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Australian
Learning
Lecture



CASE STUDY

**COLLABORATIVE PROBLEM SOLVING
at Eltham High School: Assessing and
teaching 21st Century skills**

COLLABORATIVE PROBLEM SOLVING at Eltham High School: Assessing and teaching 21st Century skills

Our schools need to prepare students for jobs that haven't been invented and technologies that don't yet exist. How can teachers prepare them? Along with core skills and knowledge employers are already demanding school-leavers who can collaborate and problem solve. These are essential skills for an information-rich economy which demands creativity, problem solving, collaboration and communication.

This ALL Case Study describes how one school is using an online tool to measure students' collaborative problem solving skills and how teachers are using this data. Learn about how to adopt the same tool in your school and find out more about teaching 21st Century Skills by using the links and references at the end of this case study. The ALL Collaborative Problem Solving video provides insights into how the online tool works and has been implemented.

The ALL Case Studies are practical examples of how joy and data can come together in learning. Inspired by the inaugural Australian Learning Lecture, delivered by Sir Michael Barber, the ALL Case Studies examine how in real learning experiences data gathered through the use of diagnostic tools provides greater insight into how each student learns. Data enables educators to help learners find joy in learning, to flourish and tackle life's opportunities.

Data, far from being in opposition to joy is an important ingredient in it.

Sir Michael Barber, Australian Learning Lecture, 21 May 2015, www.all-learning.org.au.

Collaborative Problem Solving: a skill for the 21st Century

Education researchers, policy makers and private enterprise agree that, in addition to content knowledge, students in the 21st century need to acquire particular skills to equip them for a modern world of work.

In 2015 the World Economic Forum said that “To thrive in a rapidly evolving, technology-mediated world, students must not only possess strong skills in areas such as language arts, mathematics and science, but they must also be adept at skills such as critical thinking, problem-solving, persistence, collaboration and curiosity.”ⁱ

This is a real problem facing teachers today: how to teach skills to equip students for living and working in the 21st century. Research into the *Assessment and Teaching of 21st Century Skills* (ATC21S™)ⁱⁱ has grouped these skills into four categories: ways of thinking; ways of working; tools for working; and skills for living in the world.ⁱⁱⁱ



Video - Voices: Professor Patrick Griffin (Skills for the future) - www.all-learning.org.au/resources/voices-professor-patrick-griffin

While teachers have many tools for assessing students' content knowledge they do not always have tools to assess skills such as collaborative problem solving. Collaborative problem solving has been identified by the Programme for International Student Assessment (PISA) as a key skill for the 21st century.

Patrick Griffin and Esther Care from The University of Melbourne's Assessment Research Centre, say that “Collaborative problem solving is a complex skill requiring both social and cognitive competencies. It was rationalised by the ATC21S™ project team as a composite skill arising

from the links between critical thinking, problem solving, decision making and collaboration.”^{iv} Importantly, Collaborative Problem Solving is about combining the skills and knowledge of all team members to solve complex problems. It requires participation, perspective taking, social and task regulation, and knowledge building.^v

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By working with real teachers and real students the ATC21S™ team have developed an assessment tool to provide real data to teachers and parents about students' collaborative problem solving skills.

How does ATC21S™ help?

Eltham High School is committed to teaching 21st century skills, including collaboration and problem solving. However, as Loren Clarke, English KLA Coordinator at the school found, the school had no data to provide meaningful insights into students' skills in these areas.

After approaching the ATC21S™ team at The University of Melbourne Loren began using the collaborative problem solving assessment tool in 2014. The Year 7 students at Eltham High School participate in a team-taught inquiry-based program which is an ideal environment for implementing the ATC21S™ assessment tool.

The assessment tool involves pairs of students working online to solve a problem. Each partner has different information on their screen and they need to communicate and share information in order to solve a problem. They communicate via a chat box and they may need to adjust their language and communication style so that they can work effectively as a pair. An example of one of the problems students have to solve is growing a plant: one student controls the temperature and the other controls the light conditions for the plant and they need to work



Video - ATC21S Overview of Collaborative Problem Solving tasks:
www.youtube.com/watch?v=R4X-jd7q9yY

together to make the plant grow.

Claire Scoular, Research Fellow at The University of Melbourne's Assessment Research Centre, observes that it is complex for even the most experienced teachers to assess each student's collaborative problem solving skills in a normal classroom situation. The benefit of the ATC21S™ tool is that it provides the teacher with baseline data for each student and help to inform ongoing teaching interventions.

How is data helpful?

Data from the assessment tool captures the sequences of actions and chat allowing observations to be made while students are working together online. The data for each student is summarised into a social and a cognitive report for each student and provides information such as who initiates conversations, whether students negotiate and whether they work through the problem systematically. Teachers are also provided with a report for the whole class, which provides guidance about how to cluster the class for future teaching.

Loren Clarke reports that students enjoy learning about how they think, as opposed to what they know. For some students Collaborative Problem Solving skills develop quite naturally but she believes that there are a range of students who benefit from explicit teaching of these skills.

For teachers at Eltham High School the ATC21S™ tool provides them with tangible data about their students' collaborative problem solving skills which enables teachers to plan teaching which addresses each student's needs. Students are tested at the start of Year 7, and then again

at the end of Year 7, so that teachers are able to monitor progress. With individual reports, teachers are able to identify the Zone of Proximal Development for each student and plan how to embed teaching 21st century skills in to the curriculum. Loren Clarke reports that once the testing has been completed in Term One, teachers audit the collaborative and problem solving tasks that are already in their curriculum and adjust these based on the data. These tasks can include anything from: group work/conflict resolution sessions; having students undertake learning style and personal learning activities so that they understand their strengths/weaknesses in a group; using ICT tools to support collaboration (e.g. Google Drive or edmodo); explicit teaching of problem solving and critical thinking (argument mapping, pro/con activities, logic and reasoning tasks), peer and self-evaluation in group work; small group dynamic activities that require students to solve small problems collaboratively (and mirror the types of open ended questions and problems encountered in other subjects e.g. maths, humanities, English, science).

The program has also been expanded to continue tracking student progress in Years 8-9, continuing the teaching and monitoring of students' collaborative problem solving into the later years of schooling.

What kind of joy exists when Collaborative Problem Solving is in place?

For Loren Clarke there is joy in "being able to see the effect we have as teachers; real evidence of learning. We can understand the impact we're having." She says that "there are often students who are strong in one area - so data is used to identify what should be taught, but also to review whether teaching has developed equal strength in both skills."

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Students report that working on the assessment tasks gives them insights into how they need to adjust their communication style for different situations and the need to share information and tasks with their partners. As they work on the assessment tasks students are also learning and gaining some insight into their own collaborative problem solving skills.

How did ATC21S start?

ATC21S™ began in 2009 as a research collaboration between The University of Melbourne, Intel, Cisco and Microsoft and governments in Australia, Finland, Singapore, United States of America, Costa Rica and the Netherlands. The project brought together academics, industry and policymakers to map out what they saw as the 21st century skills students need to develop to be prepared for the future of life and work.

The project then focussed on the key components of successful collaborative problem solving. ACT21S™ has developed and extensively tested a tool for the assessment of the complex skill of collaborative problem solving.

PISA, the OECD's Programme for International Student Assessment, has drafted a new competency for inclusion in its 2015 assessment of students around the world. Students will be assessed on their skills in Collaborative Problem Solving (CPS), which PISA defines as:

“Collaborative problem solving competency is the capacity of an individual to effectively engage in a process whereby two or more agents attempt to solve a problem by sharing the understanding and effort required to come to a solution and pooling their knowledge, skills and efforts to reach that solution.”^{vi}



Video - About ATC21S
(Comments from the project partners):
www.youtube.com/watch?v=Un_f5S1Kp3A

The evidence so far

The research behind the development of the tool was extensive, with academics across the globe involved in the process of defining 21st century skills. The tool represents the synthesis of a wealth of educational theory and practice in the area of collaborative problem solving.

Because it began as a research collaboration, the emphasis of ATC21S™ has always been on gathering data to analyse the efficacy of the tool and develop and improve it based upon that data.

The team has found that the test can be effectively applied globally and that there are common ways in which students solve problems, regardless of language or culture. The research team worked with real students and real teachers to develop an assessment and teaching tool for a real problem: teaching skills to equip students for living and working in the 21st Century.

Learn more

- The ATC21S™ team has also developed five professional development modules for teachers who wish to adopt the ATC21S™ assessment tool in their own school.
- Professor Patrick Griffin and Esther Care at The University of Melbourne run a free 5 week MOOC subject, *Assessment of Teaching and 21st Century Skills*. This course provides an in-depth understanding of 21st century skills and collaborative problem solving, what they are, how they are used, how to design problem solving activities and how to assess them. This is on the Coursera platform. www.coursera.org
- ATC21S™ You Tube channel - www.youtube.com/user/ATC21S

Sources:

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World Economic Forum. (2015). *New vision for education: unlocking the potential of technology*. Prepared in collaboration with The Boston Consulting Group. Retrieved from widgets.weforum.org/nve-2015/.

Professor Patrick Griffin, *Anticipating the future*, www.youtube.com/watch?v=HRN7OqYgHII

ATC21s Collaborative Problem Solving, www.youtube.com/watch?v=13smp1qfmR4

We look forward to continuing this #joyanddata conversation about collaborative learning with you on social media.

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ⁱ World Economic Forum. (2015). *New vision for education: unlocking the potential of technology*. Prepared in collaboration with The Boston Consulting Group. Retrieved from <http://widgets.weforum.org/nve-2015/>.

ⁱⁱ Details about the Assessment and Teaching of 21st Century Skills project, or ATC21S™, can be viewed at www.atc21s.org/

ⁱⁱⁱ Griffin, P. & Care, E. (2014). *Developing learners' collaborative problem solving skills*. Melbourne: Assessment Research Centre, Melbourne Graduate School of Education; and Suto, I. & Eccles, H. (2014). *The Cambridge approach to 21st Century skills: definitions, development and dilemmas for Assessment*. Singapore: IAEA Conference.

^{iv} Griffin, P. & Care, E. (2014). *Developing learners' collaborative problem solving skills*. Melbourne: Assessment Research Centre, Melbourne Graduate School of Education.

^v Griffin, P. & Care, E. (2014). *Developing learners' collaborative problem solving skills*. Melbourne: Assessment Research Centre, Melbourne Graduate School of Education.

^{vi} PISA 2015: *Draft Collaborative Problem Solving Framework*, March 2013, retrieved from <http://www.oecd.org/pisa/>