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The Literature of Educational Psychology and the Literature Used by Writers in Educational Psychology

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Using *Psychological Abstracts* as the source of the original sample ("first-level"), various characteristics of the literature of educational psychology are compared with the characteristics of a "second-level" literature (defined as the literature that the first level cites). In particular, the scatter (dispersion) of periodical articles over periodical titles is looked at for both levels. The journals most cited within the literature of educational psychology are identified. © 1985 Academic Press, Inc.

The purpose of the study reported was to examine various quantitative (or "bibliometric") aspects of publications in educational psychology, including language, country, and intellectual form, rate of obsolescence, and the major journals involved. In particular, we sought to compare the characteristics of a "first-level" literature (defined as items grouped under "educational psychology" by *Psychological Abstracts*) with those of a "second level," defined as publications that the first level cites. The major objective was to determine to what extent this literature is scattered (i.e., dispersed). The more scattered the literature of a field, the more difficult it is to identify, collect, and use.

Methods

For our purposes, we chose to define the literature of educational psychology as items included in this subject category by *Psychological Abstracts*. All of the 12 issues published in 1981 were selected for review. These contributed 2297 items on educational psychology (referred to subsequently as first-level literature). Various quantitative analyses (as identified above) were performed on this literature and the results of these are presented in Tables 1–5. The second-level literature was defined as the publications cited by the first-level literature. Three of the 12 issues

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TABLE 1
TYPE OF PUBLICATION (FIRST LEVEL)

Type	Number	%
Journal articles	2292	99.78
Research reports	3	0.13
Newsletters	2	0.09
Total	2297	100.00

of 1981 were chosen at random, the items represented under educational psychology (approximately 550) were acquired, and their bibliographies were examined. They were found to cite 7325 published sources. These items were then categorized in the same way that the first-level items had been categorized. The results appear in Tables 6–11.

Type of Publication

While *Psychological Abstracts* restricts itself almost exclusively to journal articles (Table 1), the literature cited by authors of these articles (Table 6) is very diverse, with little more than one-half being drawn from the journal literature.

There is some subjectivity in these tables in that somewhat arbitrary decisions were made in the classification. For example, the category

TABLE 2
LANGUAGE OF PUBLICATION (FIRST LEVEL)

Language	Number	%
English	2016	87.76
German	109	4.74
Russian	30	1.30
Czech	21	0.91
French	18	0.78
Hebrew	17	0.74
Slovak	15	0.65
Spanish	14	0.60
Polish	13	0.56
Hungarian	12	0.52
Chinese	9	0.39
Japanese	7	0.30
Portuguese	5	0.21
Norwegian	4	0.17
Serbo-Croatian	4	0.17
Dutch	1	0.04
Italian	1	0.04
Korean	1	0.04
Total	2297	99.9

TABLE 3
COUNTRY OF PUBLICATION (FIRST LEVEL)

Country	Number	%
United States	1830	79.7
Germany	106	4.6
United Kingdom	75	3.2
India	47	2.1
Czechoslovakia	38	1.6
USSR	29	1.3
Canada	26	1.1
Israel	19	0.8
Netherlands	16	0.7
Poland	14	0.6
Hungary	12	0.5
Japan	8	0.3
Australia	7	0.3
Belgium	7	0.3
France	6	0.3
Switzerland	6	0.3
Brazil	5	0.2
Mexico	5	0.2
China	4	0.2
Yugoslavia	4	0.2
Argentina	3	0.1
Colombia	3	0.1
Sweden	3	0.1
Ireland	2	0.1
New Zealand	2	0.1
Norway	2	0.1
Pakistan	2	0.1
Other or unidentifiable	16	0.7
Total	2297	99.9

"books" refers only to volumes published by commercial publishers and university presses. Books published by government agencies were classified as government publications. Thus, the classification partly reflects issuing agency as well as strict physical form. There seems little unexpected in the distribution of Table 6 except that books are cited more frequently in this field than they would be in, say, the physical sciences. Conference papers, including those appearing in published proceedings, were infrequently cited, which is perhaps somewhat surprising.

Language of Publication

While English could be expected to dominate the literature, its overwhelming proponderance (88% at the first level, Table 2, and 94% at the second level, Table 7) is perhaps a little unexpected. Despite the fact that

TABLE 4
SCATTER OF THE JOURNAL LITERATURE (FIRST LEVEL)

Number of journals	Number of articles	Cumulative number of journals	Cumulative number of articles
1	131	1	131
1	84	2	215
1	75	3	290
1	65	4	355
2	64	6	483
1	63	7	546
1	62	8	608
1	54	9	662
1	53	10	715
1	51	11	766
1	50	12	816
1	48	13	864
1	46	14	910
1	40	15	950
2	36	17	1022
1	35	18	1057
1	34	19	1091
1	33	20	1124
2	32	22	1188
1	31	23	1219
2	29	25	1277
1	26	26	1303
1	24	27	1327
1	23	28	1350
1	22	29	1372
1	21	30	1393
1	19	31	1412
1	18	32	1430
1	17	33	1447
4	16	37	1511
2	15	39	1541
1	14	40	1555
6	13	46	1633
4	12	50	1681
1	11	51	1692
4	10	55	1732
4	9	59	1768
6	8	65	1816
9	7	74	1879
8	6	82	1927
11	5	93	1982
10	4	103	2022
29	3	132	2109
48	2	180	2205
87	1	258	2292

TABLE 5
TOP 30 JOURNALS BY NUMBER OF PAPERS (FIRST LEVEL)

Journal	Number of papers
Psychology in the Schools	131
Journal of Educational Research	84
Academic Therapy	75
Journal of Learning Disabilities	65
Teaching of Psychology	64
Psychological Reports	64
Learning Disability Quarterly	63
Educational and Psychological Measurement	62
Journal of Special Education	54
Contemporary Educational Psychology	53
School Psychology Review	51
Journal of School Psychology	50
Journal of Educational Psychology	48
Perceptual and Motor Skills	46
Behavioral Disorders	40
British Journal of Educational Psychology	36
Exceptional Children	36
American Educational Research Journal	35
Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie	34
Education and Training of the Mentally Retarded	33
Educational Psychology	32
Psychologie in Erziehung und Unterricht	32
Catalog of Selected Documents in Psychology	31
Journal of Instructional Psychology	29
Voprosy Psikhologii	29
Praxis der Kinderpsychologie und Kinderspychiatrie	26
Reading Teacher	24
Gifted Child Quarterly	23
Personnel and Guidance Journal	22
Review of Educational Research	21

Psychological Abstracts is very much an international publication, these data suggest that its coverage of the non-English literature of educational psychology may be somewhat imperfect. Using all entries in *Psychological Abstracts* for 1952 (over 7000), Louttit (1955) discovered that about 77% referred to English-language materials.

Country of Publication

The distribution by country of publication (Tables 3 and 8) closely parallels the distribution by language: U.S. sources dominate. Note, however, that this distribution is not the same as distribution by institutional affiliation of authors. The 80 or 87% of items published in the United

TABLE 6
TYPE OF PUBLICATION (SECOND LEVEL)

	Number	%
Journal articles	3803	51.91
Books	1775	24.23
Book chapters	675	9.22
Dissertations	213	2.91
Research reports	195	2.67
Test instruments	150	2.05
Conference papers	136	1.86
Government publications	97	1.32
Newsletters	55	0.75
Unpublished papers	44	0.60
Conference proceedings	26	0.35
Technical reports	25	0.34
Master's theses	13	0.18
Rules and regulations	9	0.12
Personal communications	5	0.07
Legal cases	5	0.07
Miscellaneous or unidentifiable	99	1.35
Total	7325	100.00

States (including articles published in U.S. journals) are not, of course, all by U.S. authors.

Scatter of the Journal Literature

Table 4 shows how the 2292 first-level journal articles are scattered over 258 different journal titles. The table presents the data in the form

TABLE 7
LANGUAGE OF PUBLICATION (SECOND LEVEL)

	Number	%
English	6872	93.82
German	182	2.48
Russian	117	1.60
Czech	56	0.76
French	45	0.61
Japanese	13	0.18
Hebrew	7	0.10
Spanish	5	0.07
Dutch	4	0.05
Polish	2	0.03
Chinese	2	0.03
Other or unidentifiable	20	0.27
Total	7325	100.00

TABLE 8
COUNTRY OF PUBLICATION (SECOND LEVEL)

	Number	%
United States	6363	86.87
United Kingdom	343	4.68
Germany	192	2.62
USSR	111	1.52
Czechoslovakia	54	0.74
Pakistan	47	0.64
France	42	0.57
Canada	34	0.46
Netherlands	25	0.34
India	20	0.27
Japan	15	0.20
Australia	13	0.18
Poland	12	0.16
Israel	6	0.08
South Africa	4	0.05
Italy	4	0.05
Belgium	3	0.04
Switzerland	3	0.04
Other or unidentifiable	34	0.46
Total	7325	99.97

of a ranked list by declining frequency of articles contributed. Thus, the journal contributing most is responsible for 131 of the 2292 articles. The second journal contributes 84, and so on down the table. Note that 87 journals contributed only a single paper each. The literature of educational psychology is not compact but widely scattered. In 1934 a British librarian, S. C. Bradford, discovered that journal articles will tend to be scattered over journal titles in such a way that the journals form "zones" of decreasing productivity in an approximately geometric series (Bradford, 1948). For example, in a perfect Bradford series, 900 articles might be distributed over 285 journals as follows:

	Papers	Journals
Zone 1 (the nucleus)	300	5
Zone 2	300	35
Zone 3	300	245

This is a perfect geometric series, namely, $5:(5 \times 7):(5 \times 7^2)$. The "multiplier" between zones in this case is 7. Such a perfect series is not likely to occur in practice. In fact, the data of Table 4 can be divided into three zones as follows:

Zone 1	766 papers in 11 journals
Zone 2	775 papers in 28 journals
Zone 3	751 papers in 219 journals

These data are not typically "Bradfordian" because the scatter in the third zone is much greater than would be true of a typical Bradford distribution. The multiplier between the first two zones is only 2.54, i.e., 11:(11 × 2.54), but the third zone contains 219 journals rather than the 71 or so (i.e., 11×2.54^2) predicted by the Bradford series. The literature of educational psychology, at the first level, is very widely scattered indeed.

Table 9 presents a similar Bradford-type distribution for the second-level literature. In this case, the table reflects journals cited by the first-level literature: one journal was cited 253 times, one 178 times, one 120 times, and so on; 251 journal titles were cited only once each.

Again, we can identify these zones:

Zone 1	1267 citations to 14 journals
Zone 2	1292 citations to 54 journals
Zone 3	1244 citations to 485 journals

The multiplier between the first and second zones is roughly 3.8, but a multiplier of 3.8 between Zones 2 and 3 (i.e., $14 \times (3.8)^2$) would yield 202 journals in the third zone whereas, in fact, 485 journal titles appear. Again, this literature is scattered much more widely than the Bradford distribution would predict.

One would expect the second-level literature to be more widely scattered than the first level, since it represents what writers on educational psychology cite and thus is likely to stray into a wide variety of subject fields. The situation is not quite that simple, as Table 12 shows. In general, the second-level literature is more widely scattered as measured by the number (or percentage) of sources needed to supply a specified percentage of the articles (e.g., 30 journals supply 60% of articles at the first level, but 45 are needed to supply 60% at the second level). At the lower level of productivity, however, there is little difference between the two levels. For example, 10 journals yield 30% of the literature in the first level and 11 journals yield 30% at the second level. Both sets of data approximate the "80/20" rule: 80% of the products come from 20% of the sources.

The data in these tables are of interest because they illustrate the problems faced by a library attempting to collect the literature of educational psychology or, even more so, the problems faced by some publication attempting to index or abstract this literature. Approximately one-third of the relevant journal articles at the first level seems to come from as

TABLE 9

SCATTER OF THE JOURNAL LITERATURE (SECOND LEVEL)

Number of journals	Number of articles	Cumulative number of journals	Cumulative number of articles
1	253	1	253
1	178	2	431
1	120	3	551
1	116	4	667
1	86	5	753
1	77	6	830
2	68	8	966
1	65	9	1031
1	60	10	1091
2	59	12	1209
1	58	13	1267
1	53	14	1320
1	50	15	1370
1	48	16	1418
3	46	19	1556
1	45	20	1601
1	43	21	1644
2	41	23	1726
1	38	24	1764
2	28	26	1820
1	27	27	1847
2	26	29	1899
3	25	32	1974
1	24	33	1998
1	23	34	2021
1	22	35	2043
5	21	40	2148
2	20	42	2188
1	19	43	2207
2	18	45	2243
3	17	48	2294
3	16	51	2342
2	15	53	2372
3	14	56	2414
1	13	57	2427
11	12	68	2559
8	11	76	2647
4	10	80	2687
6	9	86	2741
7	8	93	2797
16	7	109	2909
10	6	119	2969
18	5	137	3059
28	4	165	3171
42	3	207	3297
95	2	302	3487
251	1	553	3738[a]

[a] In the case of 65 of the 3803 citations to journals, the journal title was not unambiguously identifiable. These 65 items were omitted from this analysis.

TABLE 10
TOP 32 JOURNALS BY NUMBER OF CITATIONS (SECOND LEVEL)

Journal of Educational Psychology	253
Journal of Applied Behavior Analysis	178
Child Development	120
Journal of Learning Disabilities	116
Exceptional Children	86
Journal of Personality and Social Psychology	77
Journal of Educational Research	68
Review of Educational Research	68
American Educational Research Journal	65
Educational and Psychological Measurement	60
American Psychologist	59
Psychological Reports	59
Journal of Consulting and Clinical Psychology	58
Developmental Psychology	53
Journal of Reading	50
Perceptual and Motor Skills	48
Journal of Counselling Psychology	46
Psychology in the Schools	46
Psychological Bulletin	46
Reading Teacher	45
Journal of Special Education	43
Journal of Applied Psychology	41
Journal of School Psychology	41
Behavior Therapy	38
American Sociological Review	28
Journal of Experimental Child Psychology	28
American Journal of Orthopsychiatry	27
Elementary School Journal	26
Journal of Experimental Education	26
Behavior Research and Therapy	25
Journal of Experimental Psychology	25
Journal of Educational Measurement	25

Note. Because no date restriction was placed on the citation data, a recently established journal has less opportunity to appear on the highly cited list. Moreover, it is important to recognize that the list represents journals most cited by the literature of educational psychology itself. A somewhat different ranking of titles might result if all citations (i.e., from all fields) were considered.

few as 11 titles. About two-thirds of the journal articles could be covered by subscribing to about 39 titles. But 95% coverage of this literature might require as many as 180 titles. It is unrealistic to expect a library devoted exclusively to educational psychology to collect much more than about 80 to 90% of the journal literature by direct subscription. At least, the subscription cost needed to go from 90% coverage to, say, 95% coverage may equal or even exceed the cost required to achieve the first 90% of coverage. Table 4 suggests, in fact, that 90% coverage is a "cost-effective" goal and to go much beyond this is not. Parenthetically, it should

TABLE 11
DISTRIBUTION OF CITATIONS BY DATE OF PUBLICATION

Year	Number	%
1981	43	0.59
1980	159	2.17
1979	421	5.75
1978	620	8.46
1977	627	8.56
1976	612	8.35
1975	618	8.44
1974	546	7.45
1973	498	6.80
1972	433	5.91
1971	393	5.37
1970	295	4.03
1969	255	3.48
1968	259	3.54
1967	212	2.89
1966	185	2.53
1965	139	1.90
1964	107	1.46
1963	91	1.24
1962	95	1.30
1961	52	0.70
1960	63	0.86
1959	43	0.59
1958	38	0.52
1957	51	0.70
1956	37	0.51
1955	25	0.34
1954	29	0.40
1953	33	0.45
1952	19	0.26
1951	28	0.38
1950	14	0.19
1940–1949	64	0.87
1930–1939	53	0.72
1920–1929	30	0.41
1910–1919	11	0.15
1900–1909	3	0.04
Before 1900	6	0.08
Undated	118	1.61
Total	7325	100.00

be noted that a "special" library that forms part of a larger institution (e.g., a psychology library that is a department of a university library) is in a much better position in terms of "coverage" than a library (e.g., of a professional society or research institute) that is a completely separate entity. Clearly, the "peripheral" journals for educational psychology will

TABLE 12
SCATTER OF THE LITERATURE AT TWO LEVELS

Level 1				Level 2			
Articles		Sources		Articles		Sources	
Number	%	Number	%	Number	%	Number	%
229	10	3	<1	373	10	2	<1
458	20	6	2	746	20	5	1
687	30	10	4	1119	30	11	2
916	40	15	6	1492	40	18	3
1146	50	21	8	1865	50	28	5
1374	60	30	12	2238	60	45	8
1603	70	44	17	2611	70	73	13
1832	80	68	26	2984	80	122	22
2061	90	116	45	3357	90	237	43
2292	100	258	100	3738	100	553	100

be the "core" journals for other subject fields. Thus, while the psychology library in a university may subscribe to journals yielding, say, 80% of the journal articles on educational psychology, the entire university library system could provide access to as much as 95% of the educational psychology literature. Obviously, Table 4 also illustrates a situation of decreasing stability and predictability. The top dozen or so educational psychology journals in 1981 (i.e., the top in terms of number of articles contributed) are quite likely to remain the top journals for the next several years. The farther down the table one goes, however, the less stable the situation. In the extreme situation, a journal that has published only one educational psychology paper in the last 10 years may not publish another on this subject in the next decade. It is these sporadic and unpredictable contributions that are most elusive, since they are unlikely to be covered by any service devoted to indexing and abstracting the educational psychology literature.

Most Productive Journals

The most productive journals in number of articles contributed are listed for the first-level (Table 5) and the second-level literature (Table 10). While the two tables show some predictable similarities, there are also some surprising differences. The journals that yielded the most papers in educational psychology in 1981 (at least as represented in our sample of the coverage of *Psychological Abstracts*) are not quite the same as the most cited journals in this field. The *Journal of Educational Psychology*, at the top of the most cited list, is only in the 13th position in terms of number of papers contributed, while the secondmost cited title

does not appear in Table 5 at all. In contrast, *Psychology in the Schools,* top of the productive list, is only in the 18th position in the most cited list.

The data in these tables must be viewed with some caution. The absolute ranking will be influenced by which journals happened to be present among the 258 sources appearing in the particular issues of *Psychological Abstracts* that fell in the sample. Because of the indexing/abstracting schedules adopted by *Psychological Abstracts,* a slightly different ranking might result if a second set of six issues were picked. Morover, since journals have a tendency to cite themselves more than they cite other journals, the underrepresentation or overrepresentation of a journal in these issues of *Psychological Abstracts* will have some effect on the absolute ranking of Table 10. In a more longitudinal study, involving perhaps 3 or 4 years of *Psychological Abstracts,* the relative rankings of Table 5 and Table 10 might change slightly. It seems unlikely, however, that the total composition of these tables would be altered much. That is, they probably represent the top journals in educational psychology at this time.

Obsolescence

Strictly speaking, the rate of obsolescence of a literature is the rate at which it is superseded. However, it is extremely difficult, if not impossible, to measure the rate at which publications are made redundant by later contributions. In practice, therefore, obsolescence is usually expressed in terms of decline in use with time. Decline in use can be measured by decline in citation or decline in use within libraries. Drawing an analogy with the behavior of radioactive substances, it has become fashionable to refer to the aging of the literature as its "decay" and to express it as a "half-life." The half-life of a publication is that period of time during which one-half of all its uses has occurred. For example, consider a book published in 1960 and acquired by 100 libraries at the beginning of that year. Suppose that one-half of all its library uses has occurred by the end of 1967 (e.g., 850 uses had occurred by this date in the 100 libraries and 850 further uses will occur in these libraries from 1968 on into the future). The half-life of this book is thus 8 years approximately, as measured by library use.

The same phenomenon applies to citation behavior. A journal article published in 1960 might attract one-half of all the citations it will ever attract by the end of 1967. Its half-life, as measured by citation, is 8 years. Clearly, the half-life thus measured is only an approximation since one cannot know for sure how many *future* uses or *future* citations will occur. Nevertheless, decline in use with age tends to be so rapid after a few years that the half-life, established, say, 20 years after publication is prob-

ably a good approximation. That is, if an article receives 18 citations from the beginning of 1960 to the end of 1965, and 18 more between 1966 and 1981, one can say that its half-life, measured in 1981, is 6 years. It could be a rather long time before this half-life figure changes. Indeed, it may never change because it may never attract any further citations.

Ideally, to measure the rate of obsolescence (i.e., decline in use with age) of the literature of educational psychology, one would select a random sample of articles published in, say, 1960 and plot the number of citations received by these articles in each succeeding year from 1960 to the present. This measure of obsolescence has been referred to as "diachronous decay" (Line & Sandison, 1974). While such studies can be performed through the use of citation indexes, they are still rather laborious to undertake.

An alternative approach is to study the date distribution of bibliographic references made in the current literature of some subject field. This approach was used in the present study. The sources cited in the 2292 journal articles drawn from *Psychological Abstracts* were examined in order to establish the date of their publication. The results are presented in Table 11. Of the 7325 sources cited, 6 were dated before 1900. Decline in use with age is evident in this table. In fact, about one-half of all citations are to items published in the period 1974–1981. That is, the *median citation age* is about 7 years.

Line and Sandison (1974) refer to this method of expressing obsolescence as "synchronous decay." It has often been assumed that synchronous decay gives a good approximation of diachronous decay. That is, the median citation age is roughly equivalent to the half-life. In other words, Table 11 suggests that the half-life of the literature of educational psychology is about 7 years.

Line and Sandison have been critical of this approach. They point out that there is no reason to assume that synchronous decay and diachronous decay occur at the same rate. Nevertheless, the only study to compare the two methods on any significant scale (Stinson, 1981) showed that synchronous decay does seem to be a good predictor of diachronous decay.

The second criticism leveled at the method by Line and Sandison is based on their contention that the data need to be "corrected" to show how much literature is available to be cited in any particular year. On the surface, this contention seems irrefutable. Suppose twice as much literature was published on educational psychology in the period 1974–1981 as was published in 1967–1973. If the 1974–1981 literature is cited twice as much as the 1967–1973 literature, this reflects probability alone and no obsolescence is indicated.

Brookes (1970), on the other hand, has pointed out that, if the number of authors contributing to some subject is growing at the same rate as

the number of papers published on this subject, these two phenomena exert exactly opposite influences and will completely counterbalance each other, making it unnecessary to introduce any correction factor to account for literature growth. To put this somewhat differently, the more papers published on a subject, the lower the probability that any particular paper will be cited, since they are all, in a sense, competing for a limited number of possible citations. On the other hand, the more authors writing on a subject, the greater the probability that any particular paper will be selected for citation. If contributing authors are increasing at the same rate as the growth of the literature, and assuming that the average number of bibliographic references per paper published remains fairly constant over a period of time, the two phenomena counteract each other. In the only significant tests of this phenomenon (Oliver, 1971; Stinson, 1981), the Brookes hypothesis was fully supported. Stinson, in fact, showed that synchronous obsolescence data corrected for growth of the literature *and* growth in number of contributors were the same as completely uncorrected synchronous obsolescence data. Moreover, the synchronous decay was more or less identical with the diachronous decay.

In the present study no attempt was made to measure the growth of the literature or the growth of the number of contributors to this literature. Because of this, the obsolescence data of Table 12 cannot be taken as truly definitive. Nevertheless, they are probably not too wide of the mark. The literature of educational psychology seems to age quite rapidly and the "true" half-life may well be around 7 years. This means that a typical article published today in this journal is likely to attract one-half of all the citations it will ever attract within the next 7 years. By the same token, it is likely that one-half of all uses that will ever be made of it (e.g., in libraries) will occur in approximately the same period.

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