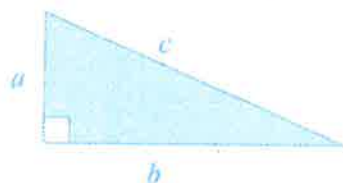
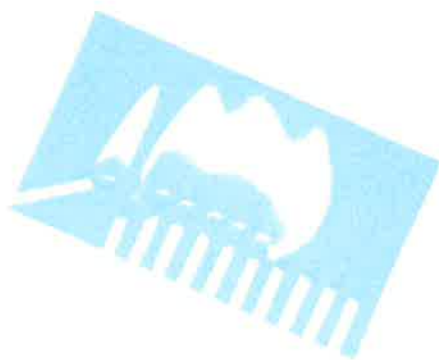
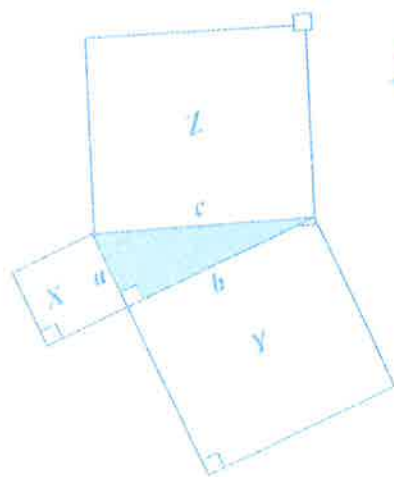


REFLECTIONS

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How to submit an article for *Reflections*

Each year there are four issues of *Reflections*. The last issue is dedicated to papers from the previous annual conference. We invite authors to submit papers for publication in the other three issues. Copy should be sent to the editor, Anne Prescott, by email anne.prescott@uts.edu.au by 31 January, 30 April, and 31 July so that members of the editorial panel can read and evaluate the material before printing in the subsequent issue.

Authors should submit their work as a Word document using the template at: <https://www.mansw.nsw.edu.au/about-us/reflections-template>.

Clear, black diagrams and tables need to be labelled and referred to in the paper. All references must be given. References to a journal paper or monograph should follow this format:

Kissane, B., Bradley, J., & Kemp, M. (1994). Graphic calculators, equity, and assessment. *Australian Senior Mathematics Journal*, 8(2), 31–43.

Heid, M. K. (1995). *Algebra in a technological world*. Reston, Virginia: National Council of Teachers of Mathematics.

We particularly encourage teachers to write about successful classroom experiences. Areas of interest include:

- the use of technology;
- alternative assessment strategies;
- teaching strategies;
- approaches to the new syllabus;
- ideas for gifted and talented students;
- thematic approaches;
- mathematical ideas;
- ideas to encourage reluctant learners; and
- alternative ways to present senior topic areas.

Teachers often produce and regularly use excellent worksheets. In each issue we would like to reproduce some of these in the Maths Exchange section. Worksheets must be original as we cannot reprint material without consulting and acknowledging the initial publisher. Please send a copy of your favourite worksheet to anne.prescott@uts.edu.au

We are also interested in receiving material for the Classroom Corner. These articles should concern ideas about practical ways that teachers can improve the quality of their classroom instruction. Please send your contributions to anne.prescott@uts.edu.au

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ENGAGING AUSTRALIAN STUDENTS IN MATHEMATICS LEARNING—THE ‘MATHS INSIDE’ PROJECT

Marco Angelini, Mary Coupland, Anne Prescott, Sandy Schuck, Steve Bush

Introduction to the project

This article introduces the project ‘Maths Inside’; the main purposes and design choices that have led to what we hope will be a positive contribution to resources that aim to support mathematics engagement and learning in schools.

Maths Inside is a project funded by the Commonwealth Department of Education and Training under the Australian Maths and Science Partnership Program. The aim of Maths Inside is to increase engagement of students by using rich tasks that show the ways mathematics is used in real-world applications. The need for such classroom resources has become well established in the mathematics education community and is a response to the call from teachers and students for resources that can help to bring mathematics to life in an inspiring and engaging way.

This project is a collaboration between the University of Technology, Sydney (UTS), the Commonwealth Scientific and Industrial Research Organisation (CSIRO), and the Australian Association of Mathematics Teachers (AAMT). The project manager, Dr Marco Angelini, and the project team are based at UTS and the team includes mathematics education researchers and mathematical scientists. The role of CSIRO is to identify scientists who are able to communicate the importance of mathematics in an inspiring way to secondary school students. CSIRO staff produce short videos of these scientists as they outline their research and how it contributes to finding solutions for real-world problems while expanding our knowledge of the world in which we live. AAMT is tasked with developing classroom resources that can make best use of the video material in an engaging way. These resources include lesson plans, teaching notes, and suggestions on how to use technology to access data-sets in the classroom. The emphasis in the resource development is to create investigative tasks that supplement textbook-based activities. An important aspect is that the Teacher Notes clearly map the activities to the Australian Curriculum Mathematics. The targeted Years are school Years 8–12.

As part of the project’s engagement with school communities we are designing professional learning workshops that are accredited with the Board of Studies, Teaching, and Educational Standards, NSW (BOSTES). These workshops focus on the use of rich investigative teaching techniques.

An additional aspect of Maths Inside is the development of ‘Pathways to Uni Maths’, an interactive website to support students in the transition from school to university. A future article in *Reflections* will outline this aspect of the project, which is still in development.

Maths Inside is also a research project. There are two reasons for this. First, to ensure that the resources are effective and deliver the defined outcomes, we need to gather feedback and evaluations on pilot versions of the videos and classroom activities. Second, to find out more about what encourages students to engage with mathematics, we need to work with teachers to benchmark current levels of mathematics engagement and collect data to demonstrate that the project has a positive impact. Mathematics learning has a high priority at all government levels of policy-making and the project is responding to this call by measuring improvements in mathematics engagement through the resources being developed for use in schools.

Collaborating with schools

The project relies on strong collaborations with school communities with an emphasis on long-term collaboration through the project cycle. Maths Inside is using the process sketched out below to develop partnerships with schools that are intended to be beneficial for students, school staff, and the UTS researchers.

School collaboration process

- An initial contact through conference workshop or individual professional network.
- A planning and development meeting between senior school and project staff to clarify aims, timelines, and working arrangements—to take place as soon as the school principal agrees to proceed.
- A pilot phase where feedback is sought on resources delivered in class, during the school term.
- The identification of participant-school teachers to attend a workshop on the aims and detail of the resources being used, arranged by the project.
- The delivery of project resources, with feedback data collected from teachers and students, to identified school classes, from 2016 till Term 2 of 2018.

Initial reflections

At the time of writing the project team has engaged with over 150 teachers through participation at professional workshops at conferences, including the 2015 AAMT biennial conference, MANSW annual conference 2015, Mathematics Association of Victoria annual conference, the UTS Women in Engineering Teachmeet in 2015, and a First Year in Maths UTS event in 2015. The following is some initial analysis from one of these events, representing the kinds of comments that teachers have contributed.

An illustrative example of one of our modules: Zebedee video

Our first set of materials were about Zebedee, a three-dimensional-mapping device that was developed by CSIRO. At the AAMT 2015 Conference workshop participants watched the first draft of a video about Zebedee. The results indicated that teachers thought that the video would be interesting and understandable for their students, that the video showed that mathematics is very important in society, and that through the video and the activities their students would be more able to connect mathematics to real life. Nearly all the teachers thought that videos and activities like those shown on the day would help their students to be more interested in studying mathematics in Years 11 and 12. The links to real life and the demonstration of mathematics in a variety of contexts were appreciated. The classroom activities were well received, but there were useful comments for the team to take on board to improve the classroom activities, such as making the activities more explicitly related to the video, making the activities less like textbook work and more about investigating, and also using technology more comprehensively. An important contribution from the teachers concerned the length of the video—in its final version the length was shortened by several minutes.

Project aspirations/expectations

By the end of 2018 we are planning for the project to offer:

- a substantive analysis of the current levels of mathematics engagement in Australian schools;
- a pool of high-quality resources that have been tested and refined through classroom experience;
- a mapping of current gaps that exist between the intention of delivering exciting, engaging mathematics lessons and mathematics as it is often experienced in many Australian classrooms;
- an effective response to the expressed need of teachers for more engaging resources that clearly identify the role of mathematics in science and society.

The sustainability of the project is ensured by another feature of the AMSPP initiative: the Dimensions Portal that is being developed by AAMT to preserve the outputs of this and other AMSPP projects. The Dimensions Portal will also serve as a 'first port of call' for teachers looking for professional learning activities.

Conclusion

Given its scope, links with stakeholders, and timeframe, this project is in a unique position to develop resources that show the importance of mathematics in the real world, and link scientists, teachers, and mathematics educators. The videos so far include the following topics: robotics, astrophysics, bees, hospital admissions, and aquaculture. At completion, Maths Inside intends to be able to offer a substantive and evidence-based perspective on mathematics learning in Australian secondary schools, together with learning tools that can facilitate effective teaching practices.

Next steps for teachers

We invite teachers who are interested in getting more information about the project to contact the Project Manager, Dr Marco Angelini, by email at marco.angelini@uts.edu.au. You may also like to view the first video, about the Zebedee 3D mapping system, which at the time of writing is located at <https://vimeo.com/143315590>.