

Complex *NUMB3RS*

Mathematicians appreciate that *NUMB3RS* is on television raising public awareness about the importance, beauty, and usefulness of mathematics, but in its second season, it has been promoted as more than mere entertainment. The fact that the CBS website now offers classroom worksheets as part of an educational initiative cosponsored by CBS, Texas Instruments (TI), and the National Council of Teachers of Mathematics (NCTM), and that recent items in publications of the AMS and the Mathematical Association of America (MAA) suggest that this initiative is a good way to attract students to the mathematics profession blurs the distinction between *NUMB3RS* as television entertainment and *NUMB3RS* as school curriculum. We should think carefully about how to use *NUMB3RS* and whether the mathematical community should endorse the show to the extent that it has.

The violence, sexual innuendos, and representations of mathematicians on the show are complex for use with students. In an interview with NCTM, Gary Lorden, one of the show's mathematics consultants, says, "I think it would be great if they made [the relationship between Charlie, the main character, and Amita, his former graduate student] more of a collaboration and less of a beautiful assistant sort of thing." One of the CBS website questions for students was whether Amita wrote a love letter to Charlie, and some episodes have explored a romantic relationship between them. She is still a student, obtaining a second Ph.D. in a related field. This could affect her future career and would violate faculty guidelines at some institutions. For example, what happens when she needs a letter of recommendation (in the case they have a bad breakup, in the case they stay together, etc.)? If we are going to use Amita in the classroom, all of this comes along with that use. Alex Kasman, who runs the Mathematical Fiction website, points out a number of problems with Charlie, including social and emotional problems. In addition, Charlie often fits the stereotype of the gifted mathematician who readily finds the right answer. In the second season, the mathematics on the show has made less sense, such as "deep current sets", even though the worksheets are advertised as exposing students to real-life mathematics used in FBI cases. While these representations can work well for the television show, they can be problematic for classroom use.

In fact, research studies have shown that stereotypical representations of mathematicians can actually discourage students from pursuing more mathematics. For example, one study showed that television commercials that are gender-stereotypic caused women to indicate less interest in quantitative career fields than those who had not been exposed to the commercials. To encourage students to study mathematics, numerous authors recommend

exposing students to mathematicians whose style of doing mathematics is identifiable to the students as being similar to the way they do mathematics. Additional studies and full bibliographic references can be found at <http://SimpsonsMath.com/wim.html#impacts>.

We as teachers are responsible for what we bring into our own classrooms, but NCTM's name is associated with the *NUMB3RS* worksheets, and so some may incorrectly assume that any difficulties or cautions are discussed in the teacher's notes. In a session on *NUMB3RS* cosponsored by the AMS, MAA, and TI at the Joint Mathematics Meetings, Johnny Lott, past president of NCTM, mentioned that the worksheet authors receive from TI a summary of all or part of an episode, and sometimes think, "What can we do now? Can we do anything with this?" He said that the worksheet writers are under intense time pressure to post worksheets before a show airs. Since the scripts they receive can differ from the final version, this can cause fundamental problems; many of the worksheets explore events that never happen on air or even contradict episode events. In addition, the worksheets do not contain links to the traditional curriculum, and he said, "We have no idea what teachers are doing with this and how teachers are using them." Until class testing, surveying, and revisions occur, at a minimum, there should be some kind of teacher forum to discuss what works and what doesn't.

Of course, TV portrayals of most professions are to some degree inaccurate glorifications and stereotypes; why should a portrayal of a mathematician be any different? If we are to follow President Bush's remarks from the recent State of the Union address, namely that "we need to encourage children to take more math and science," then we must identify and correct inaccurate portrayals of our profession, especially stereotypes that could keep students out of math classes. Popular culture can be a powerful way to engage students, but care must be taken to use it effectively. Without careful research and reflection related to the benefits and difficulties with using *NUMB3RS*, we run the risk of having the positives outweighed by the negatives.

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Editor's Note: Many newspaper and magazine articles about the *NUMB3RS* television program have appeared in the popular press. For summaries of these and other popular articles about mathematics, visit the AMS Math Digest, <http://www.ams.org/mathmedia/mathdigest>.

Letters to the Editor

Mathematical Theory of Genetic Code Needed

I again raise the possibility of developing a mathematical theory of the genetic code. I again suggest that the existing theory of codes could be used to do this. At present coding theorists develop their subject, biochemists work on the sequencing problem and related matters, and there is virtually no communication between them.

The potential benefits of better communication between mathematicians and biochemists are great, and the potential medical benefits to the general public are still greater. Here is an example:

There is a class of degenerative diseases in which the DNA of an affected person behaves in the following way. First the DNA appears to be random. As the disease begins, the DNA breaks up into long segments of equal length. As the disease progresses these segments break up into shorter segments of the same length. This process is repeated until the DNA degenerates completely and becomes something like TAGTAGTAGTAGTAG

Biochemists are puzzled by this phenomenon, but mathematicians need not be. The pattern of degeneration is precisely analogous to the behavior of a linear recursive sequence over $GF(4)$ or $Z(4)$ when terms in the denominator of the generating function are specialized to zero. This example, and many others, suggest that DNA consists at least in part of linear recursive sequences.

At present there is no mathematical theory of the genetic code. But perhaps we could keep the idea of such a theory alive, until we have world enough and time to examine it.

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Fecal Language

I notice an increasingly common use of fecal language in *Notices* articles (e.g., page 539 of May 2006). Is our

highly-educated reader population really so inarticulate as to have to use such language in what appear to be ordinary conversational or narrative settings? And, even if this has become the case, does this scholarly journal have to publish it?

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Another Nobel Prize Winning Mathematician

In a letter in the April 2006 issue, Sir Michael Atiyah mentions that the only mathematician to win a Nobel Prize for Literature was Bertrand Russell. This is not true: in 1904, the Nobel Prize for Literature was awarded to the Spanish mathematician José Echegaray.

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Student Evaluations, Grades, and the Internet

Over the last thirty years, the system of student evaluation of teachers in colleges evolved—step by step—as a result of an implicit plot by academic administrators (who are unable to fill classes by students properly prepared to attend these classes) and by unqualified students (who want to be awarded high grades without either having or getting skills and knowledge). For great educational experience—nobody talks about great education—teachers are an obstacle or a nuisance. They should be intimidated and pushed to certify illiteracy by perfect grades. The use of student evaluation (SEI scores) by administrators in making personnel decisions on promotion, tenure, and salary adjustments became the whip which keeps the faculty in line and keeps grade inflation (or to say it more simply, cheating of the public) intact.

These abstract comments are not necessarily related to Ohio State University or my department but they give

a general framework all of us function in. Recently, all these thoughts came in mind when the debate about electronic SEIs and making them public online erupted at OSU. We read a series of articles in a student newspaper the *Lantern* about SEI forms, RMP website (<http://ratemyprofessors.com>) or rumors about federal standardized tests. A student Timo Atkinson is frank and straightforward: “When we fill out these evaluations, we answer questions that are not geared toward how much you learned, but rather instructor organization and teaching effectiveness.” The students’ perception of TEACHINGEFFECTIVENESS has nothing to do with HOW MUCH YOU LEARNED. A teacher who is a students’ hero pictured by Annie Hall gives students the grade of their own choice. As we learn on his RMP page: “The guy is flippin nuts. The class is like a quarter long circus but in the end you get to give yourself whatever grade you want.” “Very easy class, but you won’t learn much.” “Very very great teacher.” “Very amusing professor, but not very instructive.” High eval rating is guaranteed.

But his colleague in Engineering College has perfect RMP rating 5.0 with the following comments: “Easiest class I’ve taken in a long time. ...class is four days a week, but you only have to go twice to get the material. Tests are EXACTLY like the homework, no surprises. Really nice teacher and a good guy.” “Bring him a bottle of scotch and you’ve got an A [happy face].” A Business College student is almost poetic: “Practice questions are for chumps, and Sample exams is how we roll.” (In 1998 the *Notices* published my letter on how destructive sample tests are for undergraduate mathematical education.)

Will these pedagogical methods make the OSU a national leader in college education? Or are they, together with SEI procedures, pillars of an EDUCATION-LITE model of a store where sophisticated customers are shopping for cheaper grades and discounted diplomas?

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