



DISCOVER

ENGAGE

IMPACT



## ROCKING THE BOAT

**UQ's Professor Robyn Gillies is making waves by advocating that talking in class should be mandatory.**

**Education is a hot topic politically. Both federally and at the state level, spending on education and educational reforms continues to rise. But, in international rankings, outcomes for Australian students really haven't changed in the last 10 years. Why?**

"There is a reluctance to change at the policy level: nobody wants to rock the boat. But I see that part of my job is to create a few little waves occasionally," says Professor Robyn Gillies from UQ's School of Education.

For almost 20 years, Professor Gillies has been researching the effects of learning styles on student outcomes, particularly in science, technology, engineering and mathematics (STEM) subjects.

In the last 20 years, international surveys assessing learning in reading, mathematics and science have been headline news because they put countries in rank order according to performance. Two of the most well-known surveys are Trends in International Mathematics and Science Study (TIMSS) and the OECD's Programme for International Student Assessment (PISA), a survey that assesses the performance of learners aged 15 who are nearing the completion of school, in reading, mathematics, science and problem solving.

"I have been concerned for some time about the relatively mediocre performances of Australia on standardised international tests such as PISA and TIMSS, particularly when I see how consistently successful Finland,

Singapore, the Republic of Korea, Chinese Taipei and Japan have been on these same tests."

Her findings show that when students are given opportunities to work together to solve a problem, their engagement, socialisation and learning all improve. Through what Professor Gillies calls 'collaborative inquiry' students learn how to engage critically and constructively with others' ideas, challenge and rebut proposals, and discuss alternative propositions – lifelong skills that extend beyond the classroom.

"If we rationalise it economically, we can't afford for our young people not to be engaging in habits that promote lifelong learning," she says.

"Students going through high school now are going to graduate into a very different world; change will be ongoing and they need the skills to be able to adapt to that change."

Professor Gillies says that in Australia, we need to be a little bit more inquisitive about what is happening overseas.

"In Shanghai, for example, they gradually scaffold students into becoming independent problem solvers, by initially supporting them, but slowly taking away those supports. We don't do that to the same extent."

### **A cooperative approach to cooperative learning.**

With an increasing awareness that many students are passive during teaching sessions, calls for instructional methods that

allow students to become actively engaged have increased..

"My work shows that cooperative learning can be used as a tool to help teachers teach in a way that taps into students' natural curiosity to explore their world," says Professor Gillies.

Although she has been undertaking this research for some time, in the last two years Professor Gillies has teamed with neuroscientists and cognitive psychologists at the Science of Learning Research Centre in a collaborative 'educational neuroscience' project to gather hard data about the best way of getting students motivated.

Educational neuroscience is a young and growing field and, by increasing understanding of the neural mechanisms that contribute to learning by cooperation, it can provide an important new perspective by which to further inform pedagogical practice.

In both actual classrooms in schools around Australia and in experimental classrooms set up by the Science of Learning Research Centre, the team uses technologies that allow it to measure students' engagement.

Students wear Empatica wristbands that are like watches and give researchers measures such as heart rate and electrodermal activity that provide information on students' attention. The team complements the wristbands with socio-metric badges that measure how students engage with each other.

"We can also pick up on speech events such as how often they participate, the volume,

and the tone of what they're saying, so all of that provides us with additional insights into how the students are embracing the learning that they're experiencing."

She hopes to involve education departments across Australia in projects to gather this hard evidence by following a cohort of students through their middle years of school.

### Gaining in-classroom traction

Teaching in the classroom is often the result of the collective wisdom of teachers handed down over the generations. And that's not always put to the test.

Teachers often think they are using an inquiry approach to teaching because they are out the front of the classroom directing the investigation or demonstrating how to do it. But Professor Gillies argues that science requires teachers to be able to excite the students' interest in a topic and provide them with opportunities to undertake the investigation, either by themselves or preferably in collaboration with others. The teacher, however, needs to remain active in the lesson, guiding the students and asking questions to help them consolidate their understandings.

"This work has great implications for teachers and for the development of curriculum and the way teachers teach, because we can now say, provided you get a teacher who is very effective and who is highly motivational, the students will listen to that teacher," Professor Gillies says.

When young people feel that teachers understand and respond to their needs, they are going to be better able to learn because they feel more at ease.

A reluctance to embrace cooperative learning may be partly due to the challenge it poses to teachers' control of the channels of communication, the demands it places on curriculum organisation, and the personal commitment teachers need to make to sustain their efforts. It may also be due to a lack of understanding of how to use this pedagogical practice in their classrooms.

### Creating a shift

Professor Gillies says that it takes time to build up a corpus of knowledge around best practices and international trends. She feels that after 20 years in the field, she has a handle on collaborative learning, its benefits and the science behind it. Her recommendations on how to translate her research into practice have been widely profiled in the international literature and on the website of the Smithsonian Science Education Center in Washington, DC.

"A corpus of knowledge allows me to have a broader mindset. It is time for a shift," she says.

Professor Gillies cites the work of her colleague, Professor Lauren Resnick from the Learning Research and Development Center, University of Pittsburgh, who states that intelligence, which was once thought to be determined almost solely by heredity, is in fact malleable. In school settings, however, intelligence is often still treated as a fixed attribute that limits many students' ability to learn.

"We have listened to and coded the language that students use in their group work – the more they engage with each other, the more sophisticated their language becomes.

"Once that starts to happen – and we have the linguistic markers to prove it – it changes the way students think and it changes their intelligence."

**Professor Gillies agrees that schools can and should create intelligence – this means that schools can actually 'grow the mind'. We just need to rock the policy boat to do so.**

**[uq.edu.au/research/impact](http://uq.edu.au/research/impact)**

*(Image credit: istock/RichVintage)*

### Active knowledge construction during collaborative inquiry science in the middle years

**2001–2002:** Receives UQ Foundation Research Excellence Award and Deputy Vice-Chancellor (Research) funding for a project on the effects of teacher/student interactions in cooperative learning on the development of small group communication and prosocial behaviours in children during the middle years of schooling

**2001–2003:** Receives ARC Australian Research Council grant to study the effects of teacher–student interactions in cooperative learning on the development of small group communication and prosocial behaviours among secondary students

**2005–2007:** Receives ARC Discovery Projects grant for the effects of training teachers in communication skills during cooperative learning on classroom discourse social inclusion and learning among middle-year students

**2008–2009:** Receives ARC Discovery Projects grant for a project on the comparative effectiveness of two strategic and meta-cognitive questioning approaches on children's explanatory behaviour, problem-solving and learning during cooperative, inquiry-based learning

**2009–2012:** Receives ARC Linkage Project grant for a project on inquiry teaching in mathematics: accelerating the process of change

**2013–2017:** Receives ARC Special Research Initiative grant to establish the Science of Learning Research Centre

**2014–2015:** Collaborates with the Office of Learning and Teaching on the project, 'Step up! Transforming mathematics and science pre-service secondary teacher education in Queensland'

**2015–2017:** Receives QGC and Queensland Museum Network STEM Education Partnership Program grant to develop a professional learning, research and evaluation plan

**2015–2018:** Receives ARC Linkage Project grant for 'School-wide approaches for developing social and emotional wellbeing: New understandings of positive identities, emotions and learning in adolescents'

**2017–2020:** Receives ARC Linkage Project Grant for 'Community-based STEM professional learning for teachers of middle years'

### Contact details:

**Professor Robyn Gillies**, School of Education

Email: [r.gillies@uq.edu.au](mailto:r.gillies@uq.edu.au)

Phone: +61 7 3365 6541

Web: <http://researchers.uq.edu.au/researcher/267>