COMPUTATIONAL SKILL IS PASSÉ

Editorial Panel

The Mathematics Teacher

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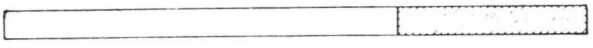
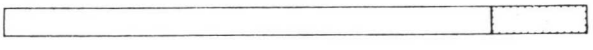
Soon nearly everyone who faces an arithmetic problem will be able to call on a low-cost electronic calculator as an aid. For more elaborate calculation, remote communication with a computer will be almost as easy. This development has led many teachers and students to question the high instructional and testing priority currently assigned to speed and accuracy in arithmetic computation. Their doubts have been expressed in a variety of controversial propositions and proposals for curricular change.

The Mathematics Teacher Editorial Panel posed the following seven issues to a sample of teachers, mathematicians, and laymen. Their responses are given here in percentage form, along with some of their positions and justifications, which help to identify the consequences of emerging technology and alternative instructional policies.

1. Facility with arithmetic computation is the major goal of elementary and junior high school mathematics teaching today.

68% Agree  32% Disagree

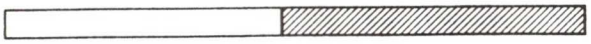
2. Speed and accuracy in arithmetic computation are still essential for a large segment of business and industrial workers and intelligent consumers.

84% Agree  16% Disagree

- One always needs to check mechanical contrivances.
- Ability to make accurate mental estimates quickly is now most important.
- One doesn't carry his pocket calculator around at all times.
- Calculators will not soon be as readily available as pencil and paper; more time will be wasted getting to a machine than saved using it.
- Unit pricing decreases the importance of calculation for consumers.
- Inexpensive pocket and desk calculators provided at company or personal expense have all but eliminated the need for computational skill.

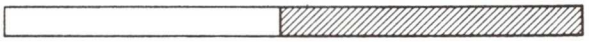
. When is the last time you saw a salesperson do mental or paper and pencil computation?

3. Impending adoption of metric measurement implies that computation with rational numbers should be largely confined to decimal fractions.

48% Agree  52% Disagree

. The housewife will still want fractions of a recipe, and these fractions and ratios are not always best expressed as decimals.
. This is true for the low achievers; others should spend more time with p/q.
. Working with algebraic fractions requires considerable knowledge of all kinds of fractions.
. As long as we measure time to the quarter of an hour, sell shares of stock at 35 7/8, measure material by eighths of yards, or even concern ourselves with degree and radian measure, we must continue to work with all kinds of fractions.
. Probability requires common fractions.
. Halves, thirds, and quarters are too commonly needed.
. Eventually the average citizen may have no use for fractions of the type p/q.
. We need more experience with the metric system before we can express an opinion.
. We should examine the European experience.
. The decimal notation has always made more sense than common fractions; it makes use of the basic whole-number computational algorithms and avoids far-out common denominator problems, and so on.

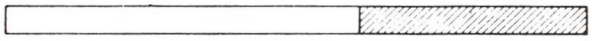
4. In the face of declining arithmetic computation test scores, the energies of mathematics instruction should be concentrated on these skills until achievement reaches mastery levels.

48% Agree  52% Disagree

. Mastery of computation is not essential to do the kind of arithmetic thinking that is important in programming, estimating, and checking answers from machine computation.
. Yes, particularly for those teachers who have misunderstood the call for emphasis on concepts and excluded drill.
. The business person or consumer who is arithmetically illiterate and dependent on machines would be lost when the machines are not available or in good working order.
. Kids compute as well now as they ever have.
. Not everyone can be expected to achieve mastery of computation skills.
. Continued practice with straight computation is tedious and boring to teacher and student.
. Introducing geometry into lower grades is as important as computational skills.
. Spend the money on making calculators available so we can get on to more important mathematics, like learning *when* to perform arithmetic operations.

- Mastery level might be a long way off, but we should certainly strive for significant improvement in skills.
- What we need is to establish individual mastery levels for each child, reflecting his or her ability, expectations, and so on.
- The energies of mathematics instruction should be spent on problem-solving skills and applications of mathematics.

5. Weakness in computational skill acts as a significant barrier to learning of mathematical theory and applications.

61% Agree  39% Disagree

- Yes, to the extent that errors in calculation prohibit building on that result.
- There is correlation, but doubtful causal relation.
- It is through arithmetical examples that one gets the feel of what theory and applications are about.
- How can one expect to learn algebra as generalized arithmetic without knowing arithmetic?
- If a person is not sure of an algorithm, he cannot concentrate on the theoretical issue or application.
- I know a brilliant mathematician who cannot do basic computation.
- Students today show *increased* knowledge of theory and applications.
- This is true when it comes to applying theory to applications; those who make contributions to theory but have weak computational skills are exceptional.
- What electronic calculator helps factor trinomials?
- Many instructional texts use simple skills in illustrating mathematical theory and applications.
- Many slower students lacking computational skill have, when given access to a calculator, easily mastered some difficult theories and applications.
- The more important understanding of concepts and quantitative relationships can easily be supported by computation equipment if student skills are weak.

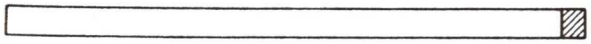
6. Every Grade VII mathematics student should be provided with an electronic calculator for his personal use throughout secondary school.

28% Agree  72% Disagree

- Cost would be prohibitive for the initial supply and the replacement due to theft, damage, and so on.
- With costs plummeting downward, a school system can no longer consider the cost prohibitive.
- Students would become too dependent on the calculator as a crutch.
- This should wait until Grade VIII or IX or when students demonstrate computational proficiency without the calculator.
- Maybe even at an earlier age!
- In China, students are taught to use the abacus early.

- Access at least should be provided.
- Students' minds would get lazy and operate less efficiently if the machines were available.

7. Availability of calculators will permit treatment of more realistic applications of mathematics, thus increasing student motivation.

96% Agree  4% Disagree

- We won't have to avoid the messy real-life situations or reach for a set of tables; we can deal with the approximations encountered in real measures.
- In my experience, student interest and success increase when calculators are available for use.
- The motivation is often short-lived and artificial.
- The standard text problems rigged with "nice" answers deceive students.
- Calculators will support the efforts of less able students.

HOW DO YOU FEEL?

Have the above questions identified the key issues in determining the impact of calculating equipment on mathematics education?

Do the opinions of our preliminary sample reflect the beliefs of most NCTM members?

Have you had exceptionally good or bad experiences with calculator use that can be shared profitably with other readers of *The Mathematics Teacher?*

The Panel welcomes your reaction.