ABSTRACT
        This document consists of six reports on literature
published in the United States each year from 1969 through 1973 on
the pedagogy of mathematics. These reports were prepared for the
German publication, ZENTRALBLATT FUR DIDAKTIK DER MATHEMATIK. In each
report, the literature is briefly reviewed under five categories:
mathematics textbooks for teachers, books for professional reading,
books on teaching methodology, books on research in mathematics
education, and committee and conference reports. Each report contains
an extensive list of references. (Author/DT)

Reports on Mathematics Education Literature,

1969 - 1973

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This document consists of six reports which survey the

literature that was published in the United States each year from

1969 through 1973 on the pedagogy of mathematics. These reports

were prepared for the German publication, Zentralblatt für Didaktik

der Mathematik (ZDM). The first four reports (1969-1971) were

authored by Jeremy Kilpatrick; the other two (1972-1973) were

prepared by Marilyn N. Suydam.

In each report, the literature is briefly reviewed under

five categories:

1. Mathematics textbooks for teachers

2. Books for professional reading

3. Books on teaching methodology

4. Books on research in mathematics education

5. Committee and conference reports

Each report contains an extensive list of references.

Zentralblatt für Didaktik der Mathematik

Report on the Literature in the United States, 1969

This survey of American literature on the pedagogy of mathematics covers publications appearing during the calendar year 1969. In order to keep the report within manageable limits, school and college mathematics textbooks, unless they are of special interest to teachers, and journal articles are not included. Readers interested in recent college mathematics textbooks should consult the Reviews in the American Mathematical Monthly. The Arithmetic Teacher, the Mathematics Teacher, and School Science and Mathematics contain lists and reviews of recent school mathematics textbooks.

The survey is organized according to the following categories:

1. Mathematics textbooks for teachers

2. Books for professional reading

3. Books on teaching methodology

4. Books on research in mathematics education

5. Committee and conference reports

1. Mathematics textbooks for teachers

The most influential force in revising teacher training programs in the United States during the last decade has been the Committee on the Undergraduate Program in Mathematics (CUPM) of the Mathematical Association of America. Recommendations by the CUPM have prompted many colleges to revise and extend their mathematics courses for teachers. The recommendations have also inspired a growing flood of textbooks for these new courses. For the college training of elementary school teachers, the CUPM suggests:

(1) a two-course sequence on the structure of the real number system
and its subsystems, (2) a course on the basic concepts of algebra, and
(3) a course in informal geometry. Some textbooks have been specifically
designed to meet the criteria for one of these courses, some treat
selected topics from several courses, and some were devised for other
purposes, but acknowledge CUPM's influence. Strict categorization,
therefore, is difficult.

Brumfiel and Krause's book [1] provides an outstanding example
of how challenging mathematical ideas can be made appealing and
intelligible to prospective elementary school teachers. Devoted primarily
to the development of number systems, with chapters on number theory,
geometry, and probability, the book combines a stimulating presentation
of mathematics with illustrations from elementary school teaching and
discussions of "stages of abstraction" in mathematics learning. Of the
seven other books that can be classed in the same genre, [2] to [8],
those by Kenyon [4] and by Webber and Brown [8] are notable for the
inclusion of substantial material on geometry, and the Paige, Willcutt,
and Wagenblast book [5] is accompanied by six supplementary programmed
booklets that could be used in any elementary course.

A completely programmed course in algebra [9], developed as part
of the Minnesota Mathematics and Science Teaching Project and tested
extensively with preservice and inservice teachers, has been placed on
the market in its latest edition, together with a Summary Textbook.
The course treats the basic ideas of algebra, with emphasis on the real
number system. A similar textbook, not programmed, was designed by Wren
and Lindsay [10] for a one-semester course in algebra for upper elementary
and junior high school teachers. More advanced, and probably more
appropriate for secondary school teachers, is the textbook by Larsen [11].

Three textbooks, [12] to [14], follow rather closely the CUPM recommendations for a course in informal geometry. Rosskopf, Levine, and Vogeli [13] give special attention to logic and include three chapters on transformation geometry. In contrast to these books, Choquet's Geometry in a Modern Setting [15] is intended primarily for secondary school teachers; it exhibits the Bourbakian, algebraic approach to geometry. More traditional, Euclidean approaches to geometry can be found in two textbooks, [16] and [17], that, although intended primarily for ordinary college geometry courses, could be used in teacher training courses.

The CUPM has also suggested, as an elective for secondary school teachers, a one-semester course on number theory. Two books, [18] and [19], are competent additions to the available titles. Neither requires much background in mathematics; both contain ample material for a one-semester course.

Prospective teachers frequently elect college courses in mathematics for liberal arts students, and writers of textbooks for such courses have begun to consider the CUPM recommendations. One of the most popular textbooks for liberal arts students, Mathematics: The Man-made Universe [20], has now appeared in a second edition. Not only is the approach to mathematics fresh and appealing, but the topics treated can easily be adapted by teachers for classroom use. Other textbooks for courses in precalculus mathematics that can be used either in liberal arts courses or in courses for secondary school teachers are two new books, [21] and [22], and two revisions of popular works, [23] and [24]. In a departure from the format usual in such textbooks, Excursions into Mathematics [25] contains essays on six topics: polyhedra, perfect numbers, area, geometries, games, and numeration systems. Each essay

begins with elementary notions and moves, in a lively, informal fashion,
into some complex and beautiful mathematics. The first of a two-volume
series, Mathematics for the Social and Behavioral Sciences [26], presents
a complete introduction to probability and statistics, and a sketchy
introduction to calculus, using problems from the social sciences to
illustrate the mathematics. Teachers looking for "real world" applications
of mathematics should find the book valuable.

Among the host of other college mathematics textbooks produced
in the United States in 1969, we cite only a few that are worthy of
special attention by teachers. Bers's Calculus [27] is a first-rate
addition to an overcrowded field. His thesis: "Calculus is the art of
setting up and solving differential equations." Blackwell's Basic Statistics
[28] takes the student with a modest background in mathematics through
an intuitive, nicely-organized presentation of the main ideas of statistics.
Coxeter's Introduction to Geometry [29] is an updated version of a well-
known undergraduate textbook that teachers should find useful as a
reference. Six other textbooks, [30] to [35], all dealing with precalculus
topics, might serve either as reference works or for independent study.

2. Books for professional reading

The best general guide to reference sources, How to Find Out in
Mathematics [36], has been brought up-to-date and reissued. Also reissued,
in a paperback edition, is the classic Soviet survey Mathematics: Its
Content, Methods, and Meaning [37]. Both works belong on the teacher's
reference shelf.

One book on the philosophy of mathematics appeared during 1969
that teachers might find helpful: the collection of papers edited by
Hintikka [38]. The papers, although technical, convey a clear sense of
current thought in the philosophy of mathematics.

Several titles in the history of mathematics appeared in 1969. The thirty-first yearbook of the National Council of Teachers of Mathematics (NCTM), Historical Topics for the Mathematics Classroom [39], contains eight chapters on the history of various fields of mathematics supplemented by 120 "capsule" histories of selected topics. The yearbook should prove invaluable both as a reference work and as a textbook for courses in the history of mathematics. The comprehensive, scholarly source book by Struik [40] reprints original texts in mathematics for the six centuries before 1800. Many of the texts appear in English for the first time. Three books, [41] to [43], deal with the history of special topics; one textbook [44] attempts a comprehensive survey.

The thirtieth NCTM yearbook [45] also appeared in 1969. Like the twenty-ninth, in 1964, it comprises articles on some of the central unifying concepts in mathematics written for elementary school teachers and published previously as separate booklets. Of the ten articles in the thirtieth yearbook, the one entitled "Hints for Problem Solving" is easily the most original and provocative. The yearbook, designed for independent study, can also be used with its companion volume in teacher training courses.

The two-volume work by Eves, In Mathematical Circles [46], contains 360 little stories about mathematics and mathematicians that teachers can use in the classroom. Teachers might also wish to reread, and recommend to their students in its inexpensive paperback edition, Hardy's A Mathematician's Apology [47], with a foreword by C. P. Snow. Two books for the "literate layman," The Spirit and the Uses of the Mathematical Sciences [48] and The Mathematical Sciences: A Collection of Essays [49], contain cogent expositions of modern mathematical

thought, research, and applications that will interest the mathematically literate professional. The third American edition of Steinhaus's classic Mathematical Snapshots [50] presents many interesting mathematical ideas in an attractive format. And C. Stanley Ogilvy, whose books for the layman have been valuable sources of ideas for teachers, has come up with a new book on geometry [51] that continues his unique combination of scholarly standards and lucid writing.

Not for the layman, but useful for the well-prepared teacher, are three recent books. Dieudonné's book [52], addressed to mathematics teachers in France, has appeared in an English translation after five years. Dieudonné proposes a course in geometry for secondary schools based on the vector space approach. Since his arguments are beginning to be implemented in experimental curricula, his work deserves serious study by mathematics educators. A collection of papers on calculus drawn from the first 75 volumes of the American Mathematical Monthly and the first 40 volumes of the Mathematics Magazine has been assembled by a distinguished editorial panel and published by the Mathematical Association of America [53]. Every calculus teacher will find the collection indispensible. Also produced by the MAA is a collection of papers on contemporary research in number theory [54]. Some previous acquaintance with number theoretic ideas is necessary for understanding most of the papers.

Books that a high school teacher might wish to read and pass on to his students as supplementary reading include a second collection of original puzzle problems by Barr [55], an introduction to cryptanalysis (the twenty-second volume in the monograph project of the School Mathematics Study Group) [56], and two translations of Soviet works in the Library of School Mathematics series, [57] and [58].

Of the school mathematics textbocks published during 1969, six
merit special attention. An unusual experimental geometry textbook for
high school honors students has been published commercially [59].
It develops geometry from a small number of axioms using affinities
and algebraic concepts. An adaption of a School Mathematics Study
Group (SMSG) textbook Algorithms, Computation, and Mathematics has also
been published commercially [60]. Preliminary editions appeared during
the year of SMSG's Calculus of Elementary Functions [61]--designed for
the College Entrance Examination Board's Calculus AB advanced placement
syllabus--and Secondary School Mathematics: Sample Chapters [62]--
illustrative of SMSG's "second round" of junior high school curriculum
reform. Another experimental curriculum reform project is the Secondary
School Mathematics Curriculum Improvement Study (SSMCIS), which has
published a revised edition of its ninth-grade course [63] and an
experimental edition of its tenth-grade course [64]. SSMCIS, heavily
influenced by recent developments in European secondary school curricula,
is developing a six-year unified mathematics program for talented students.

3. Books on teaching methodology

One of the most interesting books on teaching to appear in recent
years is Biggs and MacLean's Freedom to Learn [65], which is designed
to help teachers recenter their textbook-and teacher-dominated mathematics
programs around the activities of children. Numerous examples and practical
suggestions enhance the book's value. A laboratory manual [66] for a
course in number systems for elementary school teachers is listed here,
rather than with the textbooks, because it has proved to be a useful device
for acquainting teachers with the mathematics laboratory approach. The

manual is certain to be widely used and copied. Other methodological

works are, at the elementary school level, the books by Collier and

Lerch [67], by Feldman [68], and by Vigilante [69]; and, at the secondary

school level, the book by Fremont [70].

4. Books on research in mathematics education

Several reviews of research in mathematics education, [71] to

[74], and a journal of abstracts, [75], were published during the year.

Reports from the National Longitudinal Study of Mathematical Abilities,

conducted by SMSG, [76] to [78], continue to appear at intervals. SMSG

has also undertaken, together with the Survey of Recent East European

Mathematical Literature, the translation of Soviet pedagogical studies in

mathematics education. The first three of a series of fifteen volumes have

been published, [79] to [81].

Explications for educators of Piaget's thought and work have

mushroomed recently. Four that mathematics educators may find helpful are

listed, [82] to [85].

The summer institute program established by the National Science

Foundation for the inservice training of secondary science and mathematics

teachers is a major success story in recent American education. A history

by Krieghbaum and Rawson [86] of the first dozen years of the program,

from 1954 to 1965, makes interesting reading.

5. Committee and conference reports

We conclude by mentioning three committee reports and two

conference reports. The committee reports, [87] to [89], are three

additions by the CUPM to is distinguished series of recommendations for

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college mathematics programs. The two conference reports, [90] and [91], are the report of the Cambridge Conference on the Correlation of Science and Mathematics in the Schools, held August 21 to September 8, 1967, in Brookline, Massachusetts; and the proceedings of the National Conference on Computer-Assisted Instruction, held September 24 to 26, 1968, at Pennsylvania State University.

J. Kilpatrick, New York

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Zentralblatt für Didaktik der Mathematik

Report on the Literature in the United States, 1970, Part 1

This report surveys the literature on the pedagogy of mathematics that was published in the United States in the first three quarters of 1970. A subsequent report will treat the last quarter of 1970, picking up any publications that were missed in this survey.

As usual, the largest category of publications consists of textbooks for college mathematics courses. The number of such books published each year in the United States is so large that this survey must be limited to books explicitly designed for teacher education courses plus selected titles that might be of special interest to teachers. The other categories in the report are books for professional reading, methods books, books on research, and conference reports.

1. Mathematics textbooks for teachers

A baker's dozen new titles, [1] to [13], have been added to the rapidly growing number of textbooks for general mathematics courses that enroll liberal arts students or prospective teachers or both. Notable among these titles is Kelley and Richert's book [9], a unique blend of "content" and "methods" designed to be of direct assistance to elementary school teachers. Also worthy of special attention are the books by Armstrong [1] and Douglis [2], both organized around key ideas in mathematics. The books by Evans [3], Herrick [5], Jones [7], and Nichols [10], although aimed less at teacher education courses than the other books listed, deal with many of the same topics.

Three programmed books, [14] to [16], might be helpful to teachers taking general mathematics courses. The title of Hardy's book [15] is a little misleading since the book contains exercises in sets, relations, mappings, and number theory,

as well as group theory. Paige and Beattie's set of programmed booklets
[16] is designed to accompany the Paige, Willcut, and Wagenblast book
Elementary Mathematics published in 1969.

Two books on arithmetic, [17] and [18], and four on number theory,
[19] to [22], could be used as textbooks in courses for teachers. Dutton,
Petrie, and Adams's Arithmetic for Teachers [18] places particular stress on
issues of instruction, but is somewhat thin in content. Vanden Eynden's
Number Theory: An Introduction to Proof [22] is noteworthy for its attention
to the heuristics of proof construction.

Teachers with little or no background in abstract algebra might find
the textbook by Weiner [23] a useful introduction even though the book is not
directed primarily at teachers or prospective teachers. A textbook for an
integrated course in algebra and geometry for elementary and junior high
school teachers has been developed by Brumfiel and Vance [24]. Colleges
that have been offering separate courses in algebra and geometry, as
recommended by the Committee on the Undergraduate Program in Mathematics
(CUPM), may wish to experiment with an integrated course using the Brumfiel
and Vance book. For those colleges that offer separate courses, four new
textbooks, [25] to [28], have appeared that follow, more or less, the CUPM
recommendations for a course in informal geometry for elementary school
teachers.

Teachers of high school courses in elementary functions may find useful
ideas in two college precalculus textbooks, [29] and [30]. The book by
Sorgenfrey and Beckenbach [30] looks especially promising as a source of ideas.
Applications of mathematics that high school teachers could use in their
classes can be found in abundance in four new college textbooks, [31] to [34].

In particular, Mosteller, Rourke, and Thomas's well-known Probability with
Statistical Applications [33] has been updated and expanded, and now includes
projects that can be carried out on a computer. Since computer terminals
are becoming fixtures in more and more high school classrooms these days,
teachers may be interested in the book by Hull and Day [35] and the two books
by Sterling and Pollack, [36] and [37] (which differ only in the computer
language used). All three books introduce the reader to some fundamentals
of computer science.

Calculus textbooks of all sorts continue to proliferate. Listed here
are five, [38] to [42], that illustrate the turning away from rigor and
formalism toward intuitive arguments and applications that is beginning to
characterize American calculus textbooks. The two shortest of these--
Lowengrub and Stampbli's Topics in Calculus [40] and Richmond's Calculus:
A Short Course [41]-- are designed for one-semester courses for liberal arts
students.

2. Books for professional reading

W. W. Sawyer has published the third book [41] in a series entitled
Introducing Mathematics and designed to give the interested layman an idea of
how mathematics works. Teachers will want to borrow many of Sawyer's
inventive techniques. A more comprehensive treatment of modern mathematics,
both pure and applied, for the general reader is Kramer's book [44].

Books on special topics are Buchanan's brief treatment of limits of
sequences leading to infinite series and continuous functions [45]; DeLong's
non-technical, descriptive account of mathematical logic, its history, and
its import [46]; Bolt and Wardle's excellent introduction to computers and
why they do that elementary school teachers could use with profit [47]; and

Bellman, Cooke, and Lockett's elementary introduction, through dynamic programming

and graph theory, to computer methods used in operations research [48].

W. L. Schaaf has expanded to two volumes his well-known bibliography of some

five thousand books, articles, and pamphlets on puzzle problems, mathematical

curiosities, and other "recreational mathematics" [49]. Three recent books on

recreational mathematics have also appeared, [50] to [52]. High school teachers

may wish to read and pass on to their students a revision of a popular handbook

on how to study mathematics [53].

3. Books on teaching methodology

Several recent books deal with methodology in the context of other concerns,

but are cited in this section nonetheless. The thirty-second yearbook of the

National Council of Teachers of Mathematics [54] traces the historical origins of

current practices in mathematics education in the United States and Canada. It

is a valuable book for anyone concerned with issues and problems in mathematics

education. A useful accompaniment to the thirty-second yearbook, and published

at the same time, is a collection of readings in the history of mathematics

education [55], which contains reprints (mostly excerpts) of many notable and

difficult-to-obtain documents, position papers, and committee reports. Another

book of readings [56] reprints a heterogeneous collection of recent articles on

the teaching of elementary school mathematics. The articles vary considerably

in quality and usefulness, but they do give a comprehensive picture of the

literature.

Part I of the sixty-ninth yearbook of the National Society for the Study of

Education is entitled Mathematics Education [57] and contains thirteen essays for

educators on various aspects of the revolution in school mathematics, ranging from

an outline of the treatment of geometry in the curriculum to discussions of

problems of evaluation. Of the many fine chapters, two deserve special mention

here: Lee Shulman's linkage of current issues in psychology to issues of mathe-

matics instruction--destined to become a classic statement---and Henry Pollak's

provocative discussion of applications of mathematics and the difficulties of

getting them into the curriculum. Concluding this sequence of publications that

have much to say about methodology, although they are not "methods books," is a

pamphlet [58] aimed at informing elementary school principals and mathematics

specialists about factors influencing the effectiveness of elementary school

programs. Teachers and laymen should also find the pamphlet helpful.

A book missed in the review of the 1969 literature is DeVault and Kriewall's

textbook that sets forth a systems approach to elementary school mathematics [59].

Among this year's crop of methodological works are two attempts to delineate the

discovery approach, one for elementary school teachers [60] and one for secondary

school teachers [61]; a methods course built on Piaget's work and emphasizing how

children learn rather than how to teach [62]; an elaborate, theory-based exposition,

using notions from Dewey and Piaget, of how problems can be used to capitalize on

the child's natural motivation to learn mathematics [63]; and a comprehensive,

useful guide to the laboratory approach in grades 5 through 9 [64].

4. Books on research in mathematics education

Eleven bulletins prepared as part of the Interpretive Study of Research and

Development in Elementary School Mathematics [65] are available as a set. Each

bulletin contains a discussion, at a level that teachers, principals, and supervisors

can understand, of selected research findings on a given topic. Two reports of

research have appeared in book form: Almy and associates' study of the effect of

early instruction in science and mathematics on the later development of logical

thinking [66], and Fey's analysis of the verbal interchanges between teachers and

students in seventh grade mathematics classes [67]. A valuable account of seminars on

problem solving and productive thinking given by Max Wertheimer at the New School in

New York in the late 1930's has just been issued in three volumes [68]. Wertheimer

used many mathematical problems to illustrate his theories; few psychologists have more

to say to mathematics educators about problem solving and how it might be taught.

As a footnote to this section, 1970 marked the appearance of the National Council

of Teachers of Mathematics' Journal for Research in Mathematics Education, which clearly

will do much to raise the level of the design and reporting of research in the field.

5. Conference reports

Only one report is listed: the report of a colloquium held at the University of

Illinois College of Education in October 1969 that dealt with the preparation of

teachers of mathematics teachers [69].

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Zentralblatt für Didaktik der Mathematik

Report on the Literature in the United States, 1970, Part 2;

1971, Part 1

By

Jeremy Kilpatrick

This report covers the last quarter of 1970 and the first quarter

or so of 1971. It is intended as a fairly comprehensive survey of

books on the pedagogy of mathematics that were published in the

United States during the period. The titles surveyed include

college mathematics textbooks appropriate for teacher education

courses, books for professional reading, methodological works,

reports of research, and committee and conference reports.

1. Mathematics textbooks for teachers

Like crabgrass in June, mathematics textbooks for teacher

education courses continue to multiply. Allendoerfer's book [1]

is unusual among the most recent crop of textbooks in elementary

mathematics because it grew out of an attempt to design a

"multimedia" course. The text materials, tested in classroom

tryouts, include readiness tests, programmed exercises, and

summary tests; thirteen supplementary films are available. Of

the other general texts in elementary mathematics, [2] to [6],

Fletcher and Howell's book [2] is notable because it exemplifies

the Nuffield approach as applied to teacher education, and

Phelps' book [6] is different because it provides a condensed

treatment of topics the other books treat in more detail: the

real number system, informal geometry, and measurement. Moser's

text [7] is designed for a first college course in Euclidean

geometry.

For secondary school teachers, Hall and Szabo [8] have

used isometries to develop Euclidean plane geometry, Peterson [9]

has written a careful introduction to fundamental concepts of

number theory and modern algebra, and Sloyer [10] has organized

a problem-centered approach to many of the same concepts. A

truly monumental work is Griffiths and Hilton's A Comprehensive

Textbook of Classical Mathematics: A Contemporary Interpretation

[11], which grew (considerably) out of a course in modern

mathematics for teachers that was given at the University of

Birmingham in England. The purpose was to treat topics from

classical mathematics from a modern standpoint so as to bridge

the gulf between school and university mathematics, the gulf

between the eighteenth century mathematics used by scientists

and engineers and the contemporary mathematics used by mathe-

maticians. Teachers in junior colleges and community colleges

ought to find the text especially useful, but it would be a

handy reference for any secondary school or college teacher.

Two books on sets, [12] and [13], two on finite

mathematics, [14] and [15], and one on number theory [16], although not intended particularly for teacher education courses, could be used there. Two new college geometry textbooks, [17] and [18], could also be used by teachers in training. Blumenthal and Menger's Studies in Geometry [17] is the weightier (526 pages) and the more advanced; it covers lattice geometries, metric geometry, the geometry of projective and related spaces, and curve theory. Levy's Geometry: Modern Mathematics via the Euclidean Plane [18] focuses on transformations; it uses the Euclidean plane to introduce students to modern ideas concerning number systems, algebra, and geometry.

A statistics text that could be used either in a teacher education course or in a unit on statistics in high school is Noether's Introduction to Statistics: A Fresh Approach [19]. It presupposes only high school mathematics. Two calculus textbooks of greater-than-usual merit, [20] and [21], might be useful sources of ideas for teachers.

2. Books for professional reading

Teachers of calculus should be interested in Grattan-Guinness's account [22] of how the foundations of mathematical analysis developed, as reflected in the solution of the vibrating string problem. Three recent biographies of mathematicians--Charles Babbage [23], Carl Friedrich Gauss [24], and David Hilbert [25]-- provide readable portraits of the men, their lives, and their

work that students and teachers alike will find enlightening.

Other books that a teacher might wish to read and pass on to his students include a history of systems of weights and measures (with arguments for and against U.S. conversion to the metric system) [26], and introduction to linear programming for the general reader [27], a collection of short, self-contained essays illustrating the elegant and the ingenious in mathematical thinking (the twenty-third volume in the monograph project of the School Mathematics Study Group) [28], a treatise on beauty in mathematics, built around the golden section [29], a problem-centered book on elementary number theory [30], and a reissued classic for young children that introduces geometry through paper-folding [31].

A valuable reference book for school libraries is the Handbook of Tables for Mathematics [32], available also in a students' version [33]. Libraries, high school teachers, and counselors should have the most recent edition of the Mathematical Association of America's guidebook to undergraduate and graduate departments in the mathematical sciences [34]--a goldmine of useful information. Similarly, the updated survey of curriculum projects in science and mathematics by the American Association for the Advancement of Science (AAAS) and the Science Teaching Center at the University of Maryland [35] provides a wealth of information not available elsewhere. The AAAS has also produced a new edition of their list of science books for the professional

library [36], which contains a 32-page annotated listing of titles in mathematics. A more comprehensive list for schools is provided by the fourth edition of Schaaf's The High School Mathematics Library [37].

3. Books on teaching methodology

The thirty-third yearbook of the National Council of Teachers of Mathematics (NCTM) is entitled The Teaching of Secondary Mathematics [38]. It contains sixteen chapters dealing with various components of the instructional process. Rather than duplicate existing methods books, the authors attempted to anticipate future problems of instruction, discussing strategies for putting theory into practice and providing illustrations of classroom applications. As a supplement to the yearbook, which treats questions of evaluation rather lightly, teachers will find James Wilson's paper on the evaluation of learning in secondary school mathematics [39] to be both a definitive statement and a practical guide.

A practical book of a different sort is Krulik's Handbook of Aids for Teaching Junior-Senior High School Mathematics [40], which shows how to construct and use 41 inexpensive devices for illustrating mathematical ideas. The NCTM has put together, in two volumes, thirteen units designed to provide meaningful mathematical experiences for low achievers in grades 5 to 8 [41]. The text is chiefly a teacher's guide; it is accompanied by a

teaching package of worksheets, transparencies, and activity
materials.

For elementary school teachers, the NCTM has reprinted
selected articles on the teaching of geometry that appeared in
the Arithmetic Teacher from 1950 to early 1970 [42]. A teacher's
guide for a unit in informal geometry that introduces concepts of
transformation geometry, symmetry, and group theory [43] has also
been published by the NCTM. Lovell's The Growth of Understanding
in Mathematics: Kindergarten through Grade Three [44] uses
Piaget's developmental theory as a framework for analyzing
elementary mathematical concepts and suggesting appropriate
instructional activities.

Other methodological works for elementary teachers
include a book of readings [45], three textbooks, [46] to [48],
and a study guide [49].

4. Books on research in mathematics education

Ashlock and Herman have prepared a collection of recent reports
of research, curriculum development, and evaluation in elementary
mathematics [50]--apparently the only collection of its kind now
available. Reports of research that have appeared in book form
are Dienes and Jeeves' second monograph on investigations of the
learning of group structures [51], another in the series of
textbook comparison reports from the National Longitudinal Study
of Mathematical Abilities [52], and the fourth volume in a series

of translations from the Soviet literature on the pedagogy of mathematics [53].

5. Committee and conference reports

The Committee on the Undergraduate Program in Mathematics has issued a new report [54] in its series of recommendations for college mathematics programs. The report outlines a one-year basic mathematics course, Mathematics E, using computer-related mathematics, accompanied by a mathematics laboratory, and designed to replace current college courses in arithmetic and elementary algebra. A series of essays on the role of mathematics in the expansion and development of the social sciences can be found in the report of the Mathematical Sciences Panel of the Behavioral and Social Sciences Survey [55].

A sample curriculum in probability and statistics is presented in the first report of a Canadian committee studying the K-13 curriculum in arithmetic and algebra [56]. Probability and statistics was also the subject of the first international conference of the Comprehensive School Mathematics Program in March 1969. The papers delivered at the conference have been collected and published [57].

The report of a Conference on Responsibilities for School Mathematics in the 70's [58], held in San Francisco in October 1970 and sponsored by the School Mathematics Study Group, contains the major addresses, summaries of the discussions, and a proposal for a new organization for mathematics education.

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Zentralblatt fur Didaktik der Mathematik

Report on the Literature in the United States, 1971, Part 2

The literature surveyed in this report consists of books on the pedagogy
of mathematics published in the United States. The report covers the
last three quarters of 1971, but it includes a few titles missed in
previous reports.

1. Mathematics textbooks for teachers

Among the several textbooks for elementary school teachers, five, [1] to
[5], are relatively comprehensive in content. The book by Dinese [1] spans
modern elementary mathematics from sets to vector spaces, with attention
to transformation geometry and logic. The others are somewhat more
restricted in coverage. Forbes and Eicholz's book [2] gives a fairly
rigorous development of concepts from the elementary school curriculum,
together with some strategies for teaching the concepts. Scandura's
book [4] contains even more material on teaching methodology and school
learning.

The other textbooks for elementary school teachers are more
focused in content. Two, [6] and [7], are designed for a course on
number systems, and one [8] combines material on number systems with an
introduction to algebraic concepts in a relatively rigorous and formal
approach. The theory of elementary school arithmetic is developed in
two books, [9] and [10]; elementary notions of geometry are given in
three others, [11] to [13].

Textbooks for all-purposed liberal arts mathematics courses continue to turn up in quantity. Of the ten listed, [14] to [23], the most unusual is Jacobs's Mathematics: A Human Endeavor [19], which presents elementary content in an original, appealing manner. The other books generally contain more advanced content. Most of them would be useful references for junior or senior high school teachers; many contain interesting examples that teachers could use in class.

The textbook for secondary mathematics teachers by Peressini and Sherbert [24] is composed of self-contained chapters on such topics as set theory, number systems, graph theory, and the geometry of complex numbers--each accompanied by historical remarks and references. Several textbooks for college courses in algebra, [25] to [32], might be used with classes of secondary mathematics teachers. The most elementary of these books is the fifth edition of a widely used college algebra textbook [30]. Secondary mathematics teachers would find especially helpful two intro-ductory treatments of abstract algebra, [25] and [27].

2. Books for professional reading

Two books, [33] and [34], have appeared that introduce the basic concepts of mathematical logic; teachers may find them useful for self-study. A short paperback on statistics [35] offers many examples and counterexamples that can be used in instruction. Students and teachers looking for appli-cations of mathematics may be interested in Restle's introduction to mathematical models in psychology [36]. Two books of essays for the general reader on computers, [37] and [38], should also appeal to teachers and students alike.

Several important classics have been reissued recently, including an account of the geometric theories of the circle and sphere [39], an analysis of the mathematical references in Aristotle's writings [40], a new edition of Hilbert's Foundations of Geometry [41], and an examination of various attempts, successful and otherwise, to construct an angle trisector [42]. The National Council of Teachers of Mathematics (NCTM) has published in paperback [43] twenty-five "capsule" histories of topics in algebra that originally appeared in the thirty-first NCTM yearbook.

The history of non-decimal place-value numeration is exhaustively treated in a recent monograph [44]; teachers may find it a helpful source of information. Another treatise [45], in this case dealing with geometry, illustrates numerous relations between solids with excellent photographs and a lucid text. A popularization of mathematics for the layman [46] might offer some pedagogical hints for teachers; a translation of two volumes of essays by French mathematicians [47] might place in perspective some key mathematical ideas.

Eves has published a sequel to In Mathematical Circles: 360 additional anecdotes about mathematics and mathematicians that teachers can borrow for use in class [48]. A compendium of works about mathematics by non-mathematicians has been assembled by Linn [49]. Several books on recreational mathematics, [50] to [53], have appeared. One [53] is appropriate for junior high school students; the others are more advanced. A collection of seven essays by high scorers in the National High School Mathematics Contest on how mathematics is related to their subsequent careers [54] should be read by high school teachers and passed on to their interested students.

Recent books for the teacher's reference shelf include a library list for mathematics departments in two year colleges [55], a compilation of more than 600 activities for the elementary school mathematics classroom [56], a collection of geometry problems to supplement a regular course [57], an up-to-date bibliography of audio-visual materials for school mathematics course [58], and a definitive set of instructions for making models of the 75 known uniform polyhedra plus some stellated forms [59].

Of the numerous school mathematics textbooks that have been published recently, six merit special attention. Two textbooks have appeared that foreshadow the incursion of transformation geometry into the American high school curriculum. One contains material for a year course [60]; the other is designed to follow a compressed treatment of the standard Euclidean geometry course [61]. Four short experimental textbooks written for British secondary school students, [62] to [65], could be employed both as background reading and as sources of exercise material.

3. Books on teaching methodology

The informal mathematics classroom of the British primary school is the subject of a short, anecdotal book by Biggs [66], which includes some helpful references. Stern and Stern [67] offer a detailed introduction to their structural approach to arithmetic in a volume designed to accompany the Stern apparatus. A more conventional and comprehensive methods book for elementary school teachers is the second edition of the textbook by Heddens [68].

A research-based approach to the teaching of mathematics has been developed by Dienes and Golding [69], who use the results of their own and others' experimentation to derive instructional principles. Secondary school teachers will find the volume edited by Servais and Varga [70] a valuable set of essays by European mathematics educators on a variety of themes, such as the treatment of the axiomatic method in the classroom and a survey of the psychological and educational research related to the teaching of school mathematics. A wide-ranging bibliography, sample syllabi, and examples of classroom lessons are included. Bassler and Kolb [71] have put together a secondary mathematics methods textbook that is short on exposition and long on exercises and activities. The first fifteen chapters treat general pedagogical issues; the last five treat problems of teaching specific school subjects. Two anthologies of periodical articles of interest to secondary school teachers have appeared, [72] and [73].

An adaptation for mathematics educators of a general supervision model, dealing with curriculum development, inservice work, materials, and evaluation, has been published in paperback [73]. Collections of so-called "behavioral objectives" for mathematics are being assembled in various centers in the United States. One collection [75]--written by classroom teachers, tried out in schools, and used in a program of individualized instruction--is available as part of a set of four volumes, each concerning a school subject. A biannual journal for mathematics teachers in two year colleges [76] began publication in 1970; its emphasis is more on methodology than content.

4. Books on research in mathematics education

Reports of research that have appeared in book form are four more monographs from the National Longitudinal Study of Mathematical Abilities, [77] to [80], and the fifth volume in a series of translations from the Soviet literature on the pedagogy of mathematics [81].

A readable introduction to the concepts and writings of Piaget [82] has been added to the growing literature on his work. Also listed here--although equally appropriate to the next section--is the report of a conference on Piagetian research held at Columbia University in October 1970 [83]. The report contains the fourteen papers given at this conference of mathematics educators and psychologists.

5. Committee and conference reports

The Committee on the Undergraduate Program in Mathematics has issued two new reports in its series of recommendations for college mathematics programs. One outlines an undergraduate program for prospective graduate students in statistics that is designed for college mathematics departments having no specialized statistics program [84]. The other proposes a curriculum in computational mathematics for undergraduate mathematics majors [85]. A series of papers and recommendations on the place and purpose of computer sciences in secondary schools can be found in the report of a seminar of the Organization for Economic Cooperation and Development [86]. Recommendations for the teaching of computation, logic, and problem solving are presented in the second report of a Canadian committee studying the K-13 curriculum in arithmetic and algebra [87].

The International Commission on Mathematics Instruction has prepared a second volume of papers on issues and trends in mathematics teaching [88]. A nice supplement to the ICMI collection is the Secondary School Mathematics Curriculum Improvement Study's survey of trends and content in the secondary mathematics programs of several European countries and Japan [89]. Finally, the Project on the Education of Secondary School Teachers of Science and Mathematics has issued a series of guidelines for the planning, implementation, and evaluation of preservice education programs for secondary school science and mathematics teachers [90].

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Literaturbericht aus den USA

Report on the Literature in the United States, 1972

The literature surveyed in this report consists of books on the pedagogy of mathematics published in the United States during 1972.

1. Mathematics textbooks for teachers

The deluge of mathematics content textbooks continues, as does the difficult task of locating those which will meet teacher and learner needs. The difficulty of listing potentially appropropriate texts is compounded by the wide diversity of courses available to secondary-school teachers.

For elementary-school teacher-preparation courses, the range is more defined and limited. Several texts, [1] to [4], have appeared on geometry for elementary-school teachers. Bouwsma [1] appears to be one of the best in terms of presentation and scope. The second edition of Smart [2] incorporates many of the more recent geometric topics; the emphasis is on an informal and intuitive approach.

For number-oriented courses, there is also some variety from which to select, [5] to [17]. One book that has been highly recommended is by Spragens [5]; he presents formal mathematics with explanations which should be meaningful to an elementary-school teacher. The revision by Ohmer, Aucoin, and Cortez [6] is also strong on content, but the student may need more guidance in ascertaining what is really appropriate for elementary-school classrooms. Another book which is highly recommended is an NCTM publication edited by Ruderman [7]; it is one component of a

program that includes teacher-training films and single-concept films for students. The focus is on content, but there are also extensive suggestions for teaching. Maxfield and Maxfield [8] presumes no background other than basic algebra and provides the prospective teacher with some opportunities to experiment with numbers.

Callahan, Sternberg, and Weiss [12] present a carefully selected and organized set of mathematics laboratory activities as they integrate mathematics content with activities illustrating mathematical principles.

Matchett and Snader [13] systematically develop standard elementary-school content in a book designed for independent study; some students might find it useful for review. A partially programmed workbook [14] is more limited. Among the general texts are three that might serve for a general review, [15] to [17].

For secondary-school teachers, Zehna and Johnson [18] present a semiaxiomatic approach for a course in set theory. Three books, [19] to [21], provide an introduction to number theory; Niven and Zuckerman [21] continues to be recognized as an outstanding text for the well-prepared student.

A survey of geometry by Eves [22] carries the same philosophy and spirit as the 1963 edition. It incorporates historical developments, foundations and a variety of geometries, with many excellent problems. Dodge [23] is intended particularly for the teacher of Euclidean geometry. Analytic geometry texts include two designed for a precalculus course, [24] and [25], and one very readable introduction to affine and projective planes, for advanced students [26].

Calculus books continue to abound, [27] to [43]; there is a range

of difficulty and a selection of approaches. Dorn, Bitter, and Hector

[43] provide a welcome supplementary text: they augment the traditional

first-year calculus course by illustrating a computer approach to many

topics, cross-referenced to fifteen widely-used calculus texts. Anderson

and Hall [44] is designed to bridge the gap between calculus and advanced

calculus.

Abstract algebra is the topic of several books, [45] to [51], which

vary in approach. Cockcroft [47], for instance, uses complex numbers

as a vehicle for developing algebraic structures; Hall [48] uses many

concrete illustrations, while Budden [45] provides hundreds of diagrams,

for a valuable source of classroom examples. Ireland and Rosen [52]

assume a knowledge of abstract algebra in a difficult but interesting

text on number theory.

Other books are explicitly on linear algebra, [53] to [60], and

differential equations, [61] to [68]; several, [62], [64], [66], [68],

are recommended as excellent texts on this topic.

Youse [69] is a text for those who are familiar with calculus and

are ready for a rigorous course in analysis. The text on complex variables

[70] also requires a good background in basic calculus. Two texts on

numerical analysis are noted, [71] and [72], which might serve as references

for the teacher of advanced computer-mathematics courses.

2. Books for professional reading

Skemp [73] makes a significant contribution to mathematics education

with The Psychology of Learning Mathematics, in which he presents his

understanding of mathematics and psychology in a readable style, followed

by some "elementary mathematics from an adult viewpoint". Teachers at all levels should find it a useful book. SMSG has filled another need by publishing selected theoretical papers of William A. Brownell [74], who played a definitive role in elementary-school mathematics education. The ERIC Center for Science, Mathematics, and Environmental Education published a monograph [75] which explores the scope of meaningful instruction, the topic with which Brownell was closely identified.

The Thirty-fifth Yearbook of the NCTM [76] presents specific ideas and techniques to help the teacher of the slow learner teach for affective as well as cognitive goals. Research findings and techniques for selecting appropriate objectives are included as well as explicit discussion of various programs, materials, teaching styles, and activities.

Four publications present information on curriculum development projects: the first [77] cites over 300 elementary-school projects of which 28 are in mathematics; a second [78] presents an analysis of six well-known projects of the mid-60s; a third [79] indexes several science-mathematics programs by topic. The fourth is the most comprehensive: the Eighth Report of the International Clearinghouse on Science and Mathematics Curricular Developments [80], which presents extensive data on projects all over the world.

Several resources on history were published in 1972. One that has received much attention is that by Kline [81], in which the history of mathematics is organized around the central ideas of mathematical thought. Mathematics is identified with the mathematicians involved and is placed in the prevailing social and political perspective. Gillings [82] builds a case for Egyptian mathematical achievement, based on study of original

sources. The first of an anticipated three volumes with biographical
sketches on mathematicians also appeared [83].

Many teachers as well as parents used Adler's first book on the
"new mathematics"; now there is a revision [84]. Adler also edited another
book of interesting readings about mathematics from varied literature [85].
And there is a bagful of books into which the teacher can dip for ideas to
enjoy or to bring into the classroom. There are books of problems, [86]
and [87]; puzzles, [88] to [90]; facts and fables [91]; questions that
might be asked [92]. There is treatise on the arithmetic nature of Dede-
kind sums [93]; two books on Fibonacci sequences, [94] and [95]; one
book on the golden section which illustrates ways in which mathematical ideas
are interrelated [96]; and one presentation of geometric dissections [97].
Krulik [98] contains 36 activities for secondary-school mathematics
laboratories, including activities for pre-algebra, algebra, geometry,
topology, and probability and statistics.

Teachers may find that a guide to resources on space mathematics [99]
is useful--or they can come down to earth with a book on statistical
techniques [100]. For building background on the metric system, there is
a programmed text [101], or a rationale for metrication [102]. Another
book [103] presents 44 essays which explain how statistics and probability
were used to solve real-life problems in a variety of fields. Crossley
et al. [104] is a collection of six related lectures summarizing some of
the most significant ideas of mathematical logic.

Other reference works, [105] to [109], include another edition of
the NCTM listing of mathematics tests [105], a directory of mathematical
historians [106], the fifth edition of a guidebook to departments of

mathematical sciences [107]. Among the biographies are ones on Einstein [110], Fourier [111], and Newton [112].

3. Books on teaching methodology

Two of the books on teaching elementary-school mathematics focus on diagnosis and remediation for specific computational abilities. Reisman [113] discusses specific case studies, with some explicit suggestions and diagnostic tests. Ashlock [114] provides guidance to the teacher in developing simple techniques for remediation. The reader's attention is focused on the sources of errors, rather than the number of errors.

Underhill [115] provides a strong theoretical base for mathematics teaching and then helps teachers to apply that base to instructional problems by providing a wide variety of specific examples. The second edition of Copeland [116] emphasises content more than methodology, but the strongest points are those at which he discusses Piagetian ideas on mathematics learning. Another second edition is Fehr and Phillips [117], with careful pedagogical analysis of the content of contemporary elementary-school mathematics. Computational technique and structure are emphasized.

Fletcher and Howell [118] present a brief introduction to mathematical concepts in each chapter, followed by a variety of related teaching techniques for middle-school mathematics. Two more Nuffield guides were published [119]. And Biggs [120] provides a series of specific practical suggestions for classroom use in mathematics laboratories. The book by Greenes, Willcut, and Spikell [121] presents many others, with open-ended problem solving as the central process.

One Canadian book deserves special mention, for there are few books

specifically for the teachers of young children, and this is a helpful one. Nelson and Liedtke [122] present a series of experiences for children aged 4 and 5 to help them to acquire a conceptual basis for school mathematics.

Sund and Picard [123] is a text concerned with the writing of all types of behavioral objectives. It gives examples, sets up criteria for selection, and gives help in writing instruments to measure progress toward these objectives.

Among the few books on methods of teaching secondary-school mathematics is the second edition of Johnson and Rising [125], designed to help the teacher select and use effective methods, with a balance of content and processes for using that content in teaching. Rising and Wiesen [126] is a collection of 86 readings in which the articles are related to six popular methods texts; categories by topic, basic classroom activity, special technques; and enrichment lessons make it more readily usable. Weiss [127] presents a review of secondary-school geometry with the added features of suggestions for motivation, visual aids, teaching strategies, student and teacher activities, and enrichment materials.

4. Books on research in mathematics education

To accompany the collection of theoretical papers by Brownell [74], SMSG has published a collection of some of his research articles [128]. Researchers welcome the re-appearance of these significant studies, most of which had an impact on practice in the mathematics classroom.

SMSG has also published most of the remaining studies that were planned as reports on the National Longitudinal Study of Mathematical Abilities

[129] to [145]. Among these is a.report on attitudes [133], with the
data indicating that attitudes tend to be less positive as students
progress through the secondary school. Other reports present data on pat-
terns and on correlates of achievement gleaned from the five-year
study.

Still another SMSG publication is Volume VI of the Soviet Studies
in the Psychology of Learning and Teaching Mathematics, this one on
instruction in problem solving [146].

The ERIC Center developed several research reviews for mathematics
educators, [75] and [147] to [149].

5. Committee and conference reports

The four reports from the CUPM, [150] to [153], each present
suggestions or guidelines for teachers of college mathematics. The
report by Jewett and Phelps [154] presents data from a survey by the
CBMS about mathematics offerings from 2300 institutions.

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Literaturbericht aus den USA

Report on the Literature in the United States, 1973

Books on content and methodology for mathematics education which
were published in the United States during 1973 are surveyed in
this report.

1. Mathematics textbooks for teachers

Each year we witness the hopeful production of new books and
new editions of old books to meet the continual need to develop the
often-minimal mathematics background of prospective elementary-school
teachers. Two of the 1973 crop which have been particularly recommended
are Webber [1] and Wren [2], each presenting a careful, comprehensive
development of the mathematics in elementary programs. Meserve and
Sobel [3] relate number system concepts to the needs of elementary-
and junior-high-school students, while McFarland and Lewis [4] inte-
grate theory and skills to help prospective teachers relate the content
to future teaching situations. Others, [5] to [7], present content
which parallels that of elementary-school programs. One text [8]
is on geometry; it encourages the student to experiment and test
hypotheses.

For secondary-school teachers, Whitesitt [9] is recommended for
presenting abstract algebra as an orderly structure, with an
emphasis on rigorous proof. An advanced plane geometry text by
Allen and Guyer [10] helps students to understand the axiomatic
method. Smart [11] is designed for mathematics majors or minors;

various types of geometry are included. Several types of geometry are also briefly presented in one book which may be used as a supplementary text [12].

Preferences for other textbooks which might be used in mathematics courses for teachers vary widely, depending on the instructor and how he views the needs of students, as well as on the level of the course. For college algebra, there is a variety from which to select, including [13] to [17]. Among the texts with a focus on functions are [18] to [23]. Iglewicz and Stoyle [24] uses a problem-centered approach which stresses mathematical reasoning, and could be an excellent supplement to an introductory course.

Among linear algebra texts, [25] to [33] is Anton [25], which is clear, detailed, and moves from the concrete to the abstract. Bentley and Cooke [26] suggests integration of linear algebra and differential equations. Two others, [32] and [33], appear particularly appropriate for independent study.

The production of calculus texts of varied scope continues through every season. Thurston [34] is not heavily rigorous, but is sound and easy to comprehend. Stein [35] is clear, readable, and has numerous examples; Saltz [36] also has many illustrative exercises. Shanks and Gambill [37] attempts to help the student to gain a sound intuition about basic concepts while developing computational skill. Two others, [38] and [39], similarly take a casual, intuitive approach, while Flanders et al. [40] introduces topics through practice rather than theory. McNeary [41] could be used to supplement a basic calculus course, for which several other texts might also be considered, [42] to [44]. For longer courses, Gillman and McDowell [45]

and Greenspan and Benney [46] are suggested.

Several texts, [47] to [49], focus on probability. A readable and comprehensive text for a first course in logic is Byerly [50]. Ledermann [51] covers the fundamentals of group theory. And as a reference book for mathematicians, and especially college teachers of mathematics, Melzak [52] is recommended.

2. Books for professional reading

Several books are designed from an affective or liberal arts approach, to help the reader understand what mathematics is, [53] to [56], what mathematicians do [57], and the impact of mathematics on civilization [58].

In a critique of mathematics instruction, Kline [59] presents some general suggestions for alternatives. Drawing on the historical development of mathematics, he emphasises that rigor is relative, that terminology is worthless without meaning, that axiomatics do not promote understanding, that excessive use of symbols makes for increased memorizing, and that unnecessary new content adds to confusion.

The Thirty-fourth Yearbook of the National Council of Teachers of Mathematics [60] is a valuable source of information on instructional aids. The use of all types of materials and devices, including textbooks, computers, projections, models, and games, is discussed, with many illustrations and extensive lists of references. Another useful resource is the Thirty-sixth NCTM Yearbook [61], in which seven alternative approaches to the teaching of both informal and formal geometry are explored, after examination of the present status

of geometry in the curriculum.

Other references were also published by the NCTM: suggested lists of books for mathematics libraries, [62] and [63]; the third volume of sources of materials for recreational mathematics [64]; a collection of topics for mathematics clubs [65]; and a resource on perfect numbers [66]. Guidelines for the preparation of teachers were developed by an NCTM commission [67].

A collection of problems [68] from MAA contests could be used in classes or as challenging material for mathematics clubs. Posamentier and Wernick [69] presents constructions in a book which might be useful to both geometry students and teachers. A series of pamphlets by Mosteller et al. [70] offers real-life examples of a variety of statistical situations. Holt and Dienes [71] provides games for teaching children at all levels to learn, think, and do mathematics, while Holt and Marjoram [72] presents applications of mathematics models, providing good reading for secondary and college students. Spencer [73] provides a guide to the use of computers in secondary school education, with lists of available materials.

A valuable contribution on the development of mathematics among African tribes is provided by Zaslavsky [74]. Tables of numbers of various types are presented in several publications, [75] to [78]. Two more references provide guides to references: an annotated guide to 1600 books and monographs was prepared by Dick [79], while May [80] developed a classified list of the locations of information pertaining to mathematics, with 31,000 entries under 3,700 topics.

3. Books on teaching methodology

Many books focused on mathematics laboratories experiences.
Reys and Post [81] is a psychologically oriented book rather than
a book of laboratory activities, but it provides many practical
suggestions. It develops an excellent base for both elementary and
secondary pre- and in-service teachers to start developing a
laboratory approach. Fitzgerald et al. [82] is the expanded second
edition of another useful book on the laboratory approach. Kelley
[83], Kennedy and Michon [84], and Moore [85] provide games and
activities for elementary teachers. Eleven laboratory-session
experiences for direct classroom use in the intermediate grades or
junior high school are presented by Hooten and Mahaffey [86]. The
materials have also been found to be useful for pre-service education.

Among the other books on methods of teaching elementary school
mathematics, [87] to [94], are the second editions of D'Augustine
[87] and Swenson [88], both readable and helpful books. Grossnickle
and Reckzeh's latest edition [89] continues to be especially good
on the teaching of algorithms. Jensen [90] includes content as well
as pedagogy which incorporates the use of materials; Ballew [91]
also presents content and parallel pedagogy. Werner [92] discusses
the teaching of integers. A summary of the primary-school content
in English schools is the focus of one book [93].

Higgins [95] provides the student with knowledge of learning
theory from which he may draw his philosophical basis for instruction,
helping him to determine why he may teach as he does. To supplement
this text or for independent use, Crosswhite et al. [96] is a
collection of articles by authorities on learning. Specifically for

secondary-school methods classes, Scopes [97] presents goals and teaching strategies.

4. Books on research in mathematics education

Two chapters in a handbook on research [98] pertain to mathematics education. Overviews for the elementary-school and for the secondary-school levels are given, with selected findings cited.

Among the ERIC Center publications are reviews of research on cognition by Wittrock [99], on ability and creativity in mathematics by Aiken [100], and on the use of computers, [101] and [102].

Otaala [103, presents a study of children's abilities on measures of conservation, seriation, and classification, from a dissertation conducted in Africa.

5. Committee and conference reports

The Second International Congress at Exeter, England, is surveyed [104], with selected papers providing some interesting highlights. The reports from three National Science Foundation conferences, [105] to [107], are available through ERIC.

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