

Scattering, Storing, Shaping: Journals in Mathematics Education

*Vid ett seminarium på Pedagogien, Göteborgs Universitet den 25 oktober 1991 var professor **Jeremy Kilpatrick**, University of Georgia huvudtalare. Han redogjorde för kunskaper och erfarenheter från utgivning av internationellt kända tidskrifter och gav exempel på dessas betydelse för utvecklingen av professionala lärarkunskaper i matematik. Seminariet ingick i den internationella seminarieriet och firandet av Göteborgs Universitets 100-årsjubileum och behandlade även Nämnarens historia och utveckling inför utgivningen av det hundra numret.*

The printed academic journal is sometimes portrayed as an endangered species. Many journals depend heavily upon subscriptions from libraries, and when the economy is weak, subscriptions are cancelled and librarians cast about for less costly ways of providing the same services to their patrons. From the subscriber's perspective, journals can be seen as an inefficient means of getting information. In psychology, for example, most journal articles are read by only a small fraction of the journal's subscribers (Garvey & Griffith, 1964); the situation is undoubtedly the same in other fields. Journal subscriptions, especially those to libraries, are often expensive. Subscribing to journals one reads only partially and occasionally can be annoying. From the journal author's perspective, delays in reviewing and publishing one's article seem unreasonable in an era of fax machines, electronic mail, and desk-top publication.

Developments in computer technology have led to the use of on-line data bases and laser disks for information storage and retrieval. In some scientific specializations, on-line journals have been established that allow subscribers to browse tables

of contents and download only the articles of particular interest to them. Visionaries such as Marshall McLuhan have predicted a movement away from print-based knowledge to a future of video-based knowledge.

So far, however, that future has not arrived. Print remains the primary medium of exchange for scholarly work, and journals the best-established means of making that work known in a timely fashion. "Enquiries show that educational professionals are not using the abstracting and information retrieval services to any significant extent at present" (König, 1988, p.5). Despite rising costs, journals have proven to be a bargain for many subscribers when compared to various alternatives. They require no special equipment to use and can be readily sent anywhere in the world. Moreover, along with books, "they are accepted by most users as the 'legitimate' way of transmitting scholarship" (Altbach, 1987, p. 176). New technologies are not simply promising alternative ways of producing and storing information, they are already being used to produce traditional journals more cheaply and efficiently (Altbach, p.176). Journals show no signs

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of becoming extinct.

It is with that reassuring claim that I toast the 100th issue of NÄMNAREN and begin my consideration of the role of journals in our field of mathematics education. Our field is not very old (Kilpatrick, in press). As Howson (1990) notes, "it is only in the 20th century that 'mathematics education' has emerged as a field of study and for research" (pp.311-312). It has been recognized within universities for no more than 80 years, if one accepts Schubring's (1988) assertion that the first doctoral (Habilitation) degree in mathematics education was that of Rudolf Schimmack, completed under the supervision of Felix Klein at Göttingen in 1911. Professorships in education in European and American universities were not common 80 years ago. According to Husén (1983), lectures in education were given by a professor of philosophy at the University of Uppsala as early as 1804, but the university did not establish a chair in education until 1910. Professorships in mathematics education were essentially unknown at that time. Since then, the growth of the field both within and outside of universities has been remarkable. International congresses now attract several thousand participants from around the world every four years; annual meetings of mathematics teachers in the United States run to as many as 12,000 participants. The membership of the National Council of Teachers of Mathematics has grown to roughly 80,000. Journals have proliferated in the years since the first issue of *L'Enseignement Mathématique* appeared in 1899. Today, the documentation journal *Zentralblatt für Didaktik der Mathematik* and the companion MATHDI on-line database survey over 400 journals publishing articles on mathematics education.

As a professional field develops, people band together to form organizations so they can meet and exchange ideas. Most professional organizations eventually find themselves publishing a journal, in part as a way of communicating with their members, in part to document their accomplish-

ments, and in part to help give the organization and the field itself a sense of identity. These three purposes that journals serve – *communication, documentation, and unification* – are the subjects of this paper. Whether or not a journal is associated with a professional organization, it plays important roles in developing the profession itself. Certainly mathematics education owes a great debt to its journals.

Knowledge Dissemination

People tend to think first of journals as communication devices, as ways of getting ideas from some people in the profession to others. The function of disseminating knowledge quickly and accurately is of primary importance for a journal. By reading a journal in mathematics education, teachers learn of new ideas about the curriculum, teaching techniques, pupils' learning, and issues confronting the field. Young scholars have the opportunity to make their work known. Educational policy makers can put forward their proposals for consideration. Researchers and curriculum developers can report on their projects. Reviewers can offer critiques of important publications. In the pages of a journal, the profession can debate issues that confront its members individually and collectively.

Scholarly journals are different from newsletters or magazines. Like newsletters, they depend on material from their readers; like magazines, they report original research. But unlike either, they typically depend rather heavily on outside referees to help the editor and editorial board choose from among various submissions. The process of manuscript evaluation that journals have established serves as a barrier to the dissemination of raw, unexamined information. That barrier is frustrating to prospective authors. In a National Enquiry into Scholarly Communication (1979, p.46) conducted in the United States from 1976 to 1978, authors, not surprisingly, were much more critical of the scholarly journal system than were readers or re-

searchers. What was perhaps surprising was the authors' intense dissatisfaction with pressures to publish, delays in publication, and the perceived unfairness of the reviewing process.

Pressures to publish come from outside the world of the scholarly journal, but the reviewing and publication processes are in the hands of editors and editorial boards. Most of these people hold full-time positions in schools or universities and perform their editorial functions as a contribution to the profession and their own careers rather than for pay. In the reviewing process, they depend upon referees who ordinarily receive no compensation and who must take time from their other affairs to write a review. In the production process, they depend on copy editors, printers, and production people who may be operating under restricted budgets and may have to squeeze journal production in among their other activities. The problem of the backlog is eternal. No editor of a scholarly journal wants to be faced with an impending publication date and too few manuscripts that are ready for publication, yet if the backlog of articles grows too large, authors and readers begin to protest the delays. There seem to be some natural limits to the speed with which scholarly journals can be published. Though editors try to keep the process moving as fast as possible, authors are likely to continue to be dissatisfied with the pace.

The question of whether the reviews of a manuscript are unbiased and whether the decision to publish or not is fair plagues every editor. Unsolicited manuscripts are often sent to one or two referees (Page, Campbell, & Meadows, 1987, p.17). The *Journal for Research in Mathematics Education* (JRME) sends manuscripts to at least three referees (one of whom must be an editorial board member), and recent editors have used as many as five or six referees in an attempt to get helpful comments on various facets of a manuscript. The problem, of course, is that "all too often further opinions do not help to reduce

confusion" (Page et al., p.17). Encouraging a revision from the author when the reviews have been mixed or largely negative is a dangerous practice. Schneider (1990) reports the unfortunate experience of an editor who encouraged revision only to end up rejecting the third version and incurring charges of insensitivity and lack of fairness in conducting the review.

Editors try to shape the journals they edit. Some editors have used editorials as a way of personalizing the journal and provoking some response; others have felt that editorials intrude into the conversation between the authors of the articles and their readers. All editors try, through the articles they publish, to keep the journal abreast of current trends in the field. In the case of the JRME, which is now in its 22nd year and fifth editor, the journal almost immediately acquired an undeserved reputation for publishing only narrow hypothesis-testing studies like those to be found 25 years ago in American journals of educational psychology. Every editor of the JRME has made a effort to broaden the range of manuscripts submitted and articles published. As research practice in mathematics education shifted away from experimentation to field studies, from quantitative analysis to qualitative interpretation, and as the manuscripts submitted began to come from authors outside the U.S., the editors found it especially difficult to keep the journal up-to-date and attract publishable manuscripts of the newer types. Authors often hesitated to submit manuscripts that did not fit their stereotype of the journal. Occasionally, they added statistical paraphernalia in an effort to make the manuscript "more acceptable". Reviewers sometimes argued that though a manuscript was of high quality, it should be published elsewhere. Changing a journal's image once it has been set is not an easy task.

Editors take different points of view about preparing approved manuscripts for printing. Some view the manuscript as the author's property and change essentially nothing. Others see clarity and forceful-

ness of writing as qualities lacking in much academic prose and consequently suggest numerous changes in grammar, syntax, and other matters of style. The editors of the JRME have generally been concerned about eliminating jargon, making articles less technical, and developing a uniform style. They have often used a heavy hand in editing manuscripts for publication, a procedure that has incurred the annoyance and sometimes the ire of authors. Authors from outside the United States have often been surprised at the extensive copy editing their accepted manuscripts receive. American copy editors tend to make more changes than British copy editors do (Barzun, 1985), and probably than editors do in most other countries. American journals may have picked up that practice. What one person sees as maintaining standards of scholarship, however, others see as interference in an author's prerogative.

Editors are often frustrated not simply by the glut of poorly written, poorly conceived manuscripts and the dilatory reviews they receive but also by the sense that few people are reading and responding seriously to what is published. The metaphor of notes in bottles can be used to characterize the transmission of research through journals:

Sometimes one has the image of each researcher located on a separate island, sending messages to one another in bottles (journals) that may or may not be read. On most islands, people seem to be busier filling bottles with new messages than reading the messages they have received. (Kilpatrick, 1987, p.82)

Collective Memories

An important function that journals serve once they have been bound or microfilmed and put into libraries is to document what was being said and done in the field. Content analyses allow scholars to trace the evolution of ideas and trends through the pages of a journal. Furthermore, journals that are official publications of a profes-

sional association contain helpful information on the officers and activities of that association. In preparing a history of research in mathematics education (Kilpatrick, in press), I found back issues of journals invaluable in tracing the research on certain topics and in determining when various projects and committees did their work.

Several studies have been conducted of the statistical techniques used in educational journals published in the United States. Goodwin and Goodwin (1985), Kennedy (1988), and Emmons, Stallings, and Layne (1990) all found that elementary analysis-of-variance methods were the most commonly used techniques. Goodwin and Goodwin saw no changes over the five years in the journal they studied. Emmons and her colleagues found that over 15 years (1972-1987), there were increases in multivariate techniques and decreases in descriptive and nonparametric statistics. They found some decrease in the use of analysis of variance, although it was still the most popular technique. To date, despite many discussions in the literature about a trend away from nonparametric statistics, the surveys have not shown that trend.

A survey of articles in Volumes 1, 10, and 18 of the JRME (Kilpatrick, 1988) confirmed that analysis of variance is as popular as ever in research in mathematics education. It also revealed, however, that articles were becoming longer, which seemed to indicate both that more information was being provided on the procedures and materials used in the research and that more transcripts were being included of dialogues between researchers and either teachers or pupils. The survey also showed a rise in the number of submissions and published articles from authors outside the United States, and especially from Canadian authors. Submissions by authors from outside the United States were much more likely to be accepted than submissions from U.S. authors.

Themes in Volume 18 that were not represented in Volumes 1 or 10 included sex and ethnic differences in mathematics

learning, teachers' thought and beliefs, and mathematics outside the school context. Themes present in Volumes 1 and 10 that increased in prominence in Volume 19 included error analyses, analyses of teaching, the use of computer technology in instruction, and the learning of rational numbers and algebra. Themes that endured across the decades included problem solving and spatial reasoning. Themes that declined in interest included Piagetian studies and the search for aptitude-treatment interactions. When one looks back across the volumes of a journal, one can see some dramatic changes in issues that the developing community of mathematics education has considered important, even as one has difficulty seeing much change in the techniques used to study those issues.

What is often forgotten by readers and authors alike is how fragile journals can be. Several editors have sustained the life of their journals through lengthy terms of service. Henri Fehr, of the University of Geneva, and Charles Laisant, of the École Polytechnique in Paris, founded *l'Enseignement Mathématique*. Laisant was editor from 1899 until his death in 1920, Fehr until his death in 1954, keeping the journal alive after 1908 as the official organ of the International Commission on Mathematical Instruction despite two world wars and the consequent disruptions of the commission's activities. William David Reeve, of Teachers College, Columbia University, served as editor of the *Mathematics Teacher* (MT) (as well as the NCTM yearbooks) for 24 years, from 1926 to 1949, through depression and war, loaning the council money for publications when bankruptcy loomed. George Mallinson, of Western Michigan University, was editor of *School Science and Mathematics* from 1957 to 1982, producing the journal almost single-handedly with his wife's help and financing its operations when the School Science and Mathematics Association was foundering.

The case of the JRME may be illuminating because the NCTM was very reluctant to

begin a research journal, even in the late 1960s, when research was in the ascendency. For over a decade, various NCTM committees on research had been asking for a journal. In 1967 the Research Advisory Committee made a formal proposal to the NCTM Board of Directors. A booklet containing articles on research (Scandura, 1967) had been published to demonstrate that there was both material and an audience for such a journal. The booklet sold over 4,000 copies. There were strong feelings on the NCTM Board, however, that

(a) it was not appropriate to publish a journal aimed at such a specialized segment of the Council's membership, and

(b) such a journal would be a financial burden for the Council.

When the proposal was finally brought before the Board in April 1968, the Board was evenly divided. Board members argued that, if approved, the journal should not cater to the narrow concerns of researchers but be "relevant" to classroom practice. The NCTM President Donovan A. Johnson cast the deciding vote to approve a "selfsupporting" research journal. After some delays in making financial arrangements, the first issue of the JRME appeared in January 1970.

Throughout the journal's first years, its status was precarious. Although subscriptions eventually rose to about the 4,000 level, and although much correspondence and editorial work was done at no cost to the Council, the expenses of the Council's publication office in Reston, Virginia, that were charged against the journal continued to exceed the income produced by subscriptions and advertisements. Strong limitations were set on the number of pages that could be published in each issue, and at times, the journal was treated like an unwanted stepchild by some members of the NCTM leadership. Not until 1989, its 20th year, was it made an official journal of the Council. Today, after weathering many

storms, it is firmly established and well respected. As Mosquera (1991) observes, it is the only national or international journal of mathematics education to be included in the Social Sciences Citation Index. One should note, however, that many NCTM members still perceive the JRME as of little interest or value to them.

The role of a journal in documenting the concerns of a profession helps people in that profession gain some perspective on their current work. Teachers can look back and see some of the problems that faced their predecessors and how they handled them. Researchers can trace the roots of their research problems and collect relevant literature. Even if journals were to become electronic and interactive, allowing the presentation of dynamic images of classrooms, teachers, and pupils, they would still be storehouses of information. The scholarly journal serves as a repository of what the profession has accomplished.

Invisible Colleges

The scholarly journal also contributes to the development of a field of knowledge. It helps delineate an intellectual community composed of its authors and readers. It legitimates what is to count as knowledge, and it regulates the growth of that knowledge.

In every field, there is a social circle (Crane, 1972, p.13) of people who, although they may not meet together or even be acquainted, influence one another's thought and professional activities. When a scientific field forms a communication network of people actively working in a research area, that network is termed an invisible college (Crane, p.35). Invisible colleges play a key role in developing a field. They promote collaboration and the exchange of ideas. Work done in fields that lack an invisible college is likely to be characterized by an absence of theoretical constructs, little replication, and studies that are isolated from one another (Crane,

p.54). Invisible colleges provide leadership for a field, demonstrating the approaches to research that are considered most acceptable and signaling new trends. Journals provide not only a medium for members of invisible colleges to communicate with one another and a means for the rest of the field to track their work, but also a stimulus for the formation of invisible colleges.

In a way, a journal itself serves to define an invisible college. As Altbach (1987) puts it, "scholarly journals are the most visible form of the invisible college" (p.177). Their editors "are key gatekeepers who in many ways control access to the field" (Altbach, p.177). The more prestigious the journal, the more it can influence the acceptance of people and ideas. The articles and critiques it publishes, the manuscripts it rejects, and the opportunities it provides for dialogue in its pages mold its readers' opinions and attitudes.

The field of mathematics education, like most fields within education, is marked by a gulf between researchers and practitioners. Journals have attempted to bridge that gulf by publishing articles that would appeal to both groups. When the *Arithmetic Teacher* (AT) began publication in 1954, the first article was a theoretical discussion of the changes in the school subject of arithmetic since 1900 (Brownell, 1954). Until the founding of the JRME in 1970, both the AT and the MT published articles that either reported original research, attempted to interpret the research literature, or offered theoretical analyses. The JRME has carried articles that discuss issues in research and that present original work in a nontechnical way. The AT and the MT continue to publish occasional articles that interpret research, as well as announcements of articles in the JRME that teachers might want to read.

Nonetheless, the journals have tended to drift apart, with the JRME tending to speak to the research community and the AT and MT tending to speak to the community of

teachers. In particular, the AT and MT have evolved into glossy magazines that publish short articles dealing with practicalities of content and method, illustrated with lively figures and photographs. Serious discussion of theoretical issues is almost unknown in their pages. For its part, the JRME has remained sedate and scholarly, with rather long articles and no photographs or color.

The evolution of the AT and MT has been, in large part, stimulated by the use of "advisory panels"—groups of readers, mostly teachers, who meet with members of the editorial board of each journal to critique each issue. Such a practice is similar to the use of "focus groups" by political candidates or marketing consultants. The panels are devices for letting the market, in this case, the readership of the journal, shape the style and content of the message. The message in the JRME has been shaped by its readership too, although less forcefully and systematically, through letters to the editor, discussions at professional meetings, and editorial board members serving as readers' representatives.

There is, therefore, a reciprocal relation between the invisible colleges among a journal's readership and the journal itself. The journal helps the invisible colleges develop their identity and facilitates communication among their members; the invisible colleges shape the image and substance of the journal.

The three decades from 1950 to 1980 saw the formation of an international community in mathematics education (Kilpatrick, in press). They were marked by increased governmental support for research and curriculum development; a rapid growth in graduate degree programs; the establishment of university chairs, departments, centers, and institutes; a profusion of conferences, seminars, and congresses; the revival, creation, expansion, and partition of professional organizations; and a great rise in publications, including journals. Journals have helped form the international community, and they have also

helped it stay rather fragmented—especially when they have seen their readers as belonging on one side or the other of a teacher/researcher dichotomy. They have often had more success in crossing international boundaries than in crossing the perceived border between researcher and practitioner.

A journal sends a message; it memorializes an accomplishment; it defines a community. Of these roles, the most complex and ultimately the most decisive is the third. A journal can put people from the world of practice in touch with people from the world of theory and research, or it can push those groups apart. It can help practitioners make their practice more reflective and researchers make their theories more useful, or it can evade that responsibility. As an international community and as a field of knowledge, theory, practice, and research, mathematics education needs the help of its journals in building not simply the invisible colleges that promote intellectual growth within the field but also an "invisible university" that would promote the development of the field itself.

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Likheter och skillnader Matematikdidaktik i USA, Sverige och Norden

USA saknar centralt (federalt) utarbetade läroplaner och kursplaner av det slag vi har i vårt land. Utbildningssystemet är mycket mer decentraliserat än i Sverige, vilket givit stort utrymme för olika intressegrupper att påverka olika delar av skolans verksamhet. Ett sådant exempel är den inflytelserika matematiklärarföreningen NCTM, se sidan 43. Föreningen har en mycket omfattande verksamhet och har bl a varit ansvarig för framtagningen av "Standards", se *Nämnan* nr 4, 1989, s 4 - 23. Tidskrifterna *Arithmetic Teacher*, (AT), *Mathematics Teacher*, (MT) och *Journal for Research in Mathematics Education*, (JRME) är också produkter från NCTM.

AT riktar sig huvudsakligen till lärare i förskolan och det som motsvarar låg- och mellanstadiet medan MT i första hand vänder sig till lärare på det som motsvarar hög- och gymnasietadiet. Dessa tidskrifter motsvaras i vårt land i första hand av *Nämnan*. Däremot saknar vi tidskrifter som JRME. Detta beror bl a på att matematikdidaktik (mathematics education i USA) inte är etablerat som forskningsområde i Sverige och att vi saknar fasta forskartjänster i ämnet.

I samverkan med nordiska matematikdidaktiker pågår emellertid ett arbete med att skapa en nordisk forskningstidskrift motsvarande JRME. Den har arbetsnamnet *NOMAD*, *NORDisk MATematik-Didaktik*, och beräknas utkomma med sitt första nummer våren 1992.

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