

An Analysis of Engineering Design Graphics Journal Articles

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Abstract

An analysis was conducted of feature articles published in the EDGJ (Engineering Design Graphics Journal) and indexed later by ERIC (Educational Resources Information Center). After a spreadsheet was promulgated with data extracted from the ERIC database and validated with the aid of actual copies of the articles, the data were sorted and counted. The results indicated that the EDGJ is a non-core journal, that at least 40% of the articles published in the EDGJ and indexed later by ERIC fall within the scope of the EDGJ, and that select ideas are being propagated by a select group of authors that target a select audience.

ERIC (Educational Resources Information Center) is a national information system funded by the U.S. Department of Education. It provides a variety of services and products on a broad range of education-related issues through its sixteen subject-specific clearinghouses, associated adjunct clearinghouses, and support components. These clearinghouses collect, abstract, and index education materials for the ERIC database; respond to requests for information in their subject specific areas; and produce special publications on current research, programs, and practices.

Since 1987, feature articles published in the EDGJ (Engineering Design Graphics Journal) have been indexed by the ERIC Clearinghouse for Science, Mathematics, and Environmental Education. However, not all feature articles published in the EDGJ since 1987 have been indexed.

An analysis of those articles published in the EDGJ and indexed later by ERIC can provide an insight into the culture of the EDGD (Engineering Design Graphics Division of the American Society for Engineering Education) and the EDGJ. As an example, the following can be gleaned by examining ERIC's database: (a) the extent to which the EDGJ is achieving its scope; (b) who is propagating its values, beliefs, and practices; (c) the nature of the ideas being propagated; (d) the nature of the EDGJ's target audience; (e) the nature of the articles being published; and (e) the nature of the EDGJ itself.

The purpose of this study then was to draw conclusions about (a) the articles published in EDGJ and to an extent (b) the EDGD and the discipline by analyzing the feature articles published in the EDGJ and indexed later by ERIC. At the very least, and according to the Publication Manual of the American Psychological Association (1994), this sort of familiarity with the literature [of a field] allows an individual investigator to avoid needlessly repeating work that has been done before, to build on existing work, and in turn to contribute something new. A literature built of meticulously prepared, carefully reviewed contributions thus fosters the growth of a field (p. 1).

Background

According to the Timken Science Library's Evolution of Scientific Information (2003), the Research Publication Cycle includes the production, dissemination, and assimilation of scientific information in primary, secondary, and tertiary sources. That is, once new knowledge is produced, it is disseminated through primary sources such as nonformal, preliminary, and formal means, such as the EDGJ. Then it is assimilated through secondary sources such as bibliographies, indexes, abstracts, and catalogs. Finally, it is surrogated by tertiary sources such as library catalogs and guides to the literature. By its nature then, ERIC is a secondary source; it collects, abstracts, and indexes new knowledge disseminated through primary sources such as the EDGJ.

Material is considered for indexing by ERIC after a copy of the material and a signed ERIC Reproduction Release Form are sent to the ERIC Processing and Reference Facility or to the ERIC Clearinghouse that covers the subject matter. Because of ERIC's potential audience base, ERIC restricts the materials it indexes to those of interest to teachers, administrators, supervisors, librarians, researchers, media specialists, counselors, parents, and students; that is, all members of the educational community. Furthermore, documents indexed by ERIC, in addition to being legible and readable, must meet ERIC's education-relatedness and quality criteria.

Education-relatedness, which is the most important criteria, refers to whether the document is clearly linked to the process or practice of education. In addition, all documents under consideration are evaluated by ERIC's subject experts for their quality. That is, they are evaluated for their contribution to knowledge, significance, relevance, newness, innovativeness, effectiveness of presentation, thoroughness of reporting, relation to current priorities, timeliness, authority of source, intended audience, and comprehensiveness. Thus, feature articles published in the EDGJ and indexed later by ERIC are scrutinized twice.

Timely and effortless access to journal articles indexed by ERIC is achieved through the following searchable ERIC fields (Ask ERIC, 2003):

Keyword: Any word that defines the topic and appears anywhere in the document citation.

Author: The person(s) responsible for writing the piece. Note: In instances where there are more than two authors, ERIC citations lists the first author then And Others, e.g. Eisenberg, Michael And Others. Author searches should be entered by Last Name then First Name. For example, Eisenberg Michael. Punctuation is ignored.

Title: Each word in the title.

ERIC_No (ERIC Number): The unique number assigned to each ERIC entry, ED stands for ERIC Documents and EJ stands for ERIC Journal.

Journal Citation: Title of the journal in which the article appears.

Major Descriptors: Subject terms found in the Thesaurus of ERIC Descriptors that characterize substantive content. Up to six "Major" Descriptors are assigned to a single document. They cover the main focus of the document.

All Descriptors: Additional descriptors, called "Minor" Descriptors, are also assigned to a document or journal article. This field searches both Major and Minor.

Identifiers: Additional identifying terms not found in the Thesaurus including new terminology and proper nouns.

Abstract: A brief informative description of the documents contents. Search will be done on each word in only the abstract portion of the citation.

Geographic Source: Country, State, and/or City of origin.

Institution Name: Organization where document originated.

Publication Type: Broad categories indicating the form or organization of the document. e.g. Reports-Evaluative, Reference Materials, Guides-General, Collected Works, Information Analyses.

Publication Date: The year the publication was indexed by ERIC. The actual date the publication was produced may be different. Entry by year only, e.g., 1990.

ISBN: International Standard Book Number. A unique number assigned to a book.

ISSN: International Standard Serial Number. A unique number assigned to a serial (journal).

Clearinghouse_No (Clearinghouse Number): A unique number assigned to the citation by the Clearinghouse which indexed it. Begins with the two-letter code identifying the Clearinghouse.

Government: Government agency where document originated.

Availability: Special Information about how

to obtain the document/article.

Notes: Additional information about the document/journal article.

Language: Indicates whether document is in any language other than English.

A journal article however may not be indexed by all the available fields.

The Engineering Design Graphics Journal

The EDGJ is the official publication of the EDGD (Engineering Design Graphics Division) of the ASEE (American Society for Engineering Education). According to Rogers (1993), the first issue of the EDGJ (Volume 1, Number 1) appeared in 1936 as the Journal of Engineering Drawing. In 1958 (with Volume 22, Number 3), the name was changed to the Journal of Engineering Graphics. The current name, the Engineering Design Graphics Journal, has been in use since 1970 (Volume 34, Number 1).

The scope of the Journal is devoted to the advancement of engineering design graphics, computer graphics, and subjects related to engineering design graphics in an effort to 1) encourage research, development, and refinement of theory and applications of engineering design graphics for understanding and practice, 2) encourage teachers of engineering design graphics to experiment with and test appropriate teaching techniques and topics to further improve the quality and modernization of instruction and quality and modernization of instruction and courses, and 3) stimulate the preparation of articles and papers on topics of interest to the membership (Miller, 2003, p. 2).

In addition to the products and services provided by ERIC on behalf of the EDGJ, the EDGJ has published its own indices (Black and Wladaver, 1966; Wladaver, 1978; and Sadowski, 1997).

Method

On August 16, 2003, a simple search was conducted at <http://www.askeric.org/Eric/> (see Figure

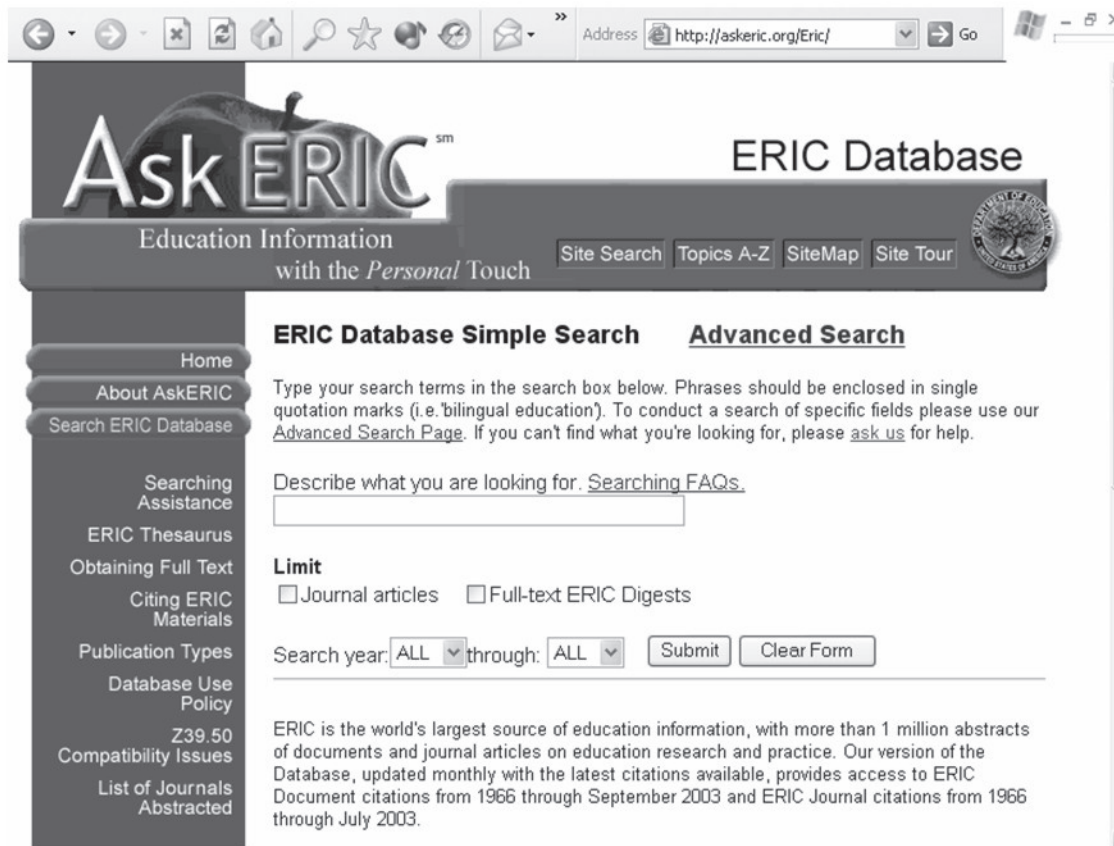


Figure 1. The ERIC Database Simple Search Page

Score	Document Title
530	EJ380937. Karayanakis, Nicholas M.. Implementation Alternatives to Analog Graphic Function Generation: Some Examples. Engineering Design Graphics Journal v52 n3 p12-19 Fall 1988. 1988

Figure 2 Sample Citation

<p>ERIC_NO: EJ380937 TITLE: Implementation Alternatives to Analog Graphic Function Generation: Some Examples. AUTHOR: Karayanakis, Nicholas M. PUBLICATION_DATE: 1988 JOURNAL_CITATION: Engineering Design Graphics Journal; v52 n3 p12-19 Fall 1988 ABSTRACT: This paper discusses the mechanization of mathematical functions by means of analog electronics. Five different approaches are described which demonstrate the versatility of the analog technique by using parabolic function, exponential decay technique, projectile trajectory, trigonometry, and piecewise linear approximation techniques. (YP) MAJOR DESCRIPTORS: College Science; Electronics; Engineering Education; Laboratory Equipment; Science Curriculum; Science Instruction; MINOR DESCRIPTORS: Engineering; Engineering Graphics; Higher Education; IDENTIFIERS: *Function Generation PUBLICATION_TYPE: 080; 052 CLEARINGHOUSE_NO: SE543450 AUDIENCE: Teachers; Practitioners LANGUAGE: English</p>
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Figure 3 Sample Abstract

1) by entering 'engineering design graphics journal' in the 'Describe what you are looking for' search box and checking 'Journal articles' to limit the search. This search yielded the citations for the eighty articles published in the EDGJ and indexed by ERIC. The search also yielded the following URL: [http://www.askeric.org/plweb-cgi/fastweb?search+simplesearch+ericdb2+ericdb:+25+25+0+\(engineering+design+graphics+journal\)+AND+\(080\)+:publication_type](http://www.askeric.org/plweb-cgi/fastweb?search+simplesearch+ericdb2+ericdb:+25+25+0+(engineering+design+graphics+journal)+AND+(080)+:publication_type), which can be used to retrieve the 80 citations.

Volume Number

51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	All
80%	27%	0%	80%	76%	70%	0%	0%	30%	25%	13%	86%	62%	38%	75%	31%	40%

Proportion of Articles

Table 1 Distribution on Indexed Articles

A sample of one of the eighty citations appears in Figure 2.

The ERIC number, EJ380937 as an example, assigned to each article links the citation to the article's abstract see Figure 3.

For the purpose of this study, a spreadsheet was promulgated with the eighty citations along with their titles, major descriptors, and minor descriptors. In addition, individual fields were created for the individual authors; volume number, issue number, and year; publication type; and audience. The data were then sorted and counts made in accordance with the intent of the study.

Results

The eighty EDGJ articles indexed by ERIC were published between 1987 (v50, n1) and 2002 (v66, n3). During this period, forty-seven of the forty-nine issues of the EDGJ contained feature articles. The forty-eighth issue (v 61, n 2) contained the most recent index, and the forty-ninth issue (v 57, special edition) was devoted to Rogers' (1993) The Evolution of the Engineering Design Graphics Division of the American Society for Engineering Education 1928-1993.

The following EDGD members provided the editorial leadership for the EDGJ during the period in which EDGJ articles were indexed by ERIC: Jon Duff (1982-88), John B. Crittenden (1988-91), Mary A. Sadowski (1991-97), Judy A Birchman (1997-2000), and Sue Miller (2000-03).

During this period, one hundred ninety eight feature articles were published by the EDGJ. The number of articles published per issue ranged from

Major Descriptor	N
Engineering Education	44
Engineering Graphics	37
College Science	31
Computer Graphics	27
Computer Assisted Design	23
Visualization	19
Computer Uses in Education	13
Computer Software	13
Spatial Ability	11
Design	10

Table 2 Frequency of Major Descriptors

two (in four issues) to six (in six issues). The average number of number articles published per issue was 4.21; the standard deviation was 1.16.

Of those one hundred ninety eight articles, 40% (N=80) were indexed by ERIC. By volume, the proportion of articles published ranged from none to 86%. Table 1 summaries the distribution by volume number in which feature articles published in the EDGJ were indexed by ERIC.

The eighty EDGJ articles indexed by ERIC were distributed among two-thirds (N=31) of the forty-seven issues of the EDGJ. That is, one-third (N=16) of the issues did not contain articles that qualified for indexing by ERIC. Eight issues, however, had all its articles indexed.

The number of articles indexed per issue ranged from one (in nine issues) to six (in one issue). The average number of articles indexed per issues was 2.58; the standard deviation was 1.41.

A number of fields are available by which indexed materials can be retrieved. Many, such as author, journal citation, major descriptors, minor descriptors, publication type, and audience, provide a sense for the nature of the articles ERIC indexers believe to be relevant.

While not inclusive, Table 2 lists the major descriptors most frequently used to index the eighty feature articles published in the EDGJ.

The majority of the articles indexed were characterized or dealt with Computer Assisted Design, Computer Graphics, College Science, Engineering Graphics, or Engineering Education. Fifty-five percent of the articles indexed (n=44) were characterized or dealt with programs of academic study that prepare students to enter or advance in professional fields, or Engineering Education¹. Forty-six percent of the articles indexed (n=37) were characterized or dealt with technical func-

Minor Descriptor	N
Higher Education	77
Science Education	32
Engineering Graphics	23
Engineering Education	20
Computer Uses in Education	17
Problem Solving	17
Computer Assisted Instruction	17
Spatial Ability	17
Computer Simulation	17
Visualization	15
Computer Graphics	14
Teaching Methods	13
Physical Sciences	12
Technical Education	11
Engineering Technology	9

Table 3 Frequency of Minor Descriptors

1st Author	N
Barr, R. E.	3
Branoff, T. J.	3
Clark, A. C.	3
Leach, J. A.	3
Sorby, S. A.	3
Wiebe, E. N.	3
Ault, H. K.	2
Bertoline, G. R.	2
Connolly, P. E.	2
Khonsari, M. M.	2
McCuiston, P. J.	2
Rodriguez-Ramos, W. E.	2
Ross, W. A.	2
Wiley, S. E.	2

Table 4 First Authors

tions including engineering drawing, problem solving or analytical graphics, and descriptive geometry and the illustrations resulting from these functions, or Engineering Graphics. Thirty-nine percent of the articles indexed (n=31) were characterized or dealt with plans incorporating a structured series of intended learning outcomes and associated learning experiences generally organized as a related combination or series of courses, or College Science². Thirty-four percent of the articles indexed (n=27) were characterized or dealt with techniques for graphic or pictorial representation of information in a computer representations may be in hardcopy or on display screens, or Computer Graphics. And twenty-nine percent of the articles indexed (n=23) were characterized or dealt with use of interactive computer

2nd and Subsequent Author	N
Scales, A. Y.	3
Barr, R. E.	2
Horn, D.	2
Jenison, R. D.	2
Juricic, D.	2
Krueger, T. J.	2
Sadowski, M. A.	2

Table 5 Second and Subsequent Authors

systems to calculate, manipulate, display, evaluate, and modify design alternatives, or Computer Assisted Design (ERIC Processing & Reference Facility, 2003b).

While not inclusive, Table 3 lists the minor descriptors most frequently used to index the eighty feature articles published by the EDGJ and indexed by ERIC.

In addition to the major descriptors, or the terms that cover the main focus of the document, the majority of the articles 25% to 96% indexed were also characterized or dealt with (a) all education beyond the secondary level leading to a formal degree (Higher Education) 96%, (b) process of imparting or obtaining knowledge, attitudes, skills, or socially valued qualities of character or behavior includes the philosophy, purposes, programs, methods, organizational patterns, etc., of the entire educational process as most broadly conceived (Science Education)³ 40%, (c) technical functions including engineering drawing, problem solving or analytical graphics, and descriptive geometry also, the illustrations resulting from these functions (Engineering Graphics) 29%, and (d) programs of academic study that prepare students to enter or advance in professional fields (Engineering Education)¹ 25% (ERIC Processing & Reference Facility, 2003b).

Table 4 lists the first authors of the eighty feature articles who authored more than one article

Vol.	Number of Feature Articles Indexed	Number of Jointly Authored Articles	Proportion of Jointly Authored Articles
51	14	5	42%
52	4	2	50%
53	0	-	-
54	12	7	58%
55	13	4	31%
56	1	0	0%
57	0	-	-
58	0	-	-
59	3	1	33%
60	2	2	100%
61	1	0	0%
62	6	2	33%
63	8	2	25%
64	5	3	60%
65	9	5	56%
66	4	3	75%
All	80	36	45%

Table 6 Articles Authored Jointly

published in the EDGJ and indexed later by ERIC. From 1987-2002, sixty different first authors contributed articles to the EDGJ that were indexed later by ERIC. Of those first authors, fourteen contributed two or more articles.

Table 5 lists the second and subsequent authors (third, fourth, etc) of the eighty feature articles who co-authored more than one article published in the EDGJ and indexed later by ERIC. From 1987-2002, thirty-three different second and subsequent authors contributed articles to the EDGJ. Of those second and subsequent authors, seven contributed two or more articles.

Table 6 lists the proportion of articles by volume number that were jointly authored. Of the articles published in the EDGJ from 1987-2002 and indexed later by ERIC, almost half were jointly authored.

Publication Type	N
080 Journal Articles	80
052 Teaching Guides (for Teacher)	29
141 Descriptive (i.e. Project Descriptions)	27
143 Reserach/Technical	23
120 Viewpoints (Opinion Papers, Position Papers, Essays, etc.)	5
072 Book/Product Reviews	2
070 Information Analyses (State-of-the-Art Papers, Research Summaries, Literature Reviews, etc.)	1
130 General (use more specific code, if possible)	1

Table 7 Publication Type

Audience	N
Practitioners	33
Teachers	16
Researchers	14
Students	2
Policymakers	2

Table 8 Audience Targeted

Table 7 lists the publication type by which the all the EDGJ articles were indexed. In addition to all eighty articles being characterized as journal articles, approximately one-third were characterized as either a teaching guide (36%), a descriptive type of a publication (34%), or a research/technical publication (29%).

Table 8 lists the audiences ERIC indexers judged the EDGJ articles targeted. According to the ERIC indexers, the majority (41%) of the EDGJ articles targeted practitioners.

Conclusions

Following a simple search of ERIC's database, a spreadsheet was promulgated with selected data that describe the eighty articles published in the EDGJ and indexed later by ERIC. Because not all the articles published in the EDGJ were abstracted by ERIC that is, they are abstracted selectively the EDGJ is considered by ERIC to be a non-core journal in the field of education. Core journals in contrast, according to ERIC, are the most important in the field of education and are covered comprehensively by ERIC. That is, all their articles are abstracted (ERIC Processing & Reference Facility, 2003a).

In addition, the featured articles published in the EDGJ from 1987 through 2002 and indexed later by ERIC (a) were clearly linked to the process or practice of education; (b) made a contribution to the knowledge base; (c) were significant, relevant, new, and innovative; (d) were effective and thorough in reporting and presenting their ideas; (e) were timely and related to current priorities; and (f) were judged to be an authoritative source, targeted ERIC audiences, and were comprehensive. Furthermore, and in general, the EDGJ published at least one article per volume that meets ERIC's criteria for legibility and readability, education-relatedness, and quality.

The major descriptors Engineering Education

and Engineering Graphics most frequently characterized the substantive content and covered the main focus of the feature articles published in the EDGJ and indexed later by ERIC. This was followed closely by the following major descriptors: College Science, Computer Graphics, Computer Assisted Design, and Visualization. To a lesser extent, the minor descriptors, Higher Education and Science Education, also characterized the substantive content and covered the main focus of the EDGJ articles indexed by ERIC.

The data also suggest that the articles published in the EDGJ and indexed later by ERIC normally targeted practitioners, teachers, and researchers, which is consistent with the scope of the EDGJ.

The data suggests too that the ideas being advanced by the EDGJ are being propagated by a select group of authors. While numerous first authors contributed featured articles to the EDGJ, of the sixty first authors who had their articles indexed by ERIC, fourteen had two or more feature articles published in the EDGJ and indexed later by ERIC. In addition seven of the thirty-three second and subsequent authors had two or more feature articles published in the EDGJ and indexed later by ERIC.

Finally, the data suggests that the research being conducted by the authors of articles published in the EDGJ and index later by the ERIC is sophisticated enough to require a collaborative effort on the part of two or more researchers.

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Footnotes

¹No Scope Note was provided for Engineering Education. The Thesaurus refers the user to the broader term Professional Education, which says Programs of academic study that prepare students to enter or advance in professional fields (Note: Prior to March 1980, this term was not differentiated from "Professional Training," which is more short term and job-specific).

²No Scope Note was provided for College Science. The Thesaurus refers the user to the broader terms College Curriculum, which refers the user to the broader term Curriculum, which says Plan incorporating a structured series of intended learning outcomes and associated learning experiences -- generally organized as a related combination or series of courses (Note: Use a more specific term if possible) and Science Curriculum, which refers the user to the broader term Curriculum.

³No Scope Note was provided for Science Education. The Thesaurus refers the user to the broader term Education, which says Process of imparting or obtaining knowledge, attitudes, skills, or socially valued qualities of character or behavior -- includes the philosophy, purposes, programs, methods, organizational patterns, etc., of the entire educational process as most broadly conceived (Note: The most general term -- use a more specific term if possible).