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REVIEW ARTICLE

AN EVALUATIVE STUDY ON THE USABILITY OF STATISTICAL PROCEDURES FOR SUPPLEMENTING RESEARCH FINDINGS IN THE AREAS OF MATHEMATICAL SCIENCES

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An Evaluative Study on the Usability of Statistical Procedures for Supplementing Research Findings in the Areas of Mathematical Sciences

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INTRODUCTION

Trends in algebra education research, as in other areas of mathematics education, are influenced by factors external and internal to the field. A group of external factors have led to the "massification" of secondary school education, whereby it is now the norm in many countries, that most students complete secondary education, and this education includes algebra. Algebra is seen as a "gateway" to higher mathematics, because it provides the language in which generalizations are expressed. Consequently, having students learn algebra is important for the production of "knowledge workers" as well as being important for social equity. But algebra is difficult, and instead of being a gateway, it can easily be a wall that blocks students' paths. Mass education thus highlights two challenges: to provide education that is relevant to students, and to provide teaching that is equitable, giving all students an opportunity to advance. We need an algebra with mathematical integrity that is more interesting and meaningful, more related to students' lives (and related to their lives in ways which students themselves recognise) and which is also more learnable. Traditionally, algebra had been mainly seen as symbol manipulation, but most graduates of such curricula have no appreciation of why this knowledge is important.

This leads to a reconsideration of the goals of algebra, to identify what are its essential components and to a search for improved teaching methods. In the ICMI study volume, MacGregor (2004) provides a perspective on these issues from the point of view of low achieving students. The new technologies have also impinged very strongly on algebra education research. As *communication* technologies, these impact on all of education (e.g. distance learning, data from the internet, new means of presentation etc). But as *information* technologies, these impact centrally on the way in which mathematics is done. Mathematics at every level, from the work of the shopkeeper to the mathematician, has always struggled to make calculations easier, and we now have tools that can perform nearly all of the standard routines known by an undergraduate at the press of a button.

This provides a serious challenge to existing curriculum: what is the role of the machine and what is the role of pencil-and-paper skill? To answer this question, we need to be very clear about goals for algebra education, about what it means to understand and to develop new pedagogies to meet the new situation. However, it also provides exciting new opportunities for teaching, especially through the possibilities of teaching with multiple representations of algebraic ideas. Common technology for graphing has made one of the most important changes to date since scientific calculators. In schools where students have access to graphics calculators or computer software for function graphing, they have immediate access to multiple representations of functions, so that they can move readily between the symbolic expression, the table of values and the graph. Importantly, whereas a by-hand graph is a static object, the new graphs are manipulable objects, where rescaling can tailor the graph immediately for different purposes. This has great pedagogic value as well as functional value, assisting students to solve problem more efficiently. Two chapters in the ICMI Study volume (Kieran and Yerushalmy, 2004; Thomas, Monaghan and Pierce, 2004) explore these issues and discuss options in depth. The GNU/Linux software "gnoware" (HBCSE) distributed to all participants of the conference, includes free software with these capabilities.

These two major external social and political considerations (massification and new technology) lead mathematics educators to rethink and research at all three corners of the didactic triangle: what is the core of algebraic activity, what are the most productive teaching approaches and how does the learner respond. This sets an agenda to categorise its problem domains and identify the most fundamental aspects.

- By adopting the best approaches from around the world
- By giving students a better start to algebra (Kaput and Lins, 2004)
- Through better teacher education (Doerr, 2004)
- By identifying major points of cognitive challenge from psychology, epistemology, from the history of mathematics, or empirically.

Algebra education research is also impacted by trends that are internal to the educational research community. At a simple level, the growth in international exchange has opened up appreciation of the possibilities for curriculum, teaching and assessment. My observations are that most people begin by thinking that algebra education is something common around the world, and are surprised to see the variations. In fact, the differences are now known to be large on all dimensions – the degree of formalism, the amount of manipulation, the place of functional thinking, the use of technology, the age of introduction etc (Kendal and Stacey, 2004). There are many alternative successful approaches. For example, at a similar age, Russian students may be solving the complicated inequality $\{x : |1- |1- x ||<1/ 2, x\in\Re\}$ and Australian students may be fitting a straight line graph to a scatterplot of data of the students' arm spans against their heights. Yet these two countries perform at similar overall levels on international tests such as TIMSS (Routitsky and Zammit, 2001). Important intellectual movements from other disciplines also impact on algebra education. For example, studying the history of mathematical ideas has led to the identification of particular cognitive obstacles for students (e.g. related to the ways in which letters are used), and consequently to teaching approaches that assist students cross the barriers (Puig and Rojano, 2004). On a more theoretical level, the role of algebra as "the language of mathematics" has been studied from the point of view of semiotics (the science of symbols) and linguistics (the science of language) (Drouhard and Teppo, 2004).

On-going reconceptualisation of the core of algebra, of what is most important to teach and to learn has also had an impact on algebra education. For example, in many western countries, it has led to elevating the importance of graphs and functions, and somewhat reducing emphasis on solving and rearranging expressions. The ability to deal with graphs and to have an elementary concept of function are more likely to be seen as "basic" now that complicated symbolic manipulation can be handled by machine in advanced work (including engineering) and also now that easy-to-use

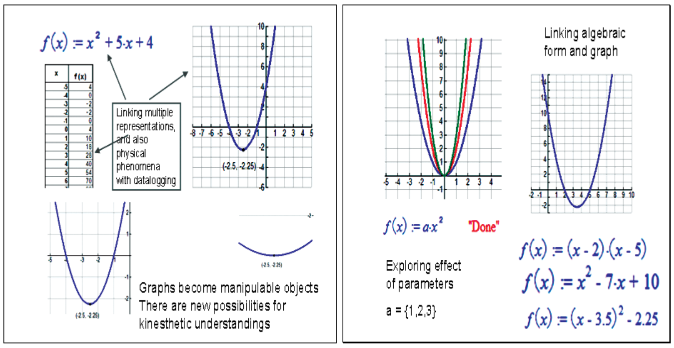

Figure. Linking symbolic with graphical and numerical representations

function graphing is available in free or inexpensive programs for computers and hand-held calculators. The study of multiple representations of functions is now very much easier, as illustrated in Figure .

REFERENCES:

1. S. C. Agarkar: Cross-cultural research in learning hurdles in science and mathematics
2. Anjana Arora: Levels of inquiry: role of language and assessment
3. Senthil Babu: Tamil mathematical manuscripts and the possibility of a social history of Math education
4. John Backwell: The design and development of cognitive acceleration through technology education: implications for teacher education
5. Rakhi Banerjee: Term as a bridge concept between arithmetic and algebra
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11. Nelofer Halai: Understanding science teaching and conceptions of the nature of science in Pakistan