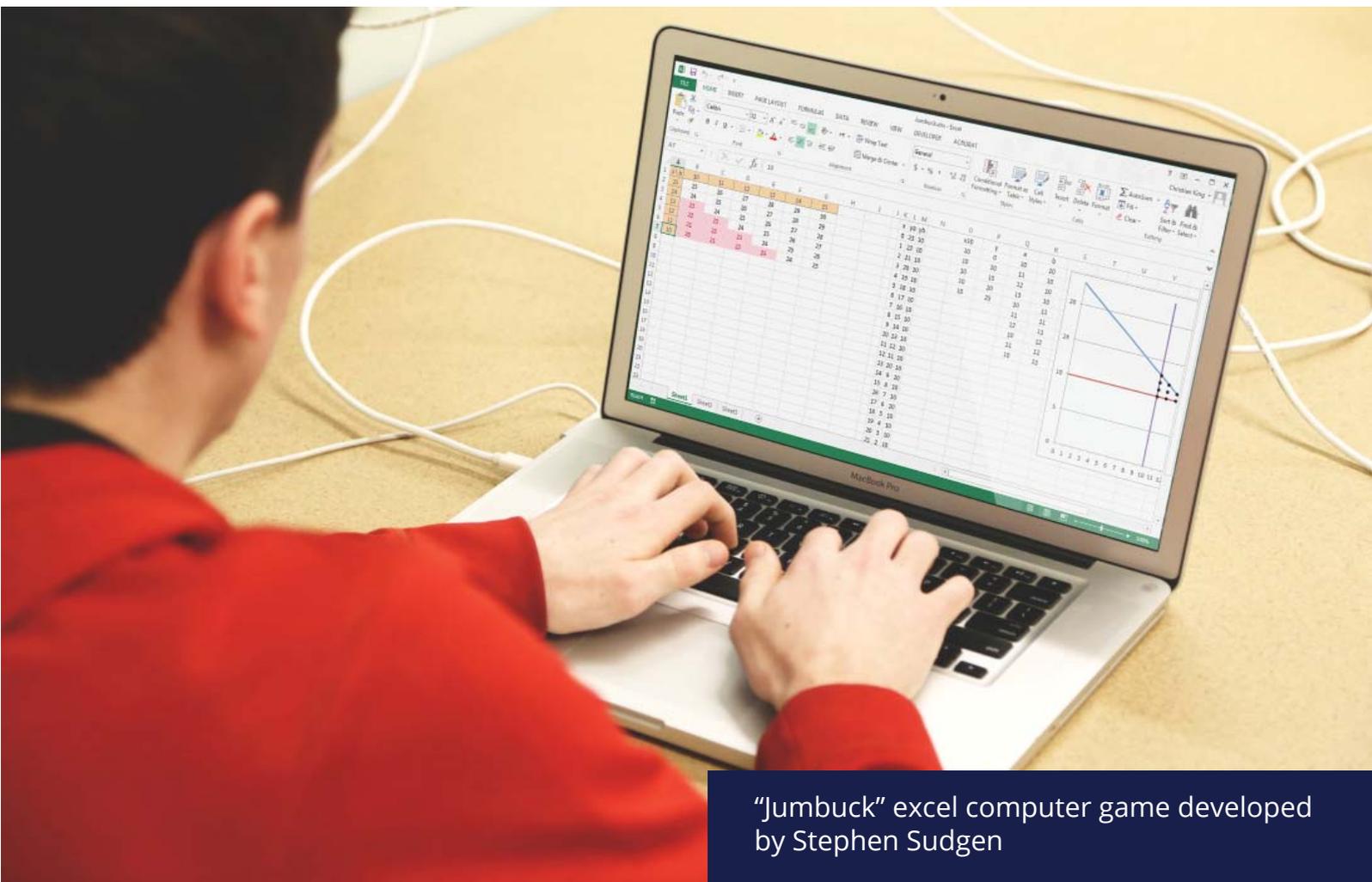


Stephen Sugden

Teaching with Spreadsheets



“Jumbuck” excel computer game developed by Stephen Sugden

Spreadsheets are a powerful way to visualise, process and calculate solutions to complex problems. Stephen Sugden, in his time at Bond, embraced the use of spreadsheets to create new mathematical learning experiences for students at Bond University.

Please describe what you did?

Stephen: I use technology, especially Microsoft Excel to help students, particularly those having conceptual issues with maths and computer programming.

What technologies were involved?

In the early years at Bond I used various debuggers. I also used a logic simulator for elementary computer logic and hardware concepts. I have also recently used a special calculator (QAMA) to help students with basic arithmetic and estimation. However, the main focus of my teaching with technology nowadays is the use of Excel. Apart from routine computation, I use it to show students the patterns and concepts of mathematics.

Why did you choose this approach?

I thought it would help the students, many of whom were very poorly prepared mathematically for the rigours of tertiary study with significant components of math.

What were some of the benefits of this approach?

The main benefit was increased understanding for the students, plus other spin-offs such as knowledge of a useful software tool in industry, e.g., Excel and its use for modelling or even just very simple day-to-day operation. Most universities do not teach these skills; they just assume that students will “pick them up”. Software skills are thought to be “trivial” or not worthy of study. I beg to differ.

Excel in particular is a powerful mathematical modelling tool. It is excellent for rapid prototyping and simulations, plus visual illustration of math principles to students whose algebra is limited or non-existent. I also use colours (conditional formatting) and recurrences (a mathematical well-founded way of simply expressing otherwise complex relationships). I do not see others doing this in Excel, and it has helped enormously with my teaching, for example teaching the fundamentals of finance. Many articles in Spreadsheets in Education attest to this.

Please describe some of the challenges

Some colleagues, especially in Business, were resistant to the use of Excel in the classroom. I only ever found one student in 24 years who complained about having to use Excel – she preferred her Graphical Calculator (GC). My opinion of GCs and calculators in general is that they are a waste of space. We have much better modelling tools now than GCs. They are not used much in industry or “the real world” but schools seemed to have adopted them and will not change for the better.

What feedback have you received from students or your peers?

I have received uniformly positive feedback from students, including formally written feedback. Some of my peers seem to sense that I am on to something, while some others must be wondering if I am crazy. Why would anyone use Excel for teaching math? I am a mathematician but mathematicians, as a rule, do not use Excel to any great extent. Why not, and why am I an exception? This is a whole story in itself.

How has this impacted student learning?

Although I have not conducted formal research the anecdotal evidence is very positive. I often run workshops for high-school teachers on how to use Excel in the classroom and they always are very appreciative. I have many unsolicited letters of appreciation from such people. Student feedback for my Excel modelling unit at Bond was very positive:

“I was delighted with that I took business and spreadsheet modelling in last semester. It enhances my excel skills so much and help me a lot in my current degree.”

“At least every second day I have something that comes along which requires something learnt from the spreadsheet modelling course. Thankful every day that I did it.”

Right: A conditionally-formatted modular times table for teaching internet commerce and digital security

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What's next?

Improving students' numeracy and math education is both a passion and primary goal for me. Over time there have been many changes with respect to the different numeracy programs at universities across Australia. Bond was at the vanguard in this field when I joined in 1988 with a keen focus on maths and computing. It's exciting to see recent developments such as the new Actuarial Science centre in the Business school and I hope that this momentum will continue.

I am keen to develop programs to boost the math skills of our students through a variety of ways. One is technology, which offers us many new tools and ways to engage students. Another I have found useful is games and puzzles, such as those in newspapers or magazines. These can help to build reasoning and problem solving skills in the students.

For students who are weak in the basics such as arithmetic and elementary algebra it can be an intensive catch-up process over a short 12 week semester.

Clearly, we need to support this steep learning curve to help students. To address this and help in building basic skills, I have found that students often benefit from a variety of approaches.

Learning can be more engaging and satisfying when presented in games and puzzles such as Sudoku, or in an interactive computer spreadsheet which can allow students to visualise the concepts.

Theory can be practised and applied in a fun problem solving format. I have published widely on related topics, most recently in the International Journal of Mathematical Education in Science and Technology (IJMEST) and on my own journal, Spreadsheets in Education -

(<http://epublications.bond.edu.au/ejsie/classroom.html>).

The screenshot shows the website interface for 'Spreadsheets in Education'. The top navigation bar includes 'Home', 'About', 'Help', and 'My Account'. Below the navigation, there is a 'Home > Business > EJSIE' breadcrumb trail. The main content area is titled 'In the Classroom' and lists several articles with their titles and authors. On the right side, there is a sidebar with links for 'Journal Home', 'Previous Issues', 'Aims & Scope', 'Editorial Board', 'Terms of Use', 'Contact Us', 'In the Classroom', and 'Recent Papers'. There is also a search bar and a 'Submit Article' link.

The Spreadsheets in Education online journal (<http://epublications.bond.edu.au/ejsie/classroom.html>)

It is very gratifying to see the students succeed in solving a challenging puzzle or problem and demonstrate their learning.

I believe we must always encourage the students and give them useful feedback and support.

Sometimes this may involve more work, but in the end overcoming an especially hard problem or puzzle is a testament to their learning and such successes are a motivating factor in their continued efforts and further improvement of their problem-solving skills.

Stephen completed his PhD at Bond. His scientific career has been varied and includes areas such as solar energy, engineering software for Queensland electricity authorities, cryptographic software engineering, and mathematical models for Keno.

Steve's current research interest is in the use of the Microsoft Excel in mathematics education.

In 2002 he established the open access electronic journal Spreadsheets in Education, which publishes fully peer-reviewed research articles plus classroom resources. Steve was awarded a federal ALTC Citation for Teaching Excellence in 2009.