Annotated Bibliography


Alternative techniques of assessing mathematical learning among elementary school students provide a more comprehensive view of the learner. This paper describes a variety of alternative assessment techniques, including portfolios, journals, observations, self-assessment, communication, surveys, and interviews.


In this study 58 private and public 2nd grade students in Nigeria were given instructions about using counting and thinking strategies on number facts. It was found that such strategies should be included in primary school curriculum since children who do not use these strategies may be constrained in their ability to solve more difficult number tasks.

Adibnia, A. (1996). *An exploration of the effects of a teaching method on Year 6 students with different ability levels in mathematical problem solving based on Garofalo and Lester's cognitive-metacognitive framework*. Unpublished PhD, James Cook University, Townsville, Qld.


This paper investigates students' conceptualisations of quadratics by solving quadratic contextual problems.


Several classroom examples explain what proving means to classrooms and why investigations do not necessarily reduce the power of solving more than one step problems. It also considers what should be meant by an emphasis on precision and proof.


In this paper teachers report that they regularly use strategies such as whole class discussion including suitable problem solving strategies, concrete materials and teacher modelling. They rarely have calculators available for students, allow students to choose problems or spend much time on one problem.


This paper documents a research design which incorporated repertory grid principles within an image-based research model. Finally detailed study of perceptions of algebraic images studies offered a powerful compliment to the more usual verbal approaches.


This article examines the mathematical reasoning behaviours of a group of grade 5 students engaged in a problem solving situation and analyses how these behaviours are integrated into the problem solving


Asp and McCrae report on why teachers use calculators and on studies, which use Geo-Logo and computer algebra systems.


This book follows earlier reviews of research in Australasia. It provides a contextual setting for the diverse developments in mathematics education, 1992-1995.


This title provides an overview of mathematics education in Australian schools at the beginning of the 1990s. It is dated but has much still to be recommended.


This study investigated whether the use of a calculator could reduce the load on working memory and subsequently reduce the number and type of errors made. A comparison was made between students who had use of calculators, and students who had no calculators on bracket expansion tasks.
This theory is used to explain why students may have difficulties with two-step problems, the value of goal-free problems and worked examples and the need to eliminate redundant material in text and drawing and drill exercises.


When students expand brackets, errors tend to cluster around key positions due to increased working memory load. The study reported here found that by neutralising the effects of position, the occurrence of error clusters was reduced. Furthermore, a self-rating mental effort instrument was employed which found a positive correlation between errors and mental effort. The instrument also detected subtle variations in mental effort between groups of varying mathematical ability.


An investigation of the surface areas of cubes leads to students reason and explain.


This paper takes up 3 problems that must be solved if the challenge to prepare teachers who not only know content but can make use of it to help all students learn is to be met. The first problem concerns identifying the content knowledge that matters for teaching; the second regards understanding how such knowledge needs to be held; the third centres on what it takes to learn to use such knowledge in practice.

This paper uses data from an international study of number sense to investigate students' misconceptions and error patterns in fraction and decimal concepts. Results suggest the need for more meaningful treatment of fraction and decimal concepts and some relocation of these topics in the curriculum.


Barnard emphasises the need for compression of ideas and precision, and comments on fractions and decimals, time-consuming activities.


This article uses a counting game to illustrate the value of using culturally appropriate games in the teaching of mathematics.


Based on Piaget and van Hiele theory, recommendations are made with the use of computer programs, justifying and explaining by similarity and experimentation.


This project demonstrates how spreadsheets with mystery games and discussion can stimulate thinking about generalisations and how these apply to a number of cases.


This paper reports on a study that examined the importance of multiplicative structure and whether, after several years of formal instruction in the decimal-number system, Year 6 students had acquired an understanding of this structure.


This paper reports on a study of the decimal-number numeration knowledge held by Year 5 students who had completed formal instruction in 10ths and 100ths. The results showed that performance varied markedly between classes, that regrouping was more difficult than place value, and that there was generally a direct relationship between available and accessible knowledge.


Beginning with a set of mixed quadrilaterals and triangles, Becker first sets the task of sorting then extends the task to 3D shapes and questions on different properties, eg., diagonals, symmetries, areas and angles.

This study was based on considerable research and working with teachers to write good tasks and establish criteria for assessment.


This paper introduces the notion of integration in mathematics and the place of algebra within that integration.


This paper is concerned with how well children who have had instruction about rational number concepts based on a continuous manipulative aid (an egg carton) are able to transfer their knowledge to accomplish tasks based on a manipulative aid which can be interpreted as discrete.


This study explores two-digit numbers up to 100 and the two computation procedures used by third graders: (1) decomposition or splitting off the tens and units in both numbers (1010) and (2) counting by tens up or down from the first unsplit number (N10). Five aspects of numerical restructuring and transformation were discriminated and two types of flexibility in strategy use were found.


This article reviews theory and research on cross-national differences in academic achievement and shows that current research has made claims about achievement motivation with little regard for contemporary theory and has formed broad assumptions about the influence of culture. These difficulties cast doubt on the validity of the accumulated findings and their practical implementation in the classroom.


This paper compares two groups of children aged three and four years who differ in their school entrance age. Comparison of the children's counting ability, on their ability to reason about number is made. The results show that young children may reason about number even without having represented it.


By studying 300 students over three years, this book seeks answers about:
* the effectiveness of different teaching methods in preparing students for the demands of the 'real world' and the twenty-first century;
* the impact of ability grouping upon student attitude and achievement;
* gender and teaching styles.


This is the current mathematics syllabus for Years 7-8 in NSW.


This is the current mathematics syllabus for Years 9-10 standard course in NSW.


This is the current mathematics syllabus for the Years 9-10 intermediate course.


This is the current mathematics syllabus for Years 9-10 advanced course.

This is the second version of the Victorian curriculum standards framework.


This report covers comprehensive interviews with consultants, summarises questionnaire data from teachers and their principals, details three teacher case studies and summarises the data from the task-based interviews and observational data.


This report deals with inter-rater viability for a small group of teachers and an expert rater.


This report is based on the case study schools. Interviews and teacher details provide examples of issues to be emphasised when schools implement the project.


This report provides an analysis of teachers' concepts maps drawn before and after participating in the program together with some teacher interviews. The analysis of the concept maps was qualitative with three main fields of knowledge being explored. The number of key nodes, node links and crosslinks were noted for specific teachers.


This paper compares different mental strategies, points out good processes and provides a number of activities which will help students develop these strategies.


This paper is concerned with the effect completed geometric models can have on primary school children. Two experiments were designed to test the prediction that a problem solving strategy (means end analysis) conventionally used by novice problem solvers would be adopted by Year 4 students who viewed a model of the completed geometrical task if displayed during initial instruction. It was concluded that displaying a completed model of a geometric task can increase the cognitive processing load by encouraging the use of a means end strategy.


This chapter examines the issues related to probabilistic thinking and the contemporary role of these in mathematical reasoning, including how the concept structures our thinking and perception of reality.


This paper uses notions of processing load to question the use of unfamiliar concrete materials in the working of subtraction problems by primary aged children.


The issues examined in this paper include the use of concrete representations, aspects of number, length, and time measurement and the transition from arithmetic to algebra.


This paper discusses the transition from arithmetic to algebra and proposes a two-path model for learning algebra. It uses the results of two studies to illustrate the importance of cognitive load and appropriate sequencing through binary algebra and complex arithmetic to effective learning of early algebra.


This paper considers the processing load of the use of concrete materials in Year 8 algebra. The students did not use the procedures taught to them for concrete representations and no students used materials voluntarily. The preferred mode of thinking to solve unknowns in equations was to use arithmetic strategies mentally.


This paper reports on a longitudinal study that investigated students' readiness for algebra to determine what constitutes a pre-algebraic level of understanding. Students in Years 7, 8 and 9 participated.


This paper considers the processing steps required in understanding and representing numbers. For example, it is likely that there is an extra step required to represent 13 compared to 30.


This article integrates mathematical content to discuss 3D shapes and look for patterns. It provides illustrations of early algebra, area, statistics, and volume opportunities including examples of when a pattern does not apply.


This paper examines how the inclusion of everyday mathematics into classroom instruction can make mathematics more meaningful to students. The concept of mathematical meaningfulness is reviewed and compared to the experiences of Hawaiian children learning about money at home and at school. Certain kinds of differences between everyday and school mathematics can make the inclusion of everyday topics in the classroom problematic. Examples from mathematical programs which successfully include everyday mathematics are given.


This study showed that the non-representative samples of Year 6 students in USA generally scored lower than the other groups on being able to recognise different representations of the same question (pictorial and numerical).


This chapter provides some interesting activities based in research for teaching measurement, probability and statistical thinking in the middle

This paper reports on the administration of the Wheatley Spatial Abilities Test and clinical interviews with grade 5 students. In the interviews, relationships among the students' imagery, mathematical understanding and problem solving were studied.


This paper describes the Leverhulme Numeracy Research Programme in the United Kingdom and provides some tentative findings concerning the relationships between numeracy development and other measurable features of mathematics classrooms.


Burton illustrates how intuition is important to mathematics and assists students to begin a problem, develop a problem, visualise, and justify.


This paper discusses how multiplication of fractions can be shown using pies.


A few tasks and student responses were used to illustrate the value of open-ended formats for assessment.


This paper discusses fourth and fifth graders' construction of ratio and proportional understanding in the USA.


In this study fifth graders from a reform-based mathematics curriculum and a traditional mathematics curriculum. The reform-based group performed much higher than the comparison group on all but one problem. Interviews indicated that experiences in the primary grades with 'invented' algorithms and discussing alternative solutions led to a better ability to compute mentally and a stronger number sense.


This paper reports on the partitioning strategies used by Year 3 children when they were asked to solve partitioning problems.


Year 5/6 students were videotaped as they worked in triads on interpreting and representing data. Their responses were categorised using the SOLO taxonomy. Connections between the two skills were considered as well as the nature and effectiveness of the collaboration which took place.


This paper investigates the effects of mental schemes corresponding to additive and multiplicative situations in the process of interpreting and solving problems in Years 2,3 and 4 mathematics classrooms.


This article suggests methods for teaching children on the basis of previous knowledge, eg. start with examples, shapes inside a circle rather than a rectangle, shapes on the computer, extending limited notions by investigation, avoiding misconceptions and adding new content to lessons.


A range of experiences with movement, blocks and computers are explained in terms of the standards document.


The earlier theories of Piaget and van Hiele are critiqued and data from preschool and kindergarten children assist in suggesting that students show a precognitive level and early syncretic level in which they show some stronger imagistic prototypes and gradually gain verbal declarative knowledge.

The notion of 'concrete', from concrete manipulatives to pedagogical sequences such as 'concrete to abstract', is embedded in educational theories, research, and practice, especially in mathematics education. The author considers research on the use of manipulatives and offers a critique of common perspectives on the notions of concrete manipulatives and concrete ideas. He introduces the notion of computer manipulatives as possibly pedagogically efficacious.


This article describes several studies that challenge conventional wisdom regarding the teaching and learning of non-standard and standard units, rulers, and measurement sense and draws educational implications from their results.


This study investigated the development of turn and turn measurement concepts within a computer-based instructional unit. Turns were less salient for children than ‘forward’ or ‘back’ motions. Students evinced a progressive construction of imagery and concepts related to turns.


An historical perspective on proof and its role in schools.


This paper was presented at the early childhood mathematics working group of ICME in Budapest, Hungary, 1988. It considers a number of ways in which children’s learning might be described.


This book reports on a three year collaborative project which
considered the coordination of psychological and sociological perspectives on mathematics learning.


Introduction to Cobb and Bauersfeld's book on emergence of mathematical ideas.


This article reports on a teaching experiment in a Year 8 classroom that focused on statistical covariation. It considers both the trajectory of the students' learning and on the researchers' learning about how to support the students' learning.


This paper presents an alternative to the transmission model of teaching mathematics and questions the unlimited use of concrete materials in this teaching. Details of the approach taken by Cobb and his colleagues in the development of constructivist theories of knowing are also given.


This is an important historical document which had a major impact on thinking during the 1980s and 1990s.


This paper investigates the links between student teachers' performance on the classic student / professor ratio task in Indonesia and Australia and their beliefs about mathematics, mathematics teaching and mathematics learning.


A succinct summary of changes in the curriculum for NSW Years 9-10 syllabus


The Asian abacus is used to establish mental images of numbers and operations to 10 and 100, and discourages counting by one.

This paper provides an overview of the research on computational numeracy among school children and adults and compares it to overseas data. In particular, it considers the notion of computational fluency and its importance in the workplace.


This is the mathematics framework for ACT, years Preschool - Year 10.

---

20
It is solidly based on the *National Statement on Mathematics for Australian Schools*.


This is the final report which set the parameters for the implementation of the National Numeracy Strategy in the United Kingdom.


This site contains details of the National Numeracy Strategy from the United Kingdom.


This is the current mathematics syllabus in England and Wales.


This URL contains the details of the draft South Australian Curriculum Standards and Accountability Framework from birth to year 12.


This South African teachers magazine provides examples of proof for theorems often treated in high schools and gives a theoretical model of the types of proofs that can be expected.


Diezmann, C.M. (1999). Assessing diagram quality: Making a difference to
representation. In J.M. Truran & K.M. Truran (Eds.), Making a difference (pp. 185-191). Adelaide: MERGA.


This article demonstrates that the purpose of dynamic geometry software and other programs is to provide a medium for students to recognise, analyse and order mathematical and to investigate in a way that is powerful for learning.


This paper considers the development of constructivist notions from the more 'radical' approaches to the socio-cultural and applies them to early childhood education.


This paper considers data drawn from excerpts of children's play and shows that there are aspects of argumentation being shown by the children. Comparison of this evidence with theoretical tools for argumentation highlight the development of the children's ideas in this area.


This paper presents some didactical engineering elements concerning an algebraic question from both an algebraic and topological point of view. It is shown that one reason for difficulty with such questions is the impossibility for pupils to implement personal knowledge which is not algebraic but which can be pertinent in tackling the problem.


This paper describes a study in which 215 children aged between 5-9 were asked to estimate the answers to addition sums. They were divided into 5 groups depending on their addition ability. In the base correspondence, children of higher levels tended to produce more reasonable estimates than did children of lower levels. As difficulty increased the reasonableness of the estimates declined. The existence and nature of a zone of partial knowledge and understanding are discussed.


This chapter reviews the role of language and politics on curriculum. In particular, it considers the implicit influence of terms like 'stages' and 'levels'. It also consider the different modes of language and the role of culture on learning and looks at mathematics as a language.

This paper discusses the fact that the current reform movement requires an understanding of mathematics which is deeper and more extensive than many teachers have. The paper focuses on whole number operations and how changing knowledge, beliefs and practice might be seen as both an individual and collective problem.


This paper argues the value of analogues - concrete aids, illustrations, diagrams, more abstract models - in the development of mathematical reasoning. As well, it stresses the need to analyse the analogues to ensure that they readily portray the intended mathematical concepts and processes.


A correlational study of year 7 and 8 students showed that reasoning was important for algebra. Generalising from a pattern was often by trial and error and without scrutiny.

This book emphasises epistemological issues encompassing multiple perspectives on the learning of mathematics, as well as broader philosophical reflections on the genesis of knowledge.


This paper investigated preschool children's understandings and use of numerals in a series of tasks constructed to draw upon common experiences at home and found that across the range of tasks understanding preceded use of numerals.


This paper describes the reaction of students who do not like graphics calculators, provides a profile of a student who might exhibit this reaction and then offers suggestions for helping these students overcome their difficulties with the use of graphics calculators.


An extensive series of construction-based studies have shown that children as young as 3 years of age engage in active spatial analytic processing. The present study was intended to demonstrate that this kind of analysis is not limited to situations that require reproduction.


The paper describes the development of student materials in geometry developed by the Mathematics in Context project. Three themes run through the geometry curriculum: orientation and navigation; shape and construction; and visualisation and representation.


This article expands on the young child's early reasoning by expanding the van Hiele model to include direct and indirect resemblance, attributes and properties.


18 Year 1 teachers were observed using the EM curriculum: using the framework of eliciting children's solution methods, supporting children's conceptual understanding, and extending children's mathematical thinking. Though some teachers supported students' mathematical thinking, they were less often eliciting or extending it.


This study shows that in fact the teacher did most of the negotiation and so ratification and endorsement really characterised the classrooms. The beliefs, expectations, and norms were too dominant for true negotiation to take place.


18 Year 1 teachers were observed using the EM curriculum: using the framework of eliciting children's solution methods, supporting children's conceptual understanding, and extending children's mathematical thinking. Though some teachers supported students' mathematical thinking, they were less often eliciting or extending it.
a number line and to discover the meaning of the language used to
describe the passing of time.

understanding of graphs. *Mathematics Teaching in the Middle School,*
3, 224-227.

D.A. Grouws (Ed.), *Handbook of research on mathematics teaching
and learning* (pp. 343-403). Reston, VA: NCTM.

mathematics, and people: Interactions in a community of practice. In
J.M. Truran & K.M Truran (Eds.), *Making the difference (Proceedings
of the 21st annual conference of the Mathematics Education Research
Group of Australasia)* (pp. 223-230). Adelaide: MERGA.

This paper describes a socio-cultural perspective on learning in
secondary mathematics classroom where technology is integrated as a
central resource. Four roles are proposed for technology in relation to
student learning: master, servant, partner, and extension of self.

In L.V. Stiff (Ed.), *Developing mathematical reasoning in grades K-12*
(pp. 207-219). Reston, VA: National Council of Teachers of
Mathematics.

This chapter begins by distinguishing statistical and mathematical
reasoning, suggests was students may be assisted to develop sound
statistical reasoning skills and offers one way of assessing this
reasoning through a paper and pencil instrument.

Garofalo, J. & Lester, F.K. (1985). Metacognition, cognitive monitoring, and
mathematical performance. *Journal for Research in Mathematics
Education,* 16, 163-176.

calculators during mathematical collaborative practices. In C. Kanes,
M. Goos, & E. Warren (Eds.), *Teaching mathematics in new times
(Proceedings of the 21st annual conference of the Mathematics
Education Research Group of Australasia)* (pp. 217-224). Gold Coast,
Queensland: MERGA.

This paper presents the results of a study of students' perspectives of,
and attitudes towards, the use of mathematically enabled technologies
in a collaborative secondary mathematics classroom setting. The
inclusion of technology in mathematics instruction was found to be
generally beneficial to both learning and peer-peer interaction.


This paper reports on a study that examined student interaction and discussion while working on computer-based tasks in a senior secondary classroom. Analysis suggested that the task itself was an important variable influencing the degree of collaboration between students, and that the teacher's intervention could change students' engagement with the task.


This paper uses the TIMSS video study to illustrate how different countries - US and Japan - treat their students like mathematicians.


This paper contextualises the research into how young people learn about number and reviews its progress. It also focuses on appropriate ways of building on this within the holistic ethos of the early years curriculum.


This paper summarises several years' work observing preschool children in their everyday mathematical activities. It considers the amount of time and effort put into a wide range of activities by the children, socio-economic differences and the design of a curriculum based on the observations. The frequency of overall mathematical activity and the relative frequency of different types of activity are related to age but not to social class and gender.


The aim of this study was to develop a better understanding of the processes involved in the construction of the oral and written symbolic systems of numbers and to grasp their role in the elaboration of the modelling function of numbers. Ideas for teaching are suggested.

This is a now classic book which considers the development of constructivism as a force in mathematics education.


The TIMSS USA results demonstrated that performance on decimals lagged behind fractions in grades 3 and 4. This is explained by lack of exposure and students understanding of notation. More pictorial representations and links to fractions are recommended.


This paper gives a brief history of mathematics teacher education in the Netherlands, leading to the Freudenthal inspired programs of the present.


This paper considers possible meanings for the term 'constructivism', looks at differences which can be ascribed to this term, the consequences of these meanings to descriptions of knowledge and the consequences of all of this to the mathematics classroom.


This article illustrates how to change the instructional sequence in high school in order that students work on problems prior to teacher demonstration by teaching with open-ended questions and stories to establish relational understanding.


This paper describes a study in which graphic calculator was used to provide an environment in which students could begin to build an understanding of variable. The graphic calculator proved to be a motivating instrument for successfully achieving a significant
improvement in student understanding.


This article details a project on tessellations can be art and mathematics but students instead talked of shape, angles and line segments with obvious enjoyment.


The design of an instructional sequence, which deals with flexible mental computation strategies for addition and subtraction up to 100, is taken as an instance for elaborating what is meant by emergent models and what role they play in fostering the constitution of formal mathematics.


This paper discusses varieties of constructivism - Steffe, von Glasersfeld, Piaget, Vygotsky - and illustrates their application in a curriculum focussing on big mathematical ideas.


This paper argues for the early introduction of algebraic experiences through consideration of 'big ideas' such as: deductive reasoning, inductive reasoning, representation, equality, variable, function and proportion.


This paper claims that powerful use of technology has the potential to radically alter the nature of classroom mathematics. It explores some of the effects of technology on the nature of mathematical activity, classroom practice and the curriculum.


After reviewing the developments in thinking about proof and its role in school mathematics, they refer to some physical examples of mathematical theorems and propose new ways of presenting proof in schools.


This paper argues that technologies such as graphing calculators and computer algebra programs are essential in a reform algebra curriculum.


These investigations show the effectiveness of using +1, -1 number cards to make negative numbers and to operate on numbers.


This article argues in favour of pupil algorithms as opposed to traditional algorithms and describes research into this issue.


This chapter reports on a meta-analysis of 88 studies on the use of calculators. Only one study reported negatively about calculator use.


This paper addresses mathematics education in the Netherlands, showing the main aspects of the Dutch approach to mathematics education by focussing on the number strand of primary school mathematics.


Classroom examples illustrate how proof should focus attention on properties. There are many challenges to our thinking about proof.


In this paper the role that research can and should play in shaping standards is discussed. Brief summaries of some research findings which might contribute to the current debates are given.


This article describes and compares three studies which examined the effects of individual differences and language differences on children's understanding of teen quantities as counted cardinal tens and ones.


This paper raises issues for the primary teacher about the role of manipulatives in the development of students' mathematical thinking. It links teacher beliefs to the use of manipulatives in their classrooms.


In Victoria, the curriculum and standards framework has increased the
emphasis on the teaching of statistics in the junior-secondary area. This has come at the same time as graphics calculator use has spread into these same classes. This paper discusses some of the changes happening in a leading Bendigo 7-10 college.


This book proposes a new perspective on children's understanding of number which is still relevant in 2001.


This book aims to help teachers develop their understanding and practice in the area of using and applying mathematics in primary schools. It makes some comparisons between practices in the UK and Japan.


This paper describes the results of several studies into young children's conceptions of division, sharing and fractions, and provides a picture of intuitive knowledge and skills that young children bring to the formal school setting.


This study demonstrates an interdependence between the development of rational number knowledge and whole number knowledge. Facility with the whole number relationships enabled students to solve fraction comparison problems.


This paper presents data from a teaching experiment to investigate fractional learning and the role whole number knowledge might play in
it. A major source for the children's experiences was an operator-like computer program called CopyCat.


This paper reports on relationships between common fractions and decimal fractions as seen by Year 6 students. A most favoured explanation involved relating decimal and common fractions to a unit of 100.


The paper compares and contrasts seven US and six Japanese Year 5 classrooms in terms of the pattern of discourse between students and teachers. Two approaches to the teaching-learning of the criteria for the evaluation of mathematical arguments were found, with each country's teachers overwhelmingly preferring a different one of these.


Students worked in pairs to solve problems involving decimal fractions. Their discussions were analysed to see what kinds of conflicts led to learning about the meaning of decimals.


This study reports results on current methods for teaching decimals in 14 classes of students aged 9-12. The main factors leading to students' improvement appeared to be careful planning to meet their needs, the use of a clear model which enabled students to visualise decimal
division, and careful bridging from visualisation to numerical forms.


This study evaluated the thinking of Year 3 students in relation to an instructional program in probability which was informed by a research-based framework.


This study designed and evaluated a teaching experiment in data exploration for a grade 2 class. The teaching experiment was informed by a cognitive framework that described elementary students' statistical thinking. The children showed significant gains on all four statistical processes associated with the framework.


This article reports on the extensive study of children's probabilistic thinking conducted by the authors. It reveals a conceptual framework
and argues that careful construction of instructional activities using the framework as a guide can result in the development of students' probabilistic reasoning.


In this study children were given a series of tasks to assess thinking across four areas of mathematics: number facts, story problems, place value and written calculations. Their performance was assessed according to their classification of learning difficulties. Differences were noted across the groups.


Students in grades 1-5 were interviewed to find out when they construct unit iteration out of transitive reasoning. The results indicated that most children construct transitive reasoning by second grade and unit iteration by fourth grade.


This article considers a constructivist approach to the development of children's own reasoning and own procedures for dealing with fractions.


Through a teaching experiment, this paper considers the notion of equivalent expressions in algebra and uses graphing technology to develop understanding.


This chapter contains some suggested elements of models of students' conceptual structures with respect to fractional and rational numbers, of conceptualisations of rational number knowing toward which instruction might be directed, and conceptualisations of curricula based on such elements.


The paper highlights some of the important connections between algebra in the secondary school and graphics calculators.


This study showed that the empty number line as a mental model for the mental addition and subtraction of numbers was practical in both the realistic and gradual program approaches but that the former led to greater diversity of approaches.


This study examined middle school students' mathematics literacy and/or fluency in responses to a task requiring an explanation, and characterised the nature of the responses. Most students did not
interpret the task in a systematic way, did not attend to multiple conditions, and were not aware of audience or expected forms of argumentation.


This article summarises the changes in research methodology, showing how it is increasingly carried out in the classroom and as such is more relevant within classrooms.


This book pushes readers beyond the limits of their current understanding of rational numbers. All activities are to be solved by reasoning alone, with the readers forced to abandon fraction rules and procedures.


The paper presents a framework of proportional reasoning strategies, activities for instruction, and recommendations for grade levels at which various concepts might be met.


President's message encouraging teachers to teach the geometry strand of NCTM's Standards.


Legrande discussed the constructivist approach to mathematics in French Polynesia which emphasised the aptitude to see small collections and avoid counting.


This paper focuses on the development of the Year 8 students’ understanding of line symmetry. Findings show that the implemented learning environment served as a vehicle for student teachers to learn mathematics. Positive dispositions towards symmetry and its role in mathematics were developed.


This is an historical document which critiques the then current views on constructivism and its application to mathematics learning.


The advisability of using equations during initial learning of mathematics or science concepts or procedures may depend on the cognitive load consequences of the equations and verbal material. An analysis of both from a cognitive load theory perspective may provide us with guidance concerning the relative emphasis that should be placed on words or equations.


The paper describes research lessons which are a feature of the Japanese education system and lists eight ways in which such lessons contribute to the improvement of Japanese instruction. Also listed are six features of the Japanese education system which seem to support such lessons.


This article makes suggestions for diagnosis of students with multiplication difficulties and describes possible intervention strategies. The fact that for many students the order of interpretation is important is highlighted.


This is a study of negative numbers that allows students to develop their intuitive knowledge of operations by basing the work on a real type of example.


Four Year 9 students were videorecorded during lessons on
probability. The video recordings were then used to conduct stimulated recall interviews with each student. A wide range of achievement was shown, with even the most able students finding some concepts difficult to grasp.


This paper compares the performance of first language Chinese and English secondary students in Hong Kong on a set of items requiring the students to express simple relationships algebraically. The results are discussed in terms of the construction of mental models.


This volume presents balanced debate on what is basic in school mathematics, how movements such as curriculum standards affect those basics and how we can guarantee that children’s mathematics education will meet their future needs.


The paper contrasts 'investigation' and 'problem solving' and suggests that investigations might provide a coherent big picture showing how skills and problem solving can be balanced in harmony within a productive curriculum.


Lowrie and Owens illustrate how concept development cannot be separated readily from either the learner or the context of learning. Two- and three-dimensional space studies are reviewed along with theoretical positions on variations of the van Hiele theory, role of imagery, and abstraction in learning. Topics covered space and measurement, early childhood, computer programs, the use of drawings, and workplace mathematics.


The purpose of this article is to provide one way in which preservice
teachers can come to better understand the mathematics they will teach.


This article describes how stimulus control technology was applied to the instruction of fraction ratio and decimal relations with 7 students who had demonstrated difficulty in these tasks. Post-test performance by all indicated the emergence of equivalence relations between fractions represented as ratios, decimals, and pictures. Limited generalisation of fraction-decimal relations was observed.


This book describes the nature and development of the 'profound understanding of fundamental mathematics' that elementary teachers need to become accomplished mathematics teachers. It suggests that such teaching knowledge is much more common in China than in the US, despite US teachers having more formal education than those in China.


In a large study, in which students in years 7 to 10 were assessed for metalinguistic awareness of symbol, syntax, and ambiguity it was found that few students with low metalinguistic awareness could achieve high algebra scores. Students need to recognise the syntax of algebra.


MacGregor, M., Stacey, K. (1996b). Using algebra to solve problems:
Selecting, symbolising, and integrating information. In P. Clarkson (Ed.), *Technology in mathematics education (Proceedings of the 19th annual conference of the Mathematics Education Research Group of Australasia)* (pp. 360-366). Melbourne: MERGA.

This paper traces a progression of stages from naming quantities through describing relationships to writing equations and solving them. Even when all relationships were recognised and correctly symbolised, integrating them into an equation was a common difficulty.


MacKernan points out that too much rigour in proof is counter-productive.


This longitudinal case study presents a sequence of episodes that document the mathematical thinking of one child over a 5-year period from Years 1-5. The study provides significant insight into the process by which the student learned to make proofs within a setting that encouraged the development of her ideas.


This article challenges the notion that effective mathematics instruction is dominated by one culture or one method of reasoning.


Calculators were introduced to a Year 1 class. Higher ability children generally made considered decisions and only used the calculators when other methods were less efficient. Students of average ability started off using the calculator at all times but, after becoming more experienced, made considered decisions. The less able students found the calculator confusing.


The paper reviews constructivist and sociocultural approaches to development and early education and outlines a neo-Piagetian systems approach to early learning and development. It continues by discussing a neo-Piagetian curriculum for teaching number sense to young children and analysing the relevance of this new version of constructivism for education.


This book section describes how one group of students came to reason about data while developing statistical understandings related to exploratory data analysis.


This paper describes episodes from an instructional sequence on linear measurement in a grade 1 classroom and examines measurement as a context for supporting students’ construction of sophisticated ways to think and reason mathematically.


This paper documents the analysis of performance assessments on seventh grade students' statistical understandings. This analysis forms the basis for instructional design of current research project.


This chapter reviews research on whole number including studies in early number, early development of operations and understanding of operations, children with learning difficulties, aspects of word problems, and assessment, the value of calculators, mental computation, negative numbers, place value and decimals.


This paper focuses on mental strategies in middle grade mathematics, describes what they are and why they are important and provides some teaching ideas for developing these strategies among students.


This paper asks whether it is sensible to follow blindly Singapore’s success in the TIMSS. It points out the need to consider cultural differences as well as differences in mathematics education.


This paper makes innovative use of the open number line to develop ideas of counting and place value for numbers up to 100.


This article details an approach where equal corners fit around a point, makes fraction angles and compares corners by fitting, defining the standard unit (degree) and using this to measure the corners.


The article reviews the literature on abstract thinking, reification, and conceptual knowledge and proposes that abstract-apart and abstract-general notions tie this literature together in a better way than earlier dichotomies about knowledge.


This article shows how teachers can work together to help students in inclusive classrooms learn advanced mathematical concepts and skills. The key to the success of the students are teamwork, research-based strategies, and student engagement and ownership.


This article reports findings on the use of a partly auditory and partly visual mode of presentation for geometry worked examples. Effective working memory may be increased by presenting material in a mixed rather than a unitary mode. If so, the negative consequences of spilt attention in geometry might be ameliorated by presenting geometry statements in auditory, rather than visual, form. The results of 6 experiments supported this hypothesis.


Two related aspects of teaching graphing--representation and interpretation--are explored through discussion of curriculum documents and research literature. Recommendations are made for the inclusion of a wide variety of graphing aspects in both primary and secondary curricula.

Students' graphical representations of statistical associations are explored through analyses of responses from students in grades 4-6. Issues for developing student representations are discussed.


This paper explores the development of algebraic thinking in primary aged children and discusses the role of technology in this development.


This book reports on numerous Australian studies dealing with number development in primary aged children.


This study focuses on the structure of children's representations of estimating, counting, grouping, regrouping, partitioning, and multiplicative processes.


Reported here are a series of three experiments designed to investigate relations between some techniques designed to reduce cognitive load and techniques such as the use of self- explanations that encourage mental effort. The experiments examined factors that influence learning to solve 2-step arithmetic word problems by studying worked examples.


This is an important historical document which had a major impact on mathematics education thinking during the 1990s. It has been superseded by the 2000 version.


This book sets out principles and standards on which it is hoped US mathematics education will be based. It puts forward a highly ambitious program aimed at the achievement of best practice in mathematics education.


This chapter reviews Australasian research on problem solving in mathematics during the years 1995-1999.


Practical division helps students gain a sense of this concept.

This is the mathematics syllabus for primary schools which immediately followed the current syllabus.


This is the current syllabus for K-6 mathematics in NSW.


A concise summary of statements on mathematical reasoning, mathematical thinking, logical reasoning, different types of proof, and research studies.


This study analyses the relationships between junior secondary students’ mathematics-related beliefs, their emotions, and their problem-solving behaviour in the classroom.


The purpose of this study is to examine the strategies used in mental computation by students in traditional and reform-based classrooms in the USA. The evidence suggests that students in a mathematics reform curriculum use varied strategies, including sense-making strategies. They are less likely to use procedural algorithms to solve mental
computation problems.


This article outlines some of the spatial thinking literature and discusses results of assessing using classroom spatial tasks and notes the correlations with scores for spatial thinking but not with each other.


This book reviews a large proportion of research in Australasia from 1996-1999. It illustrates the difficulties of learning, the changes in approach to teaching, and some of the leading research in the world.


This research examines misconceptions in probability held by a sample of pre-service primary teachers.


This paper reports on Year 3 children's thinking processes when solving fractional tasks. Students were utilising two types of strategies: using known whole number facts or solving tasks through physical manipulation of available materials.


This report focuses on the problem of returning to a 1950s or 1960s type geometry which ignores the last 30 years of research into how students learn geometry and provide what only a small percentage of students could do.


This paper looks at the first and last two parts of a question for HSC on the number plane. Most students had the question correct but some analysis is given.


This paper reports on an investigation to identify the best ways to provide support for mathematics teachers in NSW secondary schools serving low SES communities, so that they can assist their students meet the literacy demands of mathematics.


G. Bell, B. Wright, N. Leeson, & J. Geake (Eds.), *Challenges in mathematics educations: Constraints on construction* (pp. 487-496). Lismore: MERGA.


This report considers an evaluation of a systemic intervention program aimed at improving the mathematics learning outcomes of students in Year 7 who have had learning difficulties with mathematics. This program works through the professional development of teaching teams. The results of the evaluation confirm that the program can have a dramatic effect on the learning outcomes of the students.


This paper reports on the validation process conducted in two Australian states for a framework for assessing and fostering elementary students' statistical thinking. The data confirmed four levels of thinking for each construct but the degree of consistency with respect to the framework was greater for the US sample than for the Australian samples.


This paper covers the general cultural practices that impact on teaching Aboriginal students and some more specific aspects of Aboriginal cultural mathematics.


In this review 5 subconstructs associated with initial fraction concepts: part-whole, quotient, ratio, operator, and measure are identified. The authors suggest two interpretations of findings: initial fraction concepts emerge either from application of intuitive mechanisms or from ideas of ratio and proportion.


Two visual proofs form an argument for proof other than by deduction


In this study Years 5-7 students were asked to chose among calculator, written and mental computation methods to answer a series of multiplication questions with a teacher either absent or present. Findings indicate that the students made choices based on what they believed the teacher really wanted, rather than on valid mathematical factors.

Price, P. (1999). *Using place-value blocks or a computer to teach place-value
This article describes an Australian study which compared the use of computers and of place-value blocks by Year 3 students as they learned place-value concepts. This project found that students using the software tended to focus on the quantities being modelled, whereas students using blocks spent large amounts of time counting and re-counting the blocks.


This study considers the data from two Australian states--NSW and Queensland--concerning the validation of the statistical thinking framework devised by Jones et al (1998).


This is the current overall statement on curriculum in Queensland's compulsory years of schooling. It is in draft form and not generally available.


This is the current draft mathematics syllabus for Queensland schools in Years 1-10.


This article reports on the results of a newspaper survey measuring the amount and nature of private tuition undertaken by school students in Singapore.


Reid uses several scenarios to establish the importance of proof and different kinds of proof


This article gives a number of measuring activities and the kinds of questions that can be posed to engage the students in a problem.


Students naturally used a filling up wholes method to add mixed numbers so that formal approaches such as changing to equivalent fractions confused students.


The paper reports on a study which analysed young (3-5 years) children’s investigations with blocks. The results show that the children constructed abundant and valuable knowledge, skills and processes, built their mathematical language and linked their practical investigations to prior knowledge and skills.


This paper shows that block building was found to be a beneficial activity for all children (aged 3-6) to engage in. The extension of children’s construction of mathematical knowledge was observed in block play.


This is a classic text exploring the ideas of Vygotsky on socio-cultural approaches to the development of knowledge.

The aim of this study was twofold: to describe exemplary practice in teaching with computers and to isolate criteria appropriate for the identification of expertise in instructional computing.


The reasons for different kinds of questions are supported by classroom vignettes that illustrate children's mathematical thinking and generalising in primary school.


The article stresses four points about mathematical reasoning in the elementary grades: development, justification and use of generalisations; leads to interconnected web of knowledge; foundation of 'mathematical sense'; necessity for flawed reasoning.


This paper develops the idea of computational fluency as an aim of elementary mathematics education. It shows what it means and how to teach for its development.


This article overviews the use and impact of calculators in mathematics classrooms. It reports on success and lack of success over a period of twenty years.


This paper analyses how a structured sample of pupils in the last year of English primary school tackled a realistic number problem, focusing on the use of a calculator.

This study examines the use of mental, written and calculator strategies of numerical computation by year 6 pupils drawn from neighbouring schools with very different traditions in the teaching of number. Calculator aware pupils were found to make greater use of mental computation, particularly of multiplication strategies.


Open-ended and multiple-choice tasks were posed to fourth-graders who participated in a year-long teaching experiment. The analysis of their solutions indicated that the format of the arithmetical tasks influence the mathematical interactions among the students and the teacher. Multiple-choice tasks appear to limit the students' freedom to think in ways that make sense to them. Open-ended tasks appear to elicit their creativity and means of symbolising.


This article offers hands-on learning activities to help teach young children about money.


Classroom episodes illustrate the tasks and questions used with a timetable and hundreds chart to find patterns in grades 1 and 2.


This article argues that the K-12 statistics curriculum needs to change. Four areas to be stressed are: exploratory data analysis, association, inferential reasoning and principles of planning studies. Curriculum recommendations for each level of schooling are given.

This paper considers current practice in mathematical reasoning in K-6 classrooms, particularly the development of 'operation sense'. In particular, it asks "How far can children's engagement with the four basic operations take them in preparation for algebra?".


Year 9 students showed more flexibility and use of part-whole reasoning, and understanding of function attributes after course that included graphical function software, open-ended investigations, and collaborative group work.


This paper questions whether we sufficiently understand how symbolic thinking in algebra develops so that we can recognise and support the process.


This paper outlines a preliminary investigation into the kinds of mathematical and mathematics educational values conveyed in representative lower secondary mathematics textbooks in Singapore and Victoria. Data reveal an unbalanced portrayal for each of the eight selected pairs of complementary values. Differences in the way values are portrayed in the two culturally different regions are also discussed.


This article illustrates the use of programs that allow symmetric and other rotations and geometer sketchpad to develop cards and various other designs on screen in grade 2.


A study of the proofs provided by over 1500 students on a range of typical questions on proof show only 70% achieve any level of proof after a year on geometry and of those, only 25% can be said to master proof.

The tests of van Hiele levels is used to show that students will struggle with proof unless they have reached the higher levels.


This paper considers three areas of needed research in the teaching and learning of probability and statistics: (i) following up on students' initial thinking to watch for future transitions, (ii) investigating students' thinking on variability; and (iii) finding what students can do rather than pointing out what they cannot do.


This paper reports on the well known CAN calculator program and its results in the primary grades.


This article demonstrates that conjecturing and reasoning about congruence and similarity with available materials such as pencils, compasses and straws, dynamic geometry software provides excellent opportunities for developing the notion of similarity and its related ideas on proportion.


Mathematical proof, pattern and proof, proof in classrooms, good proof and does proof matter are issues raised in this article.


This study found that for 4-year olds problem solving is constrained by the temporal sequence of events in a story problem. By 5 years of age children were able to give directionality appropriate responses to both the final-unknown and the initial-unknown problems.


This paper sets out various aspects of measurement and the associated mathematical thinking such as classifying, analysing and visualising which is used.

This paper is one of a number on investigations and gives some examples and how they are important in getting students to conjecture.


This paper outlines some of the findings of a recent survey undertaken in Western Australia primary schools which collected data on young children using calculators. Initial findings suggest that integrated calculator use is rare with most use being outside mathematics learning and trivial in nature.


The book is a guide to teachers for introducing proof to 15-20 year olds. It covers issues about what is proof, is ‘it’ true, describing clearly, precise definitions, why is it true and means and ends.


Interviews with students identified 3 modes of use of variables: to refer to different quantities in the one equation; to refer to different quantities at different stages of a solution; and as a general label for any quantity or a combination of unknowns.


This paper reports the longitudinal study of children's understanding of decimal notation. Over about a year, many students remain in the same misconception category, but in the longer term they move between misconceptions.


This paper reports the results of a test of decimal understanding based on choosing the larger number from pairs of decimals. Ten incorrect ways of thinking about decimal notation are described.


This paper reports on a Year 1 teaching experiment in linear measurement and the students' creation of units of different qualities. It compares the students' unitizing in the linear measurement context with that of Steffe's counting types.


Using videotaped Grade 8 mathematics lessons from the USA, Germany and Japan, this book reveals stark differences in the ways in which mathematics is taught in these countries and offers suggestions as to how the use of approaches from other countries might help enhance the mathematical performance of US students.


This study investigated the impact of prior knowledge of task context on senior secondary students' approaches to application tasks and the effect of engagement with context on performance.


The paper illustrates the wide range on number knowledge possessed by children entering school and an even greater range at the end of their first year. There are some connections between early and later school entry.


This paper compares the responses of Year 8 students to comparable closed and open-ended tasks and explores the effect of using specific contexts for such tasks.

This article details how this well-known function box is extended to explore generalities about shapes, cubes and roots, and formulae.


This paper is concerned with some of the factors that determine the difficulty of material that needs to be learned. It is suggested that when considering intellectual activities, schema acquisition and automation are the primary mechanisms of learning. The consequences of cognitive load theory for the structuring of information in order to reduce difficulty by focusing cognitive activity on schema acquisition is briefly summarised. It is pointed out that cognitive load theory deals with learning and problem solving difficulty that is artificial in that it can be manipulated by instructional design. Intrinsic cognitive load in contrast, is constant for a given area because it is a basic component of the material.


The experiments reported in this article flow from the following assumptions concerning our cognitive processes: Schema acquisition and automation are major learning mechanisms when dealing with higher cognitive activities and are designed to circumvent our limited working memories and emphasise our highly effective long term memories. A limited working memory makes it difficult to assimilate multiple elements of information simultaneously. Under conditions where multiple elements of information interact, they must be assimilated simultaneously. As a consequence, a heavy cognitive load is imposed when dealing with material that has a high level of element interactivity.


This paper demonstrates that children as young as 3 engage in active spatial analytic processing. That is, young children attend to the constituent parts of a spatial array and the whole, as well as to the relation between the parts and the more complex whole.


This article builds on the authors' work with five year olds and their mathematical reasoning. It stresses seven aspects of such reasoning and also points out that even low socio-economic status children display these aspects. Perhaps this means that young children's abilities in this area are underestimated as they commence school.


This is a study of Victorian senior secondary education and what shapes success in this system. The author argues that the system is sharply polarised and that the most economically vulnerable populations are those most at risk of educational failure. There are four chapters analysing the role of mathematics in the system.


In this study the value of a computer environment which enables students gradually to investigate algebraic expressions and equations was assessed with very encouraging initial results.


This study investigated which aspects of developing number knowledge contributed to the apparent failure of children to make
sense of numeration as a number system.


This article reports on an instructional lesson in a primary class. It analyses progress made towards mental mathematics using the 100s chart as a bridge between concrete materials and mental computation.


This article reviews the arguments for the value of practical number apparatus and examines the practical activities for which the apparatus is used, to try to explain why the theoretical benefits do not seem to be translating into practice. The unhelpful use of the apparatus as an aid to calculation is found to be one of the most notable reasons. A change in emphasis in the use of the apparatus is recommended.


This article provides clear purposeful points for number lessons and explains how class discussion can encourage students to develop efficient number strategies.


This article explains how astutely selected activities can encourage students to see useful number strategies.


By illustrating students' strategies for solving problems it can be seen how they work to make sense of numbers.


This paper reports on an investigation into the impact of the availability of a hand-held computer algebra system on student performance and patterns of algebraic thinking, particularly their performance in a range of symbol manipulation tasks.


This paper proposes that preschool children have a solid explanatory basis for their everyday life, within which, on the one hand, the facts are not generally accepted but are interpreted through a certain 'logic' and, on the other, the motives of actions and facts are clear and comprehensible.


This article presents a novel hundreds chart and numerous activities involving it. The hundreds chart has particular applicability for children with learning difficulties.

This article investigates the range of interesting problems which were explored following first and fifth grade classroom discussions about gorillas.


Students in Years 5 and 6 in Belgium generally failed to gain the correct answers, which were generally one too many or too less for these kinds of word problems, due to a reliance on formal algorithms for addition and subtraction. When number differences were small, informal methods were more likely to result in correct solutions. The main reasons were postulated as being a limited understanding of ordinal numbers, lack of heuristic methods such as making a diagram, or metacognitive awareness about possible fallacious patterns of thinking and a distrust of “weak” informal solutions.


The influence of the dynamic geometry tool, Cabri-geometre, on the learning of geometry in Years 7 & 8 was investigated in this paper. All students increased their van Hiele levels for some or all of the concepts involved.


This report focuses on the experiences of two junior high schools students as they progressed in geometric understanding through the use of Cabri geometry.

This is the 'classic' book by Vygotsky which has been interpreted in many ways to back arguments for social constructivism, interaction and the zone of proximal development.


This article discusses the influence of calculators in making sophisticated mathematical software available to students and considers the 'appropriate use' of computer and calculator technology in the learning of school mathematics.


This paper explores the role of visualisation in the algebraic domain and in particular how the ability to visualise assists students in reaching generalisations from visual patterns and tables of values.


Warren discusses how beginning algebra students move from arithmetic thinking to algebraic thinking. Two approaches are common (a) generalising the patterns in arithmetic, and (b) generalising the patterns found in functional situations such as number patterns, visual patterns, and tables of values. The second part of this chapter focuses on the teaching of algebra.

Children show how they intuitively think about dividing as how many halves are needed for two, etc. Carefully sequenced problems are presented.


The paper analyses three questions which explore students' understanding of chance measurement in relation to the development of formal probability ideas.


Data on chance measurement of more than 1000 students in Years 3, 6, and 9 was collected in 1993, 1995, and 1997. The SOLO taxonomy was used to document changes in the levels of student learning outcomes.


The objective of this research was to understand the characteristics of students' constructions of the concept of sampling. Students in grades 3, 6, and 9 were involved. The results of the study illustrate helpful and unhelpful foundations for an appropriate understanding of representativeness.

Forty-eight K-6 students were asked to choose between two jars containing different mixes of two different colours of counters. The students applied a variety of strategies ranging from idiosyncratic to proportional reasoning.


This is the overall curriculum framework for Western Australian schools in mathematics and other key learning areas.


This paper considers ideas of imaging and image to define processes which construct, re-present, and transform images. These constructs prove useful in interpreting children’s mathematical activity.


This study examined primary school teacher intentions to allow their students to use calculators in the classroom and influences upon these intentions.


Williams, C. (1998). Using concept maps to access conceptual knowledge of
The study of 28 students from reform and traditional classrooms suggested that those from reform schools understood functions as models of real contextual problems more but both groups had limited depth of conceptual knowledge about functions.


Two collaborative groups of senior secondary mathematics students with similar ability to solve unfamiliar challenging problems demonstrated different levels of engagement and different levels of conceptual development when they worked with the same task.


Working with a Year 5 class, activities are presented and the students worked collaboratively in groups to complete the task. The conceptual stages reached by the end of the lesson are discussed and ideas are presented about ways to proceed.


This paper reports on six lessons used to 'teach' angles in parallel lines. Collaborative group work is highlighted as are student journal reflections. A proposal about 'what helps students to learn' is made.


This paper considers the concept of children being 'at risk' in their numeracy development in terms of their long term progress or mathematical growth.


Mathematics education in the twenty-first century must find a way to make learning mathematics instructive and rewarding for the student. Gives a list of what mathematics every person should know and what should be done to improve mathematics education.


This paper is concerned about the assessability of metacognition within mathematics.


This study is an initial attempt to respond to the question: 'What barriers do English language learners face in accessing standards-based mathematics curriculum and to what extent are teachers minimising these barriers?'

This paper investigates the changing patterns of migration to Australia over the last 50 years and their links with mathematics classroom environments through the perceptions of Victorian mathematics teachers.


This paper reports on a technology activity involving the construction of binary counters by third grade children and the mathematical opportunities this construction realised.


This study considered Year 3 children’s understanding of the number system at four schools with varying socio-economic status in New Zealand. About one-third of the children were Maori. The children's understanding of the number system varied as a function of ethnicity and socio-economic status.

This paper considers the social context of contemporary mathematics and its implication in the outcomes for disadvantaged students. It is argued that reliance on individualistic models of theory and research need to be considered in conjunction with the social context.


The focus of this paper is the examination of why students from socially disadvantaged backgrounds are less likely than their middle class peers to be successful in their study of mathematics.