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Letters

New: an expanded, printed version of the freedom-in-education newsletter.

Mathematics

Mathematics is the subject in which people experience the most difficulty at school and is also the subject that causes the most anxiety for home-educating parents. The following article explains some of the reasons for these difficulties and some solutions.

Failure of Mathematics Teaching

The recent history of mathematics teaching has been one of declining standards and of failure. A hundred years ago, the population in general was much more able to perform calculations and to work with numbers than are people nowadays and, in addition, people qualified in mathematics had a clearer understanding of the principles of mathematics than do modern mathematicians. The reason for this decline in standards is complex and involves many interrelated factors:

- **Lack of Practical Experience of Mathematics** – the best way to learn mathematics is through practical experience. The modern school system isolates children from most normal, everyday experiences that would involve them using mathematics – shopping, cooking, gardening, crafts, games, etc. – and they therefore miss out on the most powerful teacher of mathematics: practical experience.
- **Primary School Mathematics** – as with many other subjects, schools succeed in making mathematics – something that is essentially enjoyable – into a form of torture for young children.
- **Metric System** – the metric system is a very clever invention but it does not make sense to young children and it does not provide a good introduction to working with numbers. The fact that the school curriculum often insists on the use of the metric system shows that the people who run schools do not understand either teaching or mathematics.
- **Making Maths into a Utilitarian Subject** – up until the early eighteenth century, mathematics was still seen primarily as a branch of philosophy. However, the practical uses of geometry in building, surveying, engineering and the military sciences, led to a change of attitude. It was assumed that people could be instructed in the purely practical aspect of the subject without troubling them with any of the philosophical foundations upon which it is built, thereby robbing the subject of its essence.
- **Teaching Mathematics Too Early** – every stage of mathematics is taught too early. When children should be left to learn to count and to play with numbers, they are taught to add and take away; when they should be learning to add and take away, they are taught to multiply and divide; when they should be learning to multiply and divide, we try to teach them about decimals and fractions; and when they could be beginning to explore fractions, we are trying to teach them algebra.
- **Poor Mathematics Teachers** – this system leads to children nearly always being taught mathematics by people who do not understand what they are teaching: primary school teachers do not really understand the metric system and secondary school teachers do not understand algebra, analytical geometry or calculus. It is doubtful whether university teachers have a real grasp of the essential principles of mathematics – a subject which mathematicians down the ages have agreed should be based upon simplicity, logic and beauty.

The Difficulties People Have With Mathematics

The consequence of this poor standard of mathematics teaching is that people in general have lost confidence in their ability: they do not believe that they are capable of working out even simple sums for themselves and they do not believe that they are capable of understanding the finer points of mathematics.

Naturally, such people do not, at first, consider that they are capable of teaching mathematics to their own children and are therefore all too ready to submit their children to the same programme of mathematics teaching that had such poor results in their own case – and so standards continue to decline.

People Who are Good at Mathematics

Of course there is a small percentage of the population that does not experience any difficulty in learning mathematics. The degree to which this is a good thing depends upon how their mathematical talent is developed.

As has already been hinted, above, the modern mathematics syllabus has strayed a long way from its origins. Mathematics was originally used as a tool with which to explore the meaning of life and the nature of the universe. Ancient philosophers used it to demonstrate the limits of reason and analysis. They showed that no matter how logical an approach was adopted, sooner or later, paradoxes developed within any line of reasoning.

This is still known to be the case – but it is not something that is explained to children when they start to study the subject. Instead they are led to believe that they are studying something that is incontrovertibly true.

A detailed study of pure mathematics should be delayed until someone is old enough to see for themselves that it is simply a collection of ideas, none of which represents the absolute truth.

The Value of Mathematics

These arguments are not intended to question the importance or value of mathematics: a really good understanding of numbers is useful in almost every area of life: it is useful in managing household expenses, in dealing with the tax authorities, the utilities, etc., it is useful when shopping, and in almost every area of work and business.

The value of pure mathematics – geometry, algebra, etc. – may not be so immediately apparent but historically it has always been regarded as one of the branches of learning that does most to develop the intellect and sharpen the wits.

Good Mathematics Teaching

Here is a list of suggested do's and don'ts for parents who want to help their children to enjoy mathematics.

Don't expect someone else to teach your child mathematics.

Do take responsibility yourself for helping your child to understand mathematics.

Don't buy or follow a maths course.

Don't worry if your child does not appear to be making progress in the subject.

Do involve your child in as many practical activities as possible – shopping, cooking, crafts, gardening etc.

Do play lots of games with your child: cards, dice, board games etc. Games develop all the skills that are most useful in the understanding of mathematics.

Do practise basic arithmetic as much as possible: adding up, taking away, multiplication and division – mental arithmetic and sums on paper.

Don't expect your child to *understand* millimetres, centimetres, millilitres, cubic centimetres, metres, litres, kilometres, kilograms, etc. – even if you understand them yourself.

Do use metric measurements when they are appropriate.

Do use imperial measures when you can – feet, inches, yards, miles, pounds, ounces, pints, gallons, etc. (They involve the use of fractions such as halves, quarters, etc. and provide a good introduction to the principles of arithmetic.)

Do give your child a watch with a clock face (when they are old enough to have a watch) and help them to use it to tell the time.

Don't push your child.

Don't let your child become upset by being made to do mathematics.

Do let your child use a calculator when they want to.

If you want your child to progress in mathematics, **do** study mathematics yourself.

Surprisingly perhaps, these do's and don'ts are applicable for very young children – children enjoy counting things even before they are able to speak – right up to teenagers and beyond. Everyone wants to be good at working things out and to be able to understand weights and measures, but very few teenagers really have a spontaneous desire to know about algebra or geometry: traditionally such things have been studied by older people.

Instead of imposing a maths curriculum on someone, that may put them off the subject and which certainly will not inspire them to really understand it, it is far better to leave the subject to one side until someone either has a practical need for it in something that they are doing or else becomes interested in it as an intellectual exercise. Either of these things can happen at any time during one's life, and when they do, mathematics reveals itself to be a source of fascination and pleasure.

The Royal Road to Geometry

Alexander the Great is reputed to have asked Menaechmus to teach him geometry *concisely* but he replied “O King, through the country there are royal roads and roads for common citizens, but in geometry there is one road for all.”

Unfortunately, this important lesson has not been understood by modern mathematics teachers who try to pick out the ‘useful’ and ‘important’ bits of the subject without explaining their context. The result is that almost everyone is left confused to a greater or lesser extent by their experiences of mathematics at school and university.

For an introduction to geometry:

www.freedom-in-education.co.uk/euclid.htm

Letters

Dear Gareth,

It was a great pleasure to find your web site this evening and to read your recent newsletters. The site was recommended in the Japan homeschooling discussion group today and actually I would have ignored the link but for the mention that "this is quite different from the Shichida method".

I wonder if you are familiar with Enki Education which is the method we are presently using. There is a very detailed web site at www.enkieducation.org which may interest you and may be worth mentioning on your site.

Best regards, Mindy Harris, mother to Laura, 6, and Nina, 3, Canadians homeschooling in the Japanese countryside.

Maths Books by Gareth Lewis

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www.nezertbooks.net

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