An Analysis of Citation Patterns in ETR&D, 1990-99

James E. Gall
Heng-Yu Ku
Keyleigh Gurney
Hung-Wei Tseng
Hsin-Te Yeh
University of Northern Colorado

Abstract

The results of a citation pattern analysis on the journal Educational Technology Research and Development (ETR&D) for the period 1990-99 are presented. Reference lists for the 260 articles published during that period were compiled along with over 1,600 citations of those articles in other social science journals. Breakdowns of most commonly cited references during that period are presented along with an analysis of the journals more cited by and most citing of ETR&D.

Introduction

I want to see the book you stole there after reading it, to keep others from reading it, and you hid it here, protecting it cleverly, and you did not destroy it because a man like you does not destroy a book, but simply guards it and makes sure no one touches it. I want to see _____, the book that everyone has believed lost or never written, and of which you hold perhaps the only copy.

Brother William of Baskerville
In Umberto Eco's *The Name of the Rose*

> There is a growing mountain of research. But there is increased evidence that we are being bogged down today as specialization extends. The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less remember, as they appear…A record, if it is to be useful to science, must be continuously extended, it must be stored, and above all it must be consulted.
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> Vannevar Bush
> "As We May Think" in *Atlantic Monthly*, 1945

Social science research is itself a social endeavor. Although media representations often depict researchers as solitary figures struggling independently to discover "truth," productive research is conducted within the framework of a community. "Research is complete only when the results are shared with the scientific community." (APA, 2001, p. 3). In addition to collaboration with other researchers and the need to build upon (and sometimes tear down) the work of predecessors, the highest goals of research are defined by peer review. This examination of works by a qualified audience is required to ensure that conference presentations and published articles represent the best that the field has to offer.

The examination of the artifacts of this process inform us of not only the perceptions and viewpoints of the individual authors, but also of these "peers" who serve as science's gatekeepers. A number of researchers have examined the content of academic journals in order to capture trends or patterns of research behavior. Klein (1997) examined a nine-year period of publication of the development section of Educational Technology Research and Development (ETR&D). His content analysis indicated the "ID for Computer Technologies" and "Instructional Design & Development" were the most popular article topics and that almost half of all articles were descriptions of different activities with little or no supporting data. In a separate analysis, Klein (2002) performed a similar analysis on four years of research published in Performance Improvement Quarterly. In that analysis, about one-third of the articles contained empirical research. This follow-up research not only demonstrates that similar methodology can be applied to different journals in the field, but also that different journals in the same field may have uniquely differing publication patterns. In terms of looking for similarities, ETR&D was one of four journals examined by a group of researchers from the University of Kentucky (Anglin, Cain, Whitehouse, Cunningham, Newcomer, and Cunningham, 2003). The other three journals were the British

Journal of Educational Technology, Educational Technology, and the Journal of Research on Technology in Education. During the five year period examined (1997-2001), they identified the ERIC descriptors "the educational process: classroom perspectives" and "the educational process: societal perspectives" as the most used in indexing article content. Driscoll & Lee (2003) identified trends in distance education by analyzing article content for four selected journals over a five-year period. Among other results, they found that developmental research was rare and that case studies were the most prominent type of article.

Citation analysis in particular provides an opportunity for authors to understand the influence and influencers of their work. At the level of an individual article, an author cites others so that the reader can see the social construction of knowledge. Publication represents successfully completing the peer review process, but citation of one's work is a greater indicator of the influence of the work. Although those who cite may agree or disagree with an author's work, citation denotes that the previous work was worthy of discussion. Citation analysis is less common than other types of research on publication patterns, but should become more accessible with improvements in on-line resources and databases. For example, Frisby (1998) examined citation patterns in five years of seven major journals in school psychology. An interesting aspect of this research was his definition of self-citation within a journal as "within-journal inbreeding," a negative characteristic from his point of view. Another interesting example of citation analysis, was conducted by Oppenheim and Smith (2001). They focused on the citation patterns of final year students in an information science department. In direct contrast to "refereed" publications, their analysis indicated an increasing trend of students citing Internet resources rather than more traditional sources. Creamer (1998) examined citation patterns as a possible measure of faculty publication productivity. She reported that authors tend to cite more heavily other authors of the same gender. However, she suggested that this may be reflective of homogeneous gender informal professional networks rather than conscious bias.

Limitations

The current study is decidedly descriptive in nature. Also, the researchers believe that citations are *a* measure of importance, not *the* measure of importance. It must be added that not all citations are equal, their relative importance varies and a citation may be made to show agreement or disagreement with a particular point. However, it is suggested that patterns of citation data are informative, certainly as much as course surveys or opinion polls.

Method

For the current study, the journal Educational Technology Research and Development (ETRD) was examined over a ten-year publication period, 1990-99. This journal was selected because of its reputation in the field. For example, Maushak, Price, and Wang (2000) conducted a survey of 85 faculty members in the field of educational technology. According to their analysis, ETR&D was the overwhelming choice as the top journal in the field. During this period, 40 issues were published containing 260 journal articles. For the purpose of this study, only articles that were part of the Research or Development sections were considered.

The tables of content for the issues were photocopied and used to uniquely identify each article and record relevant data into an Excel worksheet. One research , using the online version of the Social Science Citation Index (SSCI), performed a search on each article and recorded information on each citing article into a second worksheet (N=1,553).

Another researcher created a photocopied record of the reference lists for the 260 articles. Due to the large number of references (N = 10,055), a number of individuals manually entered this reference data into a third worksheet. After these references were coded, one individual reviewed each entry in comparison with the printed record to ensure consistency and correct minor errors.

All analysis was conducted manually and/or using the functionality of Excel (for example, to count or aggregate results). During analysis, the photocopied indices and reference lists were consulted to clarify and/or correct entries.

As with any intensive data entry endeavor, errors were made in collecting and recording the data. All attempts were made to correct identified errors and the impact on aggregrated results should be minimal.

The limited journal scope (only ETR&D) and publication period (10 years) were selected arbitrarily by the researchers. Due to the descriptive nature of the analysis, any inference or interpretation must be made cautiously.

Results

Of the 260 core journal articles, 94 (36.15%) were authored by one individual. Two authors were involved in the writing of 98 articles (37.69%). Sixty-eight articles (26.15%) were written by three or more authors with nine authors being the most for any article.

The researchers attempted to establish the gender of the various authors. This was largely idiosyncratic. A large number of authors were identified via professional contact or a gender-specific name. Others were identified by locating biographical information on the Internet. For the 94 articles written by one author, 58% were male; 33% were female; and 9% were unknown. ETR&D uses a blind review process in which the identity and gender of the author are unknown. Without additional knowledge of submissions by gender or general gender makeup of the field, it is impossible to determine specific causes for the lower publication numbers for females. For the 166 articles of multiple authorship, 44% included at least one male and one female; 27% had exclusively male authors; 9% had exclusively female authors; and 20% could not be determined. The large number of undetermined makes analysis difficult. The large number of mixed gender efforts is encouraging. The large discrepancy between male-only (27%) and female-only (9%) efforts may again reflect gender distribution in the field or preferences in informal networking.

Author productivity was classified according to order of authorship (see Table 1). Those that had the largest number of first author articles were arbitrarily labeled "The Prolific" to represent the primary importance given to first authors in academic communities. Those with the largest number of second author articles were labeled "The Mentors," suggesting their role in helping others with attaining first author credits in this journal. Lastly, those that had the greatest number of authorships of third or later priority were labeled "The Collaborators," tenuously identifying them for a more minor yet continuing role in assisting in authorship.

Table 1. *Author Productivity*

The Prolific (First Authors)	**Number of Articles**
Mable B. Kinzie	6
Lloyd Rieber	6
Martin Tessmer	6
The Mentors (Second Authors)	**Number of Articles**
Michael J. Hannafin	8
Howard J. Sullivan	7
James D. Klein	5
The Collaborators (Third…Authors)	**Number of Articles**
Gary R. Morrison	4
John F. Wedman	4
John Bransford	3

Of the 10,055 references cited by the core articles, 53% were to journal articles; 36% were to books; and 11% were classified as other (e.g. websites, technical reports, dissertations, etc.). The most cited journals and most cited journal article authors are presented in Table 2.

Table 2. *Most Cited Journals and Journal Article Authors*

Journals	**Number of References**
ETR&D	494 (9.40%)
Educational Technology	351 (6.68%)
Journal of Educational Psychology	331 (6.30%)
Review of Educational Research	177 (3.37%)
Educational Researcher	163 (3.10%)
Journal Article Authors	**Number of References**
David H. Jonassen	76 (1.45%)
Michael J. Hannafin	64 (1.22%)
Gavriel Salomon	60 (1.14%)
Robert D. Tennyson	59 (1.12%)
Richard E. Mayer	58 (1.10%)
Steve M. Ross	58 (1.10%)

The references to books were further subdivided into edited and non-edited books. The most cited for both categories are shown in Table 3. For this analysis, multiple editions of a work were counted together (the year of the earliest edition is provided in the table).

Table 3 . *Most Cited Edited and Non-edited Books*

Edited Books	**Editor**	**Number of References**
Instructional Design Theories and Models: An Overview of Their Current Status (1983)	C.M. Reigeluth	55
Instructional Technology: Foundations (1987)	R.M. Gagne	34
Handbook of Research on Educational Communications and Technology (1996)	D.H. Jonassen	33
Instructional Technology: Past, Present, and Future (1991)	G.J. Anglin	31
Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser (1989)	L.B. Resnick	28

Non-edited Books	**Authors**	**Number of References**
The Systematic Design of Instruction (1978)	W. Dick L. Carey	40
The Conditions of Learning and Theory of Instruction	R.M. Gagne	39
Principles of Instructional Design (1974)	R.M. Gagne	35
Cooperative Learning: Theory, Research, and Practice (1983)	R.E. Slavin	14
Mind in Society: The Development of Higher Psychological Processes (1978)	L.S. Vygotsky	13
Teaching for Competence (1983)	H. Sullivan	12

The 260 core articles were entered into the Social Science Citation Index (SSCI) in late 2003 to determine in which journals these articles were cited. Table 4 displays the most citing journals and the core articles that were the most cited. Because the core articles were published over a period of 10 years and the SSCI data represented a snapshot of all citations to that point, it was determined that average citations since year of publication would provide the most unbiased measure of influence.

Table 4. *Most Citing Journals and Most Cited Articles*

Citing Journals	**Number of Citations**
ETR&D	475 (30.59%)
Journal of Educational Computing Research	100 (6.44%)
Computers in Human Behavior	59 (3.80%)
Instructional Science	51 (3.28%)
British Journal of Educational Technology	50 (3.22%)

Most Cited Articles	**Citations/Yr**
Media Will Never Influence Learning by R.E. Clark	7.78
Objectivism versus Constructivism: Do We Need a New Philosophical Paradigm by D.H. Jonassen	4.83
Instructional Design for Situated Learning by M.F. Young	4.40

Conclusion

These preliminary results provide guidance for professionals and students in the field as to what some consider the influential works and individuals with which one should be familiar. The methodology used advances what has previously been published in the form of course/program surveys and opinion polls.

A more complete presentation is currently being developed for eventual publication. The research team has also begun to collect data on related journals during the same time period. This will allow comparison and triangulation with this dataset. Also, data collection has begun with ETR&D for the next five-year period (2000-2004). This will allow chronological comparison with the present dataset. Finally, the improvement of online tools continues to make the process more manageable. As journals and databases add functionality and online content, more advanced analysis will become increasingly automated and informative.

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