in Taiwan	2014
23	SB Dias, JA Diniz	Towards an enhanced learning management system for blended learning in higher education incorporating distinct learners’ profiles	2014
18	D Eseryel, V Law, D Ifenthaler, X Ge, R Miller	An investigation of the interrelationships between motivation, engagement, and complex problem solving in game-based learning	2014
16	TH Liang, YM Huang	An investigation of reading rate patterns and retrieval outcomes of elementary school students with e-books	2014

Appendix L

Computers & Education

Articles cited 200 or more times. Published between January 1995 and December 2014

Cites	Authors	Title	Year
1036	PC Sun, RJ Tsai, G Finger, YY Chen, D Yeh	What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction	2008
885	M Sharples	The design of personal mobile technologies for lifelong learning	2000
875	S Ainsworth	The functions of multiple representations	1999
861	WJ Pelgrum	Obstacles to the integration of ICT in education: results from a worldwide educational assessment	2001
796	B De Wever, T Schellens, M Valcke, H Van Keer	Content analysis schemes to analyze transcripts of online asynchronous discussion groups: A review	2006
692	M Papastergiou	Digital game-based learning in high school computer science education: Impact on educational effectiveness and student motivation	2009
622	LF Motiwalla	Mobile learning: A framework and evaluation	2007
607	C Romero, S Ventura, E García	Data mining in course management systems: Moodle case study and tutorial	2008
604	C Chou, MC Hsiao	Internet addiction, usage, gratification, and pleasure experience: the Taiwan college students' case	2000
584	C Evans	The effectiveness of m-learning in the form of podcast revision lectures in higher education	2008
561	R Rosas, M Nussbaum, P Cumsille, V Marianov...	Beyond Nintendo: design and assessment of educational video games for first and second grade students	2003
546	A Weinberger, F Fischer	A framework to analyze argumentative knowledge construction in computer-supported collaborative learning	2006
542	AL Baylor, D Ritchie	What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms?	2002
520	HM Selim	Critical success factors for e-learning acceptance: Confirmatory factor models	2007

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Cites	Authors	Title	Year
515	G Zurita, M Nussbaum	Computer supported collaborative learning using wirelessly interconnected handheld computers	2004
515	C Angeli, N Valanides	Epistemological and methodological issues for the conceptualization, development, and assessment of ICT–TPCK: Advances in technological pedagogical content ...	2009
503	MJ Koehler, P Mishra, K Yahya	Tracing the development of teacher knowledge in a design seminar: Integrating content, pedagogy and technology	2007
502	TM Connolly, EA Boyle, E MacArthur, T Hailey...	A systematic literature review of empirical evidence on computer games and serious games	2012
498	A Albirini	Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers	2006
488	A Margaryan, A Littlejohn, G Vojt	Are digital natives a myth or reality? University students' use of digital technologies	2011
483	KA Pituch, Y Lee	The influence of system characteristics on e-learning use	2006
480	EWT Ngai, JKL Poon, YHC Chan	Empirical examination of the adoption of WebCT using TAM	2007
470	HJ So, TA Brush	Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors	2008
466	C Jones, R Ramanau, S Cross, G Healing	Net generation or digital natives: is there a distinct new generation entering university?	2010
458	S De Freitas, M Oliver	How can exploratory learning with games and simulations within the curriculum be most effectively evaluated?	2006
457	EM Van Raaij, JLL Schepers	The acceptance and use of a virtual learning environment in China	2008
452	R Junco	The relationship between frequency of Facebook use, participation in Facebook activities, and student engagement	2012
427	SS Liaw	Investigating students' perceived satisfaction, behavioral intention, and effectiveness of e-learning: A case study of the Blackboard system	2008
426	M Cole	Using Wiki technology to support student engagement: Lessons from the trenches	2009
413	SS Liaw, HM Huang, GD Chen	Surveying instructor and learner attitudes toward e-learning	2007
399	JW Strijbos, RL Martens, FJ Prins, WMG Jochems	Content analysis: What are they talking about?	2006

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Cites	Authors	Title	Year
397	JB Pena-Shaff, C Nicholls	Analyzing student interactions and meaning construction in computer bulletin board discussions	2004
392	Y Levy	Comparing dropouts and persistence in e-learning courses	2007
377	M Ebner, C Lienhardt, M Rohs, I Meyer	Microblogs in Higher Education—A chance to facilitate informal and process-oriented learning?	2010
374	S Schrire	Knowledge building in asynchronous discussion groups: Going beyond quantitative analysis	2006
371	CB Fried	In-class laptop use and its effects on student learning	2008
366	RA Bartsch, KM Cobern	Effectiveness of PowerPoint presentations in lectures	2003
363	A Martinez, Y Dimitriadis, B Rubia, E Gómez...	Combining qualitative evaluation and social network analysis for the study of classroom social interactions	2003
362	SG Mazman, YK Usluel	Modeling educational usage of Facebook	2010
361	HM Selim	An empirical investigation of student acceptance of course websites	2003
361	M Ebner, A Holzinger	Successful implementation of user-centered game based learning in higher education: An example from civil engineering	2007
360	MC Lee	Explaining and predicting users' continuance intention toward e-learning: An extension of the expectation–confirmation model	2010
359	CM Chiu, MH Hsu, SY Sun, TC Lin, PC Sun	Usability, quality, value and e-learning continuance decisions	2005
357	MJ Metzger, AJ Flanagan, L Zwarun	College student Web use, perceptions of information credibility, and verification behavior	2003
355	N Li, G Kirkup	Gender and cultural differences in Internet use: A study of China and the UK	2007
354	M Mazzolini, S Maddison	Sage, guide or ghost? The effect of instructor intervention on student participation in online discussion forums	2003
343	CM Chen, HM Lee, YH Chen	Personalized e-learning system using item response theory	2005
343	T Teo	Modelling technology acceptance in education: A study of pre-service teachers	2009
326	L Jarmon, T Traphagan, M Mayrath, A Trivedi	Virtual world teaching, experiential learning, and assessment: An interdisciplinary communication course in Second Life	2009
326	J Mueller, E Wood, T Willoughby, C Ross...	Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration	2008

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Cites	Authors	Title	Year
326	R Hermans, J Tondeur, J van Braak, M Valcke	The impact of primary school teachers' educational beliefs on the classroom use of computers	2008
318	M Drent, M Meelissen	Which factors obstruct or stimulate teacher educators to use ICT innovatively?	2008
315	H Tüzün, M Yılmaz-Soylu, T Karakuş, Y İnal...	The effects of computer games on primary school students' achievement and motivation in geography learning	2009
305	A De Lucia, R Francese, I Passero, G Tortora	Development and evaluation of a virtual campus on Second Life: The case of SecondDMI	2009
301	G Conole, M Dyke, M Oliver, J Seale	Mapping pedagogy and tools for effective learning design	2004
300	JW Strijbos, RL Martens, WMG Jochems	Designing for interaction: Six steps to designing computer-supported group-based learning	2004
300	B Patten, IA Sánchez, B Tangney	Designing collaborative, constructionist and contextual applications for handheld devices	2006
297	E Triantafyllou, A Pomportsis, S Demetriadis	The design and the formative evaluation of an adaptive educational system based on cognitive styles	2003
296	RH Kay, A LeSage	Examining the benefits and challenges of using audience response systems: A review of the literature	2009
295	H Cho, G Gay, B Davidson, A Ingraffea	Social networks, communication styles, and learning performance in a CSCL community	2007
293	J Macdonald	Assessing online collaborative learning: process and product	2003
292	E Smeets	Does ICT contribute to powerful learning environments in primary education?	2005
291	A Tolmie, J Boyle	Factors influencing the success of computer mediated communication (CMC) environments in university teaching: a review and case study	2000
286	G Conole, M De Laat, T Dillon, J Darby	'Disruptive technologies', 'pedagogical innovation': What's new? Findings from an in-depth study of students' use and perception of technology	2008
286	G Sang, M Valcke, J van Braak, J Tondeur	Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology	2010
285	A Szabo, N Hastings	Using IT in the undergraduate classroom: should we replace the blackboard with PowerPoint?	2000
279	MK Barbour, TC Reeves	The reality of virtual schools: A review of the literature	2009
276	LA Annetta, J Minogue, SY Holmes, MT Cheng	Investigating the impact of video games on high school students' engagement and learning about genetics	2009

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Cites	Authors	Title	Year
274	HN Kim	The phenomenon of blogs and theoretical model of blog use in educational contexts	2008
274	M Papastergiou	Exploring the potential of computer and video games for health and physical education: A literature review	2009
271	F Blin, M Munro	Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory	2008
267	S Demetriadis, A Barbas, A Molohides...	"Cultures in negotiation": teachers' acceptance/resistance attitudes considering the infusion of technology into schools	2003
267	D McKinney, JL Dyck, ES Luber	iTunes University and the classroom: Can podcasts replace Professors?	2009
264	L Chittaro, R Ranon	Web3D technologies in learning, education and training: Motivations, issues, opportunities	2007
263	A Domínguez, J Saenz-de-Navarrete, L De-Marcos...	Gamifying learning experiences: Practical implications and outcomes	2013
262	LP Macfadyen, S Dawson	Mining LMS data to develop an "early warning system" for educators: A proof of concept	2010
260	PA Ertmer, AT Ottenbreit-Leftwich, O Sadik...	Teacher beliefs and technology integration practices: A critical relationship	2012
259	K Cho, CD Schunn	Scaffolded writing and rewriting in the discipline: A web-based reciprocal peer review system	2007
259	T Schellens, M Valcke	Fostering knowledge construction in university students through asynchronous discussion groups	2006
259	M Paechter, B Maier, D Macher	Students' expectations of, and experiences in e-learning: Their relation to learning achievements and course satisfaction	2010
259	GJ Hwang, HF Chang	A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students	2011
258	A Jimoyiannis, V Komis	Computer simulations in physics teaching and learning: a case study on students' understanding of trajectory motion	2001
257	P García, A Amandi, S Schiaffino, M Campo	Evaluating Bayesian networks' precision for detecting students' learning styles	2007
257	WD Woody, DB Daniel, CA Baker	E-books or textbooks: Students prefer textbooks	2010
256	S Mumtaz	Children's enjoyment and perception of computer use in the home and the school	2001
255	CY Chou, TW Chan, CJ Lin	Redefining the learning companion: the past, present, and future of educational agents	2003

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Cites	Authors	Title	Year
254	A Jones, K Issroff	Learning technologies: Affective and social issues in computer-supported collaborative learning	2005
251	DW Shaffer	Epistemic frames for epistemic games	2006
249	C Markett, IA Sánchez, S Weber, B Tangney	Using short message service to encourage interactivity in the classroom	2006
249	SH Liu, HL Liao, JA Pratt	Impact of media richness and flow on e-learning technology acceptance	2009
248	T Martín-Blas, A Serrano-Fernández	The role of new technologies in the learning process: Moodle as a teaching tool in Physics	2009
240	GJ Hwang	A conceptual map model for developing intelligent tutoring systems	2003
240	JH Wu, RD Tennyson, TL Hsia	A study of student satisfaction in a blended e-learning system environment	2010
237	RG Muir-Herzig	Technology and its impact in the classroom	2004
236	N Selwyn	Students' attitudes toward computers: Validation of a computer attitude scale for 16–19 education	1997
236	S Ozkan, R Koseler	Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation	2009
235	F Ke	A case study of computer gaming for math: Engaged learning from gameplay?	2008
233	CE Hmelo-Silver	Analyzing collaborative knowledge construction: Multiple methods for integrated understanding	2003
233	FL Fu, RC Su, SC Yu	EGameFlow: A scale to measure learners' enjoyment of e-learning games	2009
232	H Wood, D Wood	Help seeking, learning and contingent tutoring	1999
231	BC Lee, JO Yoon, I Lee	Learners' acceptance of e-learning in South Korea: Theories and results	2009
230	MD Byrne, R Catrambone, JT Stasko	Evaluating animations as student aids in learning computer algorithms	1999
230	DY Shee, YS Wang	Multi-criteria evaluation of the web-based e-learning system: A methodology based on learner satisfaction and its applications	2008
230	PSD Chen, AD Lambert, KR Guidry	Engaging online learners: The impact of Web-based learning technology on college student engagement	2010
229	MHB Soong, HC Chan, BC Chua, KF Loh	Critical success factors for on-line course resources	2001
226	SD Johnson, C Suriya, SW Yoon, JV Berrett...	Team development and group processes of virtual learning teams	2002
226	J Robertson, C Howells	Computer game design: Opportunities for successful learning	2008

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Cites	Authors	Title	Year
225	IF Liu, MC Chen, YS Sun, D Wible, CH Kuo	Extending the TAM model to explore the factors that affect Intention to Use an Online Learning Community	2010
224	K Passerini, MJ Granger	A developmental model for distance learning using the Internet	2000
223	J Tondeur, H Van Keer, J van Braak, M Valcke	ICT integration in the classroom: Challenging the potential of a school policy	2008
223	M Kebritchi, A Hirumi, H Bai	The effects of modern mathematics computer games on mathematics achievement and class motivation	2010
223	JW Gikandi, D Morrow, NE Davis	Online formative assessment in higher education: A review of the literature	2011
221	CM Chen, CJ Chung	Personalized mobile English vocabulary learning system based on item response theory and learning memory cycle	2008
220	B Lin, C Hsieh	Web-based teaching and learner control: A research review	2001
220	JE Susskind	PowerPoint's power in the classroom: Enhancing students' self-efficacy and attitudes	2005
219	T Monahan, G McArdle, M Bertolotto	Virtual reality for collaborative e-learning	2008
219	M Kebritchi	Examining the pedagogical foundations of modern educational computer games	2008
217	S De Freitas, T Neumann	The use of 'exploratory learning' for supporting immersive learning in virtual environments	2009
215	SW Draper, MI Brown, FP Henderson, E McAteer	Integrative evaluation: an emerging role for classroom studies of CAL	1996
215	H Mahdizadeh, H Biemans, M Mulder	Determining factors of the use of e-learning environments by university teachers	2008
213	P Shea, T Bidjerano	Community of inquiry as a theoretical framework to foster "epistemic engagement" and "cognitive presence" in online education	2009
211	S Lonn, SD Teasley	Saving time or innovating practice: Investigating perceptions and uses of Learning Management Systems	2009
210	B Kim, H Park, Y Baek	Not just fun, but serious strategies: Using meta-cognitive strategies in game-based learning	2009
209	J Janssen, G Erkens, G Kanselaar, J Jaspers	Visualization of participation: Does it contribute to successful computer-supported collaborative learning?	2007
209	AY Yu, SW Tian, D Vogel, RCW Kwok	Can learning be virtually boosted? An investigation of online social networking impacts	2010
208	GD Chen, CK Chang, CY Wang	Ubiquitous learning website: Scaffold learners by mobile devices with information-aware techniques	2008

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Cites	Authors	Title	Year
207	M Volman, E van Eck, I Heemskerk, E Kuiper	New technologies, new differences. Gender and ethnic differences in pupils' use of ICT in primary and secondary education	2005
207	S Hrastinski	A theory of online learning as online participation	2009
206	A Durndell, K Thomson	Gender and computing: a decade of change?	1997
204	C Crook	Children as computer users: the case of collaborative learning	1998
204	S Price, Y Rogers	Let's get physical: The learning benefits of interacting in digitally augmented physical spaces	2004
203	GJ Hwang, TC Yang, CC Tsai, SJH Yang	A context-aware ubiquitous learning environment for conducting complex science experiments	2009
202	WH Wu, YCJ Wu, CY Chen, HY Kao, CH Lin...	Review of trends from mobile learning studies: A meta-analysis	2012
200	RBB Levy, M Ben-Ari, PA Uronen	The Jeliot 2000 program animation system	2003

Appendix M

Computers & Education—5 Top-Cited Articles

Five most-cited articles per year (1995–2014)

Cites	Authors	Title	Year
194	AL Russell	Stages in learning new technology: Naive adult email users	1995
120	AD Yakimovicz, KL Murphy	Constructivism and collaboration on the Internet: Case study of a graduate class experience	1995
117	BG Silverman	Computer supported collaborative learning (CSCL)	1995
99	L Schrum	Educators and the Internet: A case study of professional development	1995
74	K Watabe, M Hamalainen, AB Whinston	An Internet based collaborative distance learning system: CODILESS	1995
215	SW Draper, MI Brown, FP Henderson, E McAteer	Integrative evaluation: an emerging role for classroom studies of CAL	1996
151	D Squires, J Preece	Usability and learning: evaluating the potential of educational software	1996
116	E Aimeur, C Frasson	Analyzing a new learning strategy according to different knowledge levels	1996
96	R Pilkington, C Parker-Jones	Interacting with computer-based simulation: The role of dialogue	1996
95	R Wegerif	Using computers to help coach exploratory talk across the curriculum	1996
236	N Selwyn	Students' attitudes toward computers: Validation of a computer attitude scale for 16–19 education	1997
206	A Durndell, K Thomson	Gender and computing: a decade of change?	1997
170	IJ Reinen, T Plomp	Information technology and gender equality: a contradiction in terminis?	1997
140	YB Kafai, CC Ching, S Marshall	Children as designers of educational multimedia software	1997
87	A Sloane	Learning with the Web: Experience of using the World Wide Web in a learning environment	1997
204	C Crook	Children as computer users: the case of collaborative learning	1998

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Cites	Authors	Title	Year
172	B Collis	New didactics for university instruction: why and how?	1998
162	B Shneiderman	Relate–Create–Donate: a teaching/learning philosophy for the cyber-generation	1998
144	M Ward, D Newlands	Use of the Web in undergraduate teaching	1998
141	D Laurillard	Multimedia and the learner's experience of narrative	1998
875	S Ainsworth	The functions of multiple representations	1999
232	H Wood, D Wood	Help seeking, learning and contingent tutoring	1999
230	MD Byrne, R Catrambone, JT Stasko	Evaluating animations as student aids in learning computer algorithms	1999
173	G Shaw, N Marlow	The role of student learning styles, gender, attitudes and perceptions on information and communication technology assisted learning	1999
129	AF Smeaton, G Keogh	An analysis of the use of virtual delivery of undergraduate lectures	1999
885	M Sharples	The design of personal mobile technologies for lifelong learning	2000
604	C Chou, MC Hsiao	Internet addiction, usage, gratification, and pleasure experience: the Taiwan college students' case	2000
291	A Tolmie, J Boyle	Factors influencing the success of computer mediated communication (CMC) environments in university teaching: a review and case study	2000
285	A Szabo, N Hastings	Using IT in the undergraduate classroom: should we replace the blackboard with PowerPoint?	2000
224	K Passerini, MJ Granger	A developmental model for distance learning using the Internet	2000
861	WJ Pelgrum	Obstacles to the integration of ICT in education: results from a worldwide educational assessment	2001
258	A Jimoyiannis, V Komis	Computer simulations in physics teaching and learning: a case study on students' understanding of trajectory motion	2001
256	S Mumtaz	Children's enjoyment and perception of computer use in the home and the school	2001
229	MHB Soong, HC Chan, BC Chua, KF Loh	Critical success factors for on-line course resources	2001
220	B Lin, C Hsieh	Web-based teaching and learner control: A research review	2001
542	AL Baylor, D Ritchie	What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms?	2002
226	SD Johnson, C Suriya, SW Yoon, JV Berrett...	Team development and group processes of virtual learning teams	2002

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Cites	Authors	Title	Year
190	KP King	Educational technology professional development as transformative learning opportunities	2002
189	M Xenos, C Pierrakeas, P Pintelas	A survey on student dropout rates and dropout causes concerning the students in the Course of Informatics of the Hellenic Open University	2002
180	KA Papanikolaou, M Grigoriadou, GD Magoulas...	Towards new forms of knowledge communication: the adaptive dimension of a web-based learning environment	2002
561	R Rosas, M Nussbaum, P Cumsille, V Marianov...	Beyond Nintendo: design and assessment of educational video games for first and second grade students	2003
366	RA Bartsch, KM Cobern	Effectiveness of PowerPoint presentations in lectures	2003
363	A Martinez, Y Dimitriadis, B Rubia, E Gómez...	Combining qualitative evaluation and social network analysis for the study of classroom social interactions	2003
361	HM Selim	An empirical investigation of student acceptance of course websites	2003
357	MJ Metzger, AJ Flanagan, L Zwarun	College student Web use, perceptions of information credibility, and verification behavior	2003
515	G Zurita, M Nussbaum	Computer supported collaborative learning using wirelessly interconnected handheld computers	2004
397	JB Pena-Shaff, C Nicholls	Analyzing student interactions and meaning construction in computer bulletin board discussions	2004
301	G Conole, M Dyke, M Oliver, J Seale	Mapping pedagogy and tools for effective learning design	2004
300	JW Strijbos, RL Martens, WMG Jochems	Designing for interaction: Six steps to designing computer-supported group-based learning	2004
237	RG Muir-Herzig	Technology and its impact in the classroom	2004
359	CM Chiu, MH Hsu, SY Sun, TC Lin, PC Sun	Usability, quality, value and e-learning continuance decisions	2005
343	CM Chen, HM Lee, YH Chen	Personalized e-learning system using item response theory	2005
292	E Smeets	Does ICT contribute to powerful learning environments in primary education?	2005
254	A Jones, K Issroff	Learning technologies: Affective and social issues in computer-supported collaborative learning	2005
220	JE Susskind	PowerPoint's power in the classroom: Enhancing students' self-efficacy and attitudes	2005
796	B De Wever, T Schellens, M Valcke, H Van Keer	Content analysis schemes to analyze transcripts of online asynchronous discussion groups: A review	2006
546	A Weinberger, F Fischer	A framework to analyze argumentative knowledge construction in computer-supported collaborative learning	2006

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Cites	Authors	Title	Year
498	A Albirini	Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers	2006
483	KA Pituch, Y Lee	The influence of system characteristics on e-learning use	2006
458	S De Freitas, M Oliver	How can exploratory learning with games and simulations within the curriculum be most effectively evaluated?	2006
622	LF Motiwalla	Mobile learning: A framework and evaluation	2007
520	HM Selim	Critical success factors for e-learning acceptance: Confirmatory factor models	2007
503	MJ Koehler, P Mishra, K Yahya	Tracing the development of teacher knowledge in a design seminar: Integrating content, pedagogy and technology	2007
480	EWT Ngai, JKL Poon, YHC Chan	Empirical examination of the adoption of WebCT using TAM	2007
413	SS Liaw, HM Huang, GD Chen	Surveying instructor and learner attitudes toward e-learning	2007
1036	PC Sun, RJ Tsai, G Finger, YY Chen, D Yeh	What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction	2008
607	C Romero, S Ventura, E García	Data mining in course management systems: Moodle case study and tutorial	2008
584	C Evans	The effectiveness of m-learning in the form of podcast revision lectures in higher education	2008
470	HJ So, TA Brush	Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors	2008
457	EM Van Raaij, JJJ Schepers	The acceptance and use of a virtual learning environment in China	2008
692	M Papastergiou	Digital game-based learning in high school computer science education: Impact on educational effectiveness and student motivation	2009
515	C Angeli, N Valanides	Epistemological and methodological issues for the conceptualization, development, and assessment of ICT-TPCK: Advances in technological pedagogical content ...	2009
426	M Cole	Using Wiki technology to support student engagement: Lessons from the trenches	2009
343	T Teo	Modelling technology acceptance in education: A study of pre-service teachers	2009
326	L Jarmon, T Traphagan, M Mayrath, A Trivedi	Virtual world teaching, experiential learning, and assessment: An interdisciplinary communication course in Second Life	2009

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Cites	Authors	Title	Year
466	C Jones, R Ramanau, S Cross, G Healing	Net generation or digital natives: is there a distinct new generation entering university?	2010
377	M Ebner, C Lienhardt, M Rohs, I Meyer	Microblogs in Higher Education—A chance to facilitate informal and process-oriented learning?	2010
362	SG Mazman, YK Usluel	Modeling educational usage of Facebook	2010
360	MC Lee	Explaining and predicting users' continuance intention toward e-learning: An extension of the expectation–confirmation model	2010
286	G Sang, M Valcke, J van Braak, J Tondeur	Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology	2010
488	A Margaryan, A Littlejohn, G Vojt	Are digital natives a myth or reality? University students' use of digital technologies	2011
259	GJ Hwang, HF Chang	A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students	2011
223	JW Gikandi, D Morrow, NE Davis	Online formative assessment in higher education: A review of the literature	2011
197	CR Graham	Theoretical considerations for understanding technological pedagogical content knowledge (TPACK)	2011
183	LH Wong, CK Looi	What seams do we remove in mobile-assisted seamless learning? A critical review of the literature	2011
502	TM Connolly, EA Boyle, E MacArthur, T Hainey...	A systematic literature review of empirical evidence on computer games and serious games	2012
452	R Junco	The relationship between frequency of Facebook use, participation in Facebook activities, and student engagement	2012
260	PA Ertmer, AT Ottenbreit-Leftwich, O Sadik...	Teacher beliefs and technology integration practices: A critical relationship	2012
202	WH Wu, YCJ Wu, CY Chen, HY Kao, CH Lin...	Review of trends from mobile learning studies: A meta-analysis	2012
193	N Rutten, WR van Joolingen, JT van der Veen	The learning effects of computer simulations in science education	2012
263	A Domínguez, J Saenz-de-Navarrete, L De-Marcos...	Gamifying learning experiences: Practical implications and outcomes	2013
160	HK Wu, SWY Lee, HY Chang, JC Liang	Current status, opportunities and challenges of augmented reality in education	2013
124	F Sana, T Weston, NJ Cepeda	Laptop multitasking hinders classroom learning for both users and nearby peers	2013
113	A Di Serio, MB Ibáñez, CD Kloos	Impact of an augmented reality system on students' motivation for a visual art course	2013

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Cites	Authors	Title	Year
98	R Cheung, D Vogel	Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning	2013
67	RA Sánchez, V Cortijo, U Javed	Students' perceptions of Facebook for academic purposes	2014
46	L De-Marcos, A Domínguez, J Saenz-de-Navarrete...	An empirical study comparing gamification and social networking on e-learning	2014
42	Z Merchant, ET Goetz, L Cifuentes...	Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis	2014
36	WW Porter, CR Graham, KA Spring, KR Welch	Blended learning in higher education: Institutional adoption and implementation	2014
35	N Kucirkova, D Messer, K Sheehy, CF Panadero	Children's engagement with educational iPad apps: Insights from a Spanish classroom	2014

Appendix N

Journal of Educational Computing Research

Articles cited 200 or more times. Published between January 1995 and December 2014

Cites	Authors	Title	Year
1492	CN Gunawardena, CA Lowe and T. Anderson	Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing	1997
610	T Busch	Gender differences in self-efficacy and attitudes toward computers	1995
604	MJ Koehler, P Mishra	What happens when teachers design educational technology? The development of technological pedagogical content knowledge	2005
575	MJ Jacobson, RJ Spiro	Hypertext learning environments, cognitive flexibility, and the transfer of complex knowledge: An empirical investigation	1995
462	TBQ Li	Cyber-harassment: A study of a new method for an old behavior	2005
385	JJ Vogel, DS Vogel, J Cannon-Bowers...	Computer gaming and interactive simulations for learning: A meta-analysis	2006
352	DL Fabry, JR Higgs	Barriers to the effective use of technology in education: Current status	1997
343	S Cassidy, P Eachus	Developing the computer user self-efficacy (CUSE) scale: Investigating the relationship between computer self-efficacy, gender and experience with computers	2002
329	CM Fletcher-Flinn, B Gravatt	The efficacy of computer assisted instruction (CAI): A meta-analysis	1995
329	K Swan, P Shea, E Fredericksen, A Pickett...	Building knowledge building communities: Consistency, contact and communication in the virtual classroom	2000
316	KMM Culp, M Honey, E Mandinach	A retrospective on twenty years of education technology policy	2005
308	L Shashaani	Gender differences in computer attitudes and use among college students	1997

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Cites	Authors	Title	Year
254	R Azevedo, JT Guthrie, D Seibert	The role of self-regulated learning in fostering students' conceptual understanding of complex systems with hypermedia	2004
254	PL Rogers	Barriers to adopting emerging technologies in education	2000
251	R Azevedo, RM Bernard	A meta-analysis of the effects of feedback in computer-based instruction	1995
220	LF Ruberg, DM Moore, CD Taylor	Student participation, interaction, and regulation in a computer-mediated communication environment: A qualitative study	1996
216	BC Bruce, JA Levin	Educational technology: Media for inquiry, communication, construction, and expression	1997

Appendix O

Journal of Educational Computing Research—5 Top-Cited Articles

Five most-cited articles per year (1995–2014)

Cites	Authors	Title	Year
610	T Busch	Gender differences in self-efficacy and attitudes toward computers	1995
575	MJ Jacobson, RJ Spiro	Hypertext learning environments, cognitive flexibility, and the transfer of complex knowledge: An empirical investigation	1995
329	CM Fletcher-Flinn, B Gravatt	The efficacy of computer assisted instruction (CAI): A meta-analysis	1995
251	R Azevedo, RM Bernard	A meta-analysis of the effects of feedback in computer-based instruction	1995
130	TA Barker, JK Torgesen	An evaluation of computer-assisted instruction in phonological awareness with below average readers	1995
220	LF Ruberg, DM Moore, CD Taylor	Student participation, interaction, and regulation in a computer-mediated communication environment: A qualitative study	1996
198	KA Lawless, JM Kulikowich	Understanding hypertext navigation through cluster analysis	1996
139	RP Niemieć, C Sikorski, HJ Walberg	Learner-control effects: A review of reviews and a meta-analysis.	1996
124	TA Hays	Spatial abilities and the effects of computer animation on short-term and long-term comprehension	1996
119	R Corston, AM Colman	Gender and social facilitation effects on computer competence and attitudes toward computers	1996
1492	CN Gunawardena, CA Lowe...	Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing	1997
352	DL Fabry, JR Higgs	Barriers to the effective use of technology in education: Current status	1997
308	L Shashaani	Gender differences in computer attitudes and use among college students	1997

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Cites	Authors	Title	Year
216	BC Bruce, JA Levin	Educational technology: Media for inquiry, communication, construction, and expression	1997
107	E Christmann, J Badgett, R Lucking	Microcomputer-based computer-assisted instruction within differing subject areas: A statistical deduction	1997
113	MJ Brosnan	The impact of psychological gender, gender-related perceptions, significant others, and the introducer of technology upon computer anxiety in students	1998
109	CJ Bonk, S Malikowski, C Angeli...	Web-based case conferencing for preservice teacher education: Electronic discourse from the field	1998
98	EB Susman	Cooperative learning: A review of factors that increase the effectiveness of cooperative computer-based instruction	1998
95	V Ramalingam, S Wiedenbeck	Development and validation of scores on a computer programming self-efficacy scale and group analyses of novice programmer self-efficacy	1998
82	C Presno	Taking the byte out of Internet anxiety: instructional techniques that reduce computer/Internet anxiety in the classroom	1998
171	J Schacter, C Fagnano	Does computer technology improve student learning and achievement? How, when, and under what conditions?	1999
107	AM Shapiro	The relationship between prior knowledge and interactive overviews during hypermedia-aided learning	1999
98	TS Chan, TC Ahern	Targeting motivation—adapting flow theory to instructional design	1999
96	SK Macgregor	Hypermedia navigation profiles: Cognitive characteristics and information processing strategies	1999
88	P Dias, MJ Gomes, AP Correia	Disorientation in hypermedia environments: Mechanisms to support navigation	1999
329	K Swan, P Shea, E Fredericksen, A Pickett...	Building knowledge building communities: Consistency, contact and communication in the virtual classroom	2000
254	PL Rogers	Barriers to adopting emerging technologies in education	2000
174	DS Niederhauser, RE Reynolds...	The influence of cognitive load on learning from hypertext	2000
164	BA Greene, SM Land	A qualitative analysis of scaffolding use in a resource-based learning environment involving the World Wide Web	2000
156	TC Reeves	Alternative assessment approaches for online learning environments in higher education	2000
165	J Van Braak	Individual characteristics influencing teachers' class use of computers	2001

(continued)

(continued)

Cites	Authors	Title	Year
144	GV Davidson-Shivers, LY Muilenburg...	How do students participate in synchronous and asynchronous online discussions?	2001
128	U Wolfradt, J Doll	Motives of adolescents to use the Internet as a function of personality traits, personal and social factors	2001
102	RL Bangert-Drowns, C Pyke	A Taxonomy of Student Engagement with Educational Software: An Exploration of Literate Thinking with Electronic Text.	2001
99	T Volery	Online education: An exploratory study into success factors	2001
343	S Cassidy, P Eachus	Developing the computer user self-efficacy (CUSE) scale: Investigating the relationship between computer self-efficacy, gender and experience with computers	2002
131	J Margerum-Leys, RW Marx	Teacher knowledge of educational technology: A case study of student/mentor teacher pairs	2002
95	AL Baylor	Agent-based learning environments as a research tool for investigating teaching and learning	2002
92	L Lipponen, M Rahikainen...	Effective participation and discourse through a computer network: Investigating elementary students' computer supported interaction	2002
84	C Hoyles, R Noss, R Adamson	Rethinking the microworld idea	2002
195	J Hewitt	How habitual online practices affect the development of asynchronous discussion threads	2003
174	AL Baylor, J Ryu	The effects of image and animation in enhancing pedagogical agent persona	2003
145	RE Mayer	Elements of a science of e-learning	2003
110	K Guinee, MB Eagleton, TE Hall	Adolescents' Internet search strategies: Drawing upon familiar cognitive paradigms when accessing electronic information sources	2003
107	LD Bendixen, K Hartley	Successful learning with hypermedia: The role of epistemological beliefs and metacognitive awareness	2003
254	R Azevedo, JT Guthrie, D Seibert	The role of self-regulated learning in fostering students' conceptual understanding of complex systems with hypermedia	2004
173	DF Kauffman	Self-regulated learning in web-based environments: Instructional tools designed to facilitate cognitive strategy use, metacognitive processing, and motivational beliefs	2004
169	B Barron	Learning ecologies for technological fluency: Gender and experience differences	2004
161	M Russell, D Bebell, J Higgins	Laptop learning: A comparison of teaching and learning in upper elementary classrooms equipped	2004

(continued)

(continued)

Cites	Authors	Title	Year
		with shared carts of laptops and permanent 1: 1 laptops	
144	A Wise, J Chang, T Duffy...	The effects of teacher social presence on student satisfaction, engagement, and learning	2004
604	MJ Koehler, P Mishra	What happens when teachers design educational technology? The development of technological pedagogical content knowledge	2005
462	TBQ Li	Cyber-harassment: A study of a new method for an old behavior	2005
316	KMM Culp, M Honey, E Mandinach	A retrospective on twenty years of education technology policy	2005
90	X Ge, CH Chen, KA Davis	Scaffolding novice instructional designers' problem-solving processes using question prompts in a web-based learning environment	2005
79	RE Clark, S Choi	Five design principles for experiments on the effects of animated pedagogical agents	2005
385	JJ Vogel, DS Vogel, J Cannon-Bowers...	Computer gaming and interactive simulations for learning: A meta-analysis	2006
129	DS McNamara, TP O'Reilly, RM Best...	Improving adolescent students' reading comprehension with iSTART	2006
116	KUI Xie, TK Debacker, C Ferguson	Extending the traditional classroom through online discussion: The role of student motivation	2006
78	M Bannert	Effects of reflection prompts when learning with hypermedia	2006
77	R Kay	Addressing gender differences in computer ability, attitudes and use: The laptop effect	2006
138	SE Anderson, RM Maninger	Preservice teachers' abilities, beliefs, and intentions regarding technology integration	2007
106	JA Greene, R Azevedo	Adolescents' use of self-regulatory processes and their relation to qualitative mental model shifts while using hypermedia	2007
102	N Cavus, H Uzunboyulu, D Ibrahim	Assessing the success rate of students using a learning management system together with a collaborative tool in web-based teaching of programming languages	2007
86	SR Malikowski, ME Thompson...	A model for research into course management systems: Bridging technology and learning theory	2007
58	Y Rosen, G Salomon	The differential learning achievements of constructivist technology-intensive learning environments as compared with traditional ones: A meta-analysis	2007
129	D Grimes, M Warschauer	Learning with laptops: A multi-method case study	2008
114	J Lei, Y Zhao	One-to-one computing: What does it bring to schools?	2008

(continued)

(continued)

Cites	Authors	Title	Year
91	RX Guo, T Dobson, S Petrina	Digital natives, digital immigrants: An analysis of age and ICT competency in teacher education	2008
80	YM Lin, GY Lin, JM Laffey	Building a social and motivational framework for understanding satisfaction in online learning	2008
58	PS Nicolle, Y Lou	Technology adoption into teaching and learning by mainstream university faculty: A mixed methodology study revealing the “how, when, why, and why not”	2008
118	A Doering, G Veletsianos, C Scharber...	Using the technological, pedagogical, and content knowledge framework to design online learning environments and professional development	2009
107	TA Zucker, AK Moody, MC McKenna	The effects of electronic books on pre-kindergarten-to-grade 5 students’ literacy and language outcomes: A research synthesis	2009
49	JHL Koh, TW Frick	Instructor and student classroom interactions during technology skills instruction for facilitating preservice teachers’ computer self-efficacy	2009
45	T Teo	The impact of subjective norm and facilitating conditions on pre-service teachers’ attitude toward computer use: A structural equation modeling of an extended ...	2009
43	H Lin, KD Kelsey	Building a networked environment in Wikis: The evolving phases of collaborative learning in a Wikibook project	2009
67	M Moran, M Hawkes, O El Gayar	Tablet personal computer integration in higher education: Applying the unified theory of acceptance and use technology model to understand supporting factors	2010
66	RE Mayer, CI Johnson	Adding instructional features that promote learning in a game-like environment	2010
50	L Donovan, T Green, K Hartley	An examination of one-to-one computing in the middle school: Does increased access bring about increased student engagement?	2010
38	A Corbett, L Kauffman, B Maclaren...	A Cognitive Tutor for genetics problem solving: Learning gains and student modeling	2010
35	JR Stowell, D Bennett	Effects of online testing on student exam performance and test anxiety	2010
114	ML Niess	Investigating TPACK: Knowledge growth in teaching with technology	2011
90	JHL Koh, H Divaharan	Developing pre-service teachers’ technology integration expertise through the TPACK-developing instructional model	2011
55	HA Spires, JP Rowe, BW Mott...	Problem solving and game-based learning: Effects of middle grade students’ hypothesis testing strategies on learning outcomes	2011

(continued)

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Cites	Authors	Title	Year
49	J Ahn	Digital divides and social network sites: Which students participate in social media?	2011
43	KJ Kim, TW Frick	Changes in student motivation during online learning	2011
47	DL Lowther, FA Inan, JD Strahl...	Do one-to-one initiatives bridge the way to 21 st century knowledge and skills?	2012
34	B Holfeld, M Grabe	Middle school students' perceptions of and responses to cyber bullying	2012
28	O Korat, A Shamir	Direct and indirect teaching: Using e-books for supporting vocabulary, word reading, and story comprehension for young children	2012
28	LL Lou, Z Yan, A Nickerson...	An examination of the reciprocal relationship of loneliness and Facebook use among first-year college students	2012
23	W Cassidy, K Brown, M Jackson	"Making Kind Cool": Parents' Suggestions for Preventing Cyber Bullying and Fostering Cyber Kindness	2012
19	Y Bao, T Xiong, Z Hu, M Kibelloh	Exploring gender differences on general and specific computer self-efficacy in mobile learning adoption	2013
16	LH Porras-Hernández...	Strengthening TPACK: A broader notion of context and the use of teacher's narratives to reveal knowledge construction	2013
16	C Angeli, N Valanides	Technology mapping: An approach for developing technological pedagogical content knowledge	2013
15	C Mouza, R Karchmer-Klein	Promoting and assessing pre-service teachers' technological pedagogical content knowledge (TPACK) in the context of case development	2013
14	SNK Benson, CL Ward	Teaching with technology: Using TPACK to understand teaching expertise in online higher education	2013
16	A Tarhini, K Hone, X Liu	Measuring the moderating effect of gender and Age on e-learning acceptance in England: A structural equation modeling approach for an extended technology ...	2014
9	R Shadiev, WY Hwang, SC Yeh...	Effects of unidirectional vs. reciprocal teaching strategies on web-based computer programming learning	2014
4	I Celik, I Sahin, AO Akturk	Analysis of the Relations among the Components of Technological Pedagogical and Content Knowledge (Tpack): A Structural Equation Model	2014
3	DD Holland, RT Piper	A Technology Integration Education (Tie) Model: Millennial Preservice Teachers' Motivations about Technological, Pedagogical, and Content Knowledge (Tpack) ...	2014
2	UGH Fors, WT Gunning	The impact of different scoring rubrics for grading virtual patient-based exams	2014

Appendix P

Journal of Research on Technology in Education

Articles cited 200 or more times. Published between January 2001 and December 2014

Cites	Authors	Title	Year
477	PA Ertmer, A Paul, L Molly, R Eva...	Examining teachers' beliefs about the role of technology in the elementary classroom	1999
630	PA Ertmer, AT Ottenbreit-Leftwich	Teacher technology change: How knowledge, confidence, beliefs, and culture intersect	2010
560	J Harris, P Mishra, M Koehler	Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed	2009
533	DA Schmidt, E Baran, AD Thompson...	Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers	2009
430	R Christensen	Effects of technology integration education on the attitudes of teachers and students	2002
406	WR Penuel	Implementation and effects of one-to-one computing initiatives: A research synthesis	2006
369	RA Vannatta, F Nancy	Teacher dispositions as predictors of classroom technology use	2004
294	RB Kozma	Technology and classroom practices: An international study	2003
290	B Gros	Digital games in education: The design of games-based learning environments	2007
282	RH Kay	Evaluating strategies used to incorporate technology into preservice education: A review of the literature	2006
271	M Liu, Z Moore, L Graham, S Lee	A look at the research on computer-based technology use in second language learning: A review of the literature from 1990–2000	2002
258	AE Barron, K Kemker, C Harmes...	Large-scale research study on technology in K–12 schools: Technology integration as it relates to the National Technology Standards	2003
256	C Norris, T Sullivan, J Poirot...	No access, no use, no impact: snapshot surveys of educational technology in K–12	2003
254	D Jonassen	Using cognitive tools to represent problems	2003

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Cites	Authors	Title	Year
249	J Brinkerhoff	Effects of a long-duration, professional development academy on technology skills, computer self-efficacy, and technology integration beliefs and practices	2006
245	D Bebell, M Russell, L O'Dwyer	Measuring teachers' technology uses: Why multiple-measures are more revealing	2004
237	A Doering, J Hughes, D Huffman	Preservice teachers: Are we thinking with technology?	2003
232	KL Rice	A comprehensive look at distance education in the K–12 context	2006
224	L Wang, PA Ertmer, TJ Newby	Increasing preservice teachers' self-efficacy beliefs for technology integration	2004
212	S Bayraktar	A meta-analysis of the effectiveness of computer-assisted instruction in science education	2001

Appendix Q

Journal of Research on Technology in Education—5 Top-Cited Articles

Five most-cited articles per year (2001–2014)

Cites	Authors	Title	Year
212	S Bayraktar	A meta-analysis of the effectiveness of computer-assisted instruction in science education	2001
197	MH Hopson, RL Simms, GA Knezek	Using a technology-enriched environment to improve higher-order thinking skills	2001
140	AT Lumpe, E Chambers	Assessing teachers' context beliefs about technology use	2001
118	MO Thirunarayanan, A Perez-Prado	Comparing web-based and classroom-based learning: A quantitative study	2001
104	JK Gallini, D Barron	Participants' perceptions of web-infused environments: A survey of teaching beliefs, learning approaches, and communication	2001
430	R Christensen	Effects of technology integration education on the attitudes of teachers and students	2002
271	M Liu, Z Moore, L Graham, S Lee	A look at the research on computer-based technology use in second language learning: A review of the literature from 1990–2000	2002
139	YM Wang	When technology meets beliefs: Preservice teachers' perception of the teacher's role in the classroom with computers	2002
137	H Pillay	An investigation of cognitive processes engaged in by recreational computer game players: Implications for skills of the future	2002
127	NB Adams	Educational computing concerns of postsecondary faculty	2002
294	RB Kozma	Technology and classroom practices: An international study	2003
258	AE Barron, K Kemker, C Harnes...	Large-scale research study on technology in K–12 schools: Technology integration as it relates to the National Technology Standards	2003
256	C Norris, T Sullivan, J Poirot...	No access, no use, no impact: snapshot surveys of educational technology in K–12	2003
254	D Jonassen	Using cognitive tools to represent problems	2003

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Cites	Authors	Title	Year
237	A Doering, J Hughes, D Huffman	Preservice teachers: Are we thinking with technology?	2003
369	RA Vannatta, F Nancy	Teacher dispositions as predictors of classroom technology use	2004
245	D Bebell, M Russell, L O'Dwyer	Measuring teachers' technology uses: Why multiple-measures are more revealing	2004
224	L Wang, PA Ertmer, TJ Newby	Increasing preservice teachers' self-efficacy beliefs for technology integration	2004
112	S Judge, K Puckett, B Cabuk	Digital Equity: New Findings from the Early Childhood Longitudinal Study	2004
91	C Pollard, R Pollard	Research priorities in educational technology: A Delphi study	2004
197	S Vonderwell, S Zachariah	Factors that influence participation in online learning	2005
170	A Staples, MC Pugach, DJ Himes	Rethinking the technology integration challenge: Cases from three urban elementary schools	2005
158	N Strudler, K Wetzel	The diffusion of electronic portfolios in teacher education: Issues of initiation and implementation	2005
156	K Swan, M Hooft, A Kratcoski...	Uses and effects of mobile computing devices in K–8 classrooms	2005
149	NE Davis, MD Roblyer	Preparing teachers for the “Schools that technology built” Evaluation of a program to Train teachers for virtual schooling	2005
406	WR Penuel	Implementation and effects of one-to-one computing initiatives: A research synthesis	2006
282	RH Kay	Evaluating strategies used to incorporate technology into preservice education: A review of the literature	2006
249	J Brinkerhoff	Effects of a long-duration, professional development academy on technology skills, computer self-efficacy, and technology integration beliefs and practices	2006
232	KL Rice	A comprehensive look at distance education in the K–12 context	2006
197	M Barak, A Lipson, S Lerman	Wireless laptops as means for promoting active learning in large lecture halls	2006
290	B Gros	Digital games in education: The design of games-based learning environments	2007
191	Q Li	Student and teacher views about technology: A tale of two cities?	2007
162	S Vonderwell, X Liang, K Alderman	Asynchronous discussions and assessment in online learning	2007
149	BS Barker, J Ansorge	Robotics as means to increase achievement scores in an informal learning environment	2007
147	M David Merrill	A task-centered instructional strategy	2007

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Cites	Authors	Title	Year
172	C Mouza	Learning with laptops: Implementation and outcomes in an urban, under-privileged school	2008
133	HA Spire, JK Lee, KA Turner...	Having our say: Middle grade student perspectives on school, technologies, and academic engagement	2008
120	M Hofer, KO Swan	Technological pedagogical content knowledge in action: A case study of a middle school digital documentary project	2008
97	SHH Chang, RA Smith	Effectiveness of personal interaction in a learner-centered paradigm distance education class based on student satisfaction	2008
83	SJ Warren, MJ Dondlinger, SA Barab	A MUVE towards PBL writing: Effects of a digital learning environment designed to improve elementary student writing	2008
560	J Harris, P Mishra, M Koehler	Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed	2009
533	DA Schmidt, E Baran, AD Thompson...	Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers	2009
180	D Palak, RT Walls	Teachers' beliefs and technology practices: A mixed-methods approach	2009
107	M Mendicino, L Razzaq...	A comparison of traditional homework to computer-supported homework	2009
99	JW Hur, TA Brush	Teacher Participation in Online Communities: Why Do Teachers Want to Participate in Self-generated Online Communities of K–12 Teachers?	2009
630	PA Ertmer, AT Ottenbreit-Leftwich	Teacher technology change: How knowledge, confidence, beliefs, and culture intersect	2010
193	LJ Couse, DW Chen	A tablet computer for young children? Exploring its viability for early childhood education	2010
118	B Means	Technology and education change: Focus on student learning	2010
97	J Clarke-Midura, C Dede	Assessment, technology, and change	2010
73	GE Hall	Technology's Achilles heel: Achieving high-quality implementation	2010
158	JB Harris, MJ Hofer	Technological pedagogical content knowledge (TPACK) in action: A descriptive study of secondary teachers' curriculum-based, technology-related instructional ...	2011
116	JT Abbitt	Measuring technological pedagogical content knowledge in preservice teacher education: A review of current methods and instruments	2011

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Cites	Authors	Title	Year
109	H Holden, R Rada	Understanding the influence of perceived usability and technology self-efficacy on teachers' technology acceptance	2011
76	G Falloon	Making the connection: Moore's theory of transactional distance and its relevance to the use of a virtual classroom in postgraduate online teacher education	2011
43	H Miranda, M Russell	Predictors of teacher-directed student use of technology in elementary classrooms: A multilevel SEM approach using data from the USEIT study	2011
50	Y Rosen, D Beck-Hill	Intertwining digital content and a one-to-one laptop environment in teaching and learning: Lessons from the time to know program	2012
45	M Hofer, N Grandgenett	TPACK development in teacher education: A longitudinal study of preservice teachers in a secondary MA Ed. program	2012
42	D Kiger, D Herro, D Prunty	Examining the influence of a mobile learning intervention on third grade math achievement	2012
30	A Sadaf, TJ Newby, PA Ertmer	Exploring factors that predict preservice teachers' intentions to use web 2.0 technologies using decomposed theory of planned behavior	2012
25	S Dash, R Magidin de Kramer...	Impact of Online Professional Development on Teacher Quality and Student Achievement in Fifth Grade Mathematics	2012
29	L Brantley-Dias, PA Ertmer	Goldilocks and TPACK: Is the construct 'just right?'	2013
16	AD Ritzhaupt, F Liu, K Dawson...	Differences in student information and communication technology literacy based on socio-economic status, ethnicity, and gender: Evidence of a digital divide in ...	2013
12	S Weeden, B Cooke, M McVey	Underage children and social networking	2013
12	TM Gunn, M Hollingsworth	The implementation and assessment of a shared 21 st century learning vision: A district-based approach	2013
11	VH Shinas, S Yilmaz-Ozden, C Mouza...	Examining domains of technological pedagogical content knowledge using factor analysis	2013
16	JP Carpenter, DG Krutka	How and why educators use Twitter: A survey of the field	2014
11	M Liu, R Scordino, R Geurtz, C Navarrete...	A Look at Research on Mobile Learning in K-12 Education From 2007 to the Present	2014
9	KM Thomas, BW O'Bannon, VG Britt	Standing in the schoolhouse door: teacher perceptions of mobile phones in the classroom	2014

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Cites	Authors	Title	Year
6	RD Visser, LC Evering, DE Barrett	# TwitterforTeachers: The Implications of Twitter as a Self-Directed Professional Development Tool for K–12 Teachers	2014
5	LS Green, FA Inan, NJ Maushak	A Case Study: The Role of Student-Generated Vidcasts in K–12 Language Learner Academic Language and Content Acquisition	2014

Appendix R

Journal of Research on Computing in Education

Articles cited 200 or more times. Published between January 1995 and December 2001

Cites	Authors	Title	Year
477	PA Ertmer, A Paul, L Molly, R Eva...	Examining teachers' beliefs about the role of technology in the elementary classroom	1999
444	ME Pierson	Technology integration practice as a function of pedagogical expertise	2001
435	SL Dexter, RE Anderson, HJ Becker	Teachers' views of computers as catalysts for changes in their teaching practice	1999
400	S Yildirim	Effects of an educational computing course on preservice and inservice teachers: A discussion and analysis of attitudes and use	2000
370	HJ Becker, J Ravitz	The influence of computer and Internet use on teachers' pedagogical practices and perceptions	1999
338	DM Poole	Student participation in a discussion-oriented online course: A case study	2000
242	DW Sanders, AI Morrison-Shetlar	Student attitudes toward web-enhanced instruction in an introductory biology course	2001
239	MM Ropp	Exploring individual characteristics associated with learning to use computers in preservice teacher preparation	1999
236	MD Roblyer	Is choice important in distance learning? A study of student motives for taking Internet-based courses at the high school and community college levels	1999
223	D Mioduser, R Nachmias, O Lahav...	Web-based learning environments: Current pedagogical and technological state	2000
214	MJ Berson	Effectiveness of computer technology in the social studies: A review of the literature	1996
212	DJ Ayersman	Reviewing the research on hypermedia-based learning	1996
211	BJ Young	Gender differences in student attitudes toward computers	2000

Appendix S

Journal of Research on Computing in Education—5 Top-Cited Articles

Five most-cited articles per year (1995–2002)

Cites	Authors	Title	Year
114	AM Gilmore	Turning teachers on to computers: Evaluation of a teacher development program	1995
103	DJ Ayersman, W Michael Reed	Effects of learning styles, programming, and gender on computer anxiety	1995
78	ED Bunderson, ME Christensen	An analysis of retention problems for female students in university computer science programs	1995
66	CA MacArthur, V Pilato, M Kercher...	Mentoring: An approach to technology education for teachers	1995
50	NB Strudler	The role of school-based technology coordinators as change agents in elementary school programs: A follow-up study	1995
214	MJ Berson	Effectiveness of computer technology in the social studies: A review of the literature	1996
212	DJ Ayersman	Reviewing the research on hypermedia-based learning	1996
182	AC Bugbee Jr	The equivalence of paper-and-pencil and computer-based testing	1996
101	HG Weller	Assessing the impact of computer-based learning in science	1996
92	A Hirumi, A Bermudez	Interactivity, distance education, and instructional systems design converge on the information superhighway	1996
141	K Matthew	A comparison of the influence of interactive CD-ROM storybooks and traditional print storybooks on reading comprehension	1997
109	L Cifuentes, KL Murphy, R Segur...	Design considerations for computer conferences	1997
106	RT Chiero	Teachers' perspectives on factors that affect computer use	1997
103	E Christmann, J Badgett, R Lucking	Progressive comparison of the effects of computer-assisted instruction on the academic achievement of secondary students	1997

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(continued)

Cites	Authors	Title	Year
99	T Campbell	Technology, multimedia, and qualitative research in education	1997
180	DM Dusick	What social cognitive factors influence faculty members' use of computers for teaching? A literature review	1998
170	K Rex, RM Roth	The relationship of computer experience and computer self-efficacy to performance in introductory computer literacy courses	1998
140	Y Zhang, S Espinoza	Relationships among computer self-efficacy, attitudes toward computers, and desirability of learning computing skills	1998
124	A Mitra	Categories of computer use and their relationships with attitudes toward computers	1998
112	YKC Liao	Effects of hypermedia versus traditional instruction on students' achievement: A meta-analysis	1998
477	PA Ertmer, A Paul, L Molly, R Eva...	Examining teachers' beliefs about the role of technology in the elementary classroom	1999
435	SL Dexter, RE Anderson, HJ Becker	Teachers' views of computers as catalysts for changes in their teaching practice	1999
370	HJ Becker, J Ravitz	The influence of computer and Internet use on teachers' pedagogical practices and perceptions	1999
239	MM Ropp	Exploring individual characteristics associated with learning to use computers in preservice teacher preparation	1999
236	MD Roblyer	Is choice important in distance learning? A study of student motives for taking Internet-based courses at the high school and community college levels	1999
400	S Yildirim	Effects of an educational computing course on preservice and inservice teachers: A discussion and analysis of attitudes and use	2000
338	DM Poole	Student participation in a discussion-oriented online course: A case study	2000
223	D Mioduser, R Nachmias, O Lahav...	Web-based learning environments: Current pedagogical and technological state	2000
211	BJ Young	Gender differences in student attitudes toward computers	2000
195	BC Howard, S McGee, N Schwartz...	The experience of constructivism: Transforming teacher epistemology	2000
444	ME Pierson	Technology integration practice as a function of pedagogical expertise	2001
241	DW Sanders, AI Morrison-Shetlar	Student attitudes toward web-enhanced instruction in an introductory biology course	2001
140	DE Doty, SR Popplewell, GO Byers	Interactive CD-ROM storybooks and young readers' reading comprehension	2001

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(continued)

Cites	Authors	Title	Year
131	EW Christensen, UP Anakwe...	Receptivity to Distance Learnings The Effect of Technology, Reputation, Constraints, and Learning Preferences	2001
117	SM Butzin	Using instructional technology in transformed learning environments: An evaluation of Project CHILD	2001
178	C Mouza	Learning to teach with new technology: Implications for professional development	2002
121	MD Roblyer, JC Marshall	Predicting success of virtual high school students: Preliminary results from an educational success prediction instrument	2002
91	S Pedersen, M Liu	The transfer of problem-solving skills from a problem-based learning environment: The effect of modeling an expert's cognitive processes	2002
84	AP Rovai, MD Childress	Explaining and predicting resistance to computer anxiety reduction among teacher education students	2002
60	L Schrum, R Skeeel, M Grant	One college of education's effort to infuse technology: A systemic approach to revisioning teaching and learning	2002

Appendix T

List of the High-Loading Terms for the 3-Factor Solution

List of the high-loading terms for the 3-factor solution

F3.1	F3.2	F3.3
learn	Student	ict
student	Learn	profession
environ	Sttitud	commun
collabor	Test	project
learner	Group	internet
approach	Perform	school
process	Signific	universe
propos	Game	integr
system	Particip	practice
theori	Achiev	student
model	Control	resourc
problem	Score	train
support	Indic	inform
activ	Assess	classroom
object	Class	issu
context	Read	faculty
cognit	Result	teach
knowledg	Grade	teacher
tool	Level	program
teamwork	Signigicanti	distanc
mobil	Differ	year
interac	Experiment	web
adapt	Show	access
social	Comput	culture
content	Effect	develop

Appendix U

List of the High-Loading Terms for the 10-Factor Solution

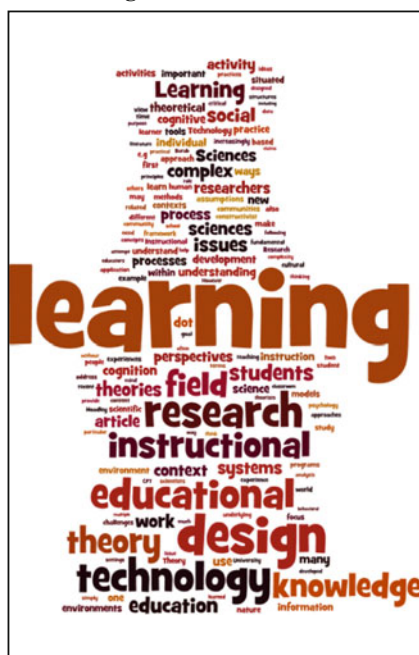
List of the high-loading terms for the 10-factor solution

F10.1	F10.2	F10.3	F10.4	F10.5	F10.6	F10.7	F10.8	F10.9	F10.10
learn	student	attitud	web	Student	Learn	student	game	children	aect
problem	learn	learn	internet	Ict	Mobil	discus	plai	internet	associ
model	test	factor	distanc	School	Student	onlin	video	read	conven
theori	group	perceiv	site	Project	Style	collabor	learn	school	intern
process	read	internet	cours	Integr	environ	face	motiv	ict	commun
solv	problem	student	univers	Classroom	learner	interac	ict	mobil	confer
framework	perform	ict	learn	Teacher	devic	social	player	digit	ethic
knowledge	solv	gender	user	Teach	object	learn	children	cours	profession
collabor	control	efficaci	resourc	Profession	collabor	commun	simul	literaci	member
approach	experiment	survei	student	Program	achiev	instructor	engag	languag	media
practic	score	influenc	access	Curriculum	motiv	particip	digit	world	division
system	assess	inten	softwar	Univers	propos	peer	seriou	faculti	present
tool	achiev	signific	evalu	Practice	enhanc	asynchron	student	access	field
context	feedback	accept	project	implement	approach	forum	read	home	held
environ	text	percep	inform	Preservice	solv	share	virtual	parent	leadership
cognit	grade	behavior	materi	Faculty	outcom	class	role	social	code
understand	mathemat	relationship	faculti	Scienc	person	distanc	skill	distanc	session
support	condition	posit	provid	Innov	adapt	activ	internet	instructor	foundat
learner	significantly	variabl	train	Year	experi	engag	text	california	
complex	program	scale	world	prepar	distanc	cours		english	internship
work	effect	social	manag	Class	english	facilit		cultur	organ
integr	cognit	affect	instructor	Skill	activ	network		classroom	program
propos	strategi	user	applic	center	experiment	messag		ag	nation
social	improv	data	system	Train	context	group		commun	train
structur	task	valid	video	cours	blend	analysi		inform	distanc

Appendix V

Wordmaps from the Titles and from the Abstracts

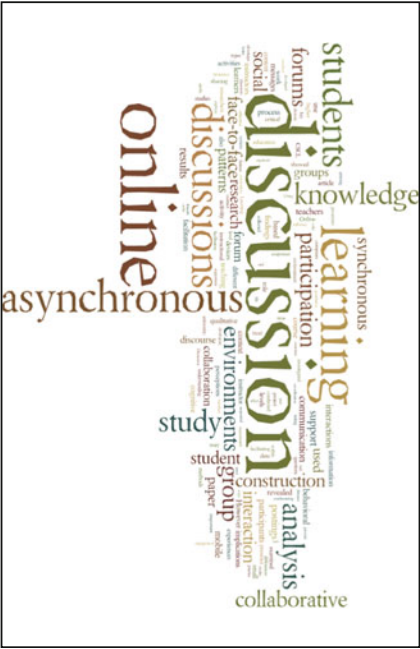
E.1 Learning and instruction—Abstracts



E.1 Learning and instruction—Titles



E.6 Online learning—Abstracts



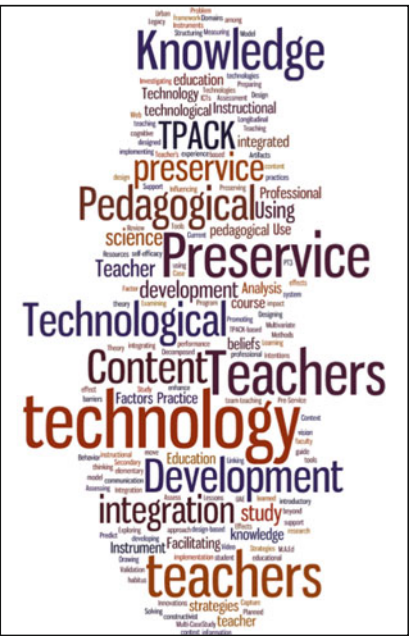
E.6 Online learning—Titles



E.7 Teacher preparation and professional development—Abstracts



E.7 Teacher preparation and professional development—Titles



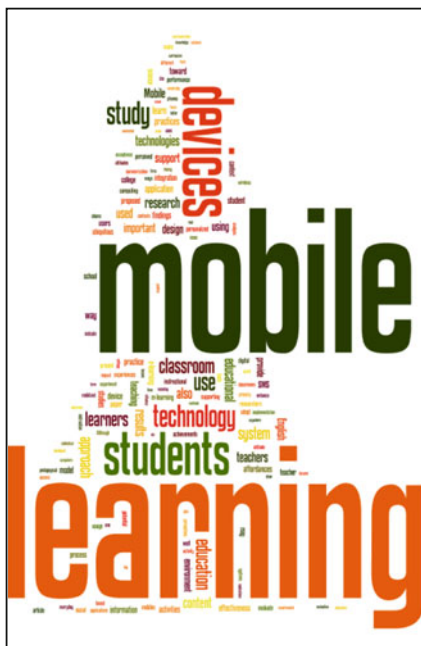
E.12 Professional meetings and associations—Abstracts



E.12 Professional meetings and associations— Titles



E.13 Mobile learning—Abstracts



E.13 Mobile learning—Titles



