

Actuaries Institute Podcast - Mastering mathematics for Australia's future

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Guests: Martin Mulcare, David Barnes, Clare Hughes, Margarita Psaras

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Martin Mulcare: Hello, and welcome to the Actuaries Institute podcast. I'm Martin Mulcare. And today I'm joined by Clare Hughes, David Barnes, and Margarita Psaras. Clare is the Public Policy and Practice Excellence Advisor at the Actuaries Institute. David is the Secretary of the Revitalizing School Maths Working Group, and Margarita is a member of that working group. Today we'll be discussing the role of the working group and its intention to produce a public policy statement in support of increasing participation in higher math subjects and indeed higher participation in maths, more generally. David, Clare, Margarita, welcome.

David Barnes: Hi Martin. Thank you for having me.

Clare Hughes: Thanks Martin.

Margarita Psaras: Thanks Martin. It's great to be here.

Martin Mulcare: The Actuaries Institute wants Australia's students to be engaged in maths, to deliver graduates with analytical and maths competency, not just for the actuarial profession, but to allow all of Australia's industries to compete in the global marketplace. Today, we will highlight the current problems with Australia's participation in higher maths across our education system and recommend material changes to address those problems. As many listeners would appreciate, a strong foundation in mathematics has many benefits for society. Let's talk about the working group. Clare, why was the working group formed?

Clare Hughes: Thanks Martin. Earlier on in the year, the Institute's Public Policy Council Committee asked for a volunteer working group to be formed, to look and see what was happening with students' participation in mathematics, in Australia's secondary students. As a profession, actuaries rely on advanced mathematics, and we hope to encourage more Australian students to consider careers focused on math skills. Jefferson Gibbs, this year's president and former president, Nicolette Rubinsztein, are both keen to ensure that Australian students have world class maths skills to ensure an adequate supply of STEM professionals, not just for the actuarial profession, but for Australia's growing STEM industries. The working group first committed to an Actuaries Digital article and, from there, was expanded to create the public policy statement.

- Martin Mulcare:** Okay, it sounds like this initiative started at the top with the input from the president. Well, let's talk about that Actuaries Digital article, which was published back in July. It was called "Where Have All the Higher Maths Students Gone?" I'm interested in your work on it, David, if I can start with you. What was one of the real insights? What was the main revelation for you, from your work, on that article?
- David Barnes:** I came into the article ready to really get on my soapbox about a few of the issues that I was already passionate about in education, like female participation or the benefits of logical and ordered thinking to protect us from being easily manipulated by whoever's speaking the loudest and, certainly, making teaching more attractive. I think what was interesting in doing the article was how much broader some of the issues were than I had originally realized. I've been an interested observer in mathematics education for a little while now, but, certainly, have been observing in quite a narrow way, following my areas of interest. Getting to see some of the other broader parts to it was quite interesting.
- Martin Mulcare:** So broader, but you're still happy to be on your soapbox. Margarita, what for you was the main insight when you were working on that article?
- Margarita Psaras:** As a recent high school graduate, I did have a pretty different perspective and a fresher perspective on what's going on in high schools regarding maths and I really felt that there was quite a lack of interest in the subjects. It was pretty surprising to find that the gap in interest over the last decade has been a lot larger than I expected and finding that the proportion of females studying maths as well has fallen quite significantly and still remains at low levels in the past decade and, as a female, I feel quite strongly about that.
- I've also investigated some of the causes behind the phenomenon of declining maths participation and it was really surprising to see that a lot of kids in high school want to choose the subjects that are less demanding, that they won't have to stress as much for, and won't eat up as much time and effort and mathematics is a very foundational process. So you're continuously building on knowledge that you have learned in previous years. That requires a lot of effort and a complex way of thinking that not everyone might have strong foundations in. Very interesting to see the underlying issues as a recent high school graduate.
- Martin Mulcare:** Thanks, Margarita. It's clear from those insights there's a lot of complexity in those underlying issues and we'll explore them shortly. So that Actuaries Digital article then morphed into the idea of a Public Policy Statement. Clare, why did that happen? Why was the statement created?
- Clare Hughes:** The Institute and its members are active participants in policy reform, particularly in those sectors where actuaries work.

- Clare Hughes:** But in this instance, we saw a need to advocate for change, to encourage more students to stay involved with maths subjects throughout their school days. As a learning institution ourselves and one with strong ties to our universities, we wanted a clearer picture of how maths is taught in schools, why students are moving away from studying maths and what policies could be changed to encourage Australian students to study advanced maths at school.
- Martin Mulcare:** Okay, so that's clear. Let's look at the core positions in that statement and let's have an outline of each of those six. David, would you like to explain for the listeners, the first position?
- David Barnes:** Our first position is to make maths compulsory to the end of high school. What we're looking to do there is that by ensuring people spend a little longer studying maths, then we hope to boost the minimum level of achievement that students have. The other thing is that we hope that if students need to study some maths, then those that are capable of studying higher maths may choose to elect those subjects rather than doing other courses that aren't maths related.
- Martin Mulcare:** That's clear. Some listeners maybe surprised that maths isn't compulsory or, even if it's optional, they would think that almost everybody would choose maths. But that's not the case, is it? I mean this is an issue.
- David Barnes:** It is. I was quite surprised how many students elect not to study maths in year 11 and 12, but it's almost a quarter of students that don't study maths in year 11 and 12, It's quite a big group that would get picked up by this change if it came in.
- Martin Mulcare:** That's the first one to really encourage all high school students to take some maths or at least basic numeracy through to the end of school. Margarita, the second position?
- Margarita Psaras:** In the second position we explored how industries within STEM can support the Australian mathematics curriculum. We have found that there aren't enough real-life examples provided to students in terms of how they can use the maths concepts they learn in real life. We have found that there is a prioritisation of procedural fluency, which is explored in the traditional assessment system throughout school. But students might be more engaged if they can use these skills and understand how these concepts are applied in real life and this can hence develop their STEM skills. What we value is this. What we want to see is this bridge between industrial partners.

- Margarita Psaras:** Other companies within STEM, for example, in the actuarial field, we can see the insurance sector could play a big role, but also, we would like to see the government and industry working together to focus on how to change a narrative for primary and high school and secondary school students on how they can use STEM skills to essentially build the future.
- Martin Mulcare:** Okay. Well, that makes sense, doesn't it? If students can see and hear the application of maths, especially higher maths in industries, especially in STEM industries, and you'd like to think that they would be motivated to keep with maths and keep with those sort of career paths.
- Margarita Psaras:** Yes, of course. It would've been great to see that during my time in high school as well, but I really hope some changes could be made.
- Martin Mulcare:** Sure. Now, David, you mentioned earlier one of your soapbox areas is about the teaching of maths. Tell us a bit about position three?
- David Barnes:** Position three is about advocating for investment in both our current and future teaching stock to help combat the current shortage math teachers that we have. Many of our listeners might not think that there is a shortage of math teachers because most people that want to study maths in school end up having a teacher. But across the Australian school system at the moment, about 30% of maths classes are taught by teachers that are teaching out of area. What we're proposing in this position is to invest in that current teacher stock that we do have with compulsory CPD to help support them to be able to teach as effectively as possible and also to invest in the future teaching stock by making the maths teaching profession more attractive and trying to incentivise more highly competent mathematicians to go down that pathway and see teaching as a reasonable alternative to all of the other things that they could do with that skill set.
- Martin Mulcare:** There's a lot in that position. I think the fact that really struck me was you said an estimate of 30% of maths classes are taught by people not out of field. So that just means not by specialist maths teachers. Is that right?
- David Barnes:** That's correct. 30% is the estimate that AMSI has come up with for the number of teachers that are teaching maths, but didn't do a maths specific education degree as part of their training.
- Martin Mulcare:** That makes sense then that our position is about supporting those teachers, not just the specialist math teachers.
- David Barnes:** That's right. There are lots of them out there and lots of them are doing a great job but what we want to support is further CPD so that all of those teachers that are teaching maths have all of the skills and resources at their disposal to be able to teach as effectively as possible.

Martin Mulcare: Thank you. Now there are a couple of causes or issues about taking up maths which are a little controversial.

Martin Mulcare: Let's pick up the next two, Margarita. Now the issue around university pre-requisites and there's also some concern about what impact the ATAR system has on subject selection. What are the positions there, Margarita?

Margarita Psaras: Thanks Martin. Positions four and five are quite dependent on each other, but I'll start with the first one. What we aim to talk about was promoting increased participation higher level maths, but that would have to happen by reintroducing mathematics as the prerequisite for admission to STEM-related university degrees and it was quite surprising to find that the participation rates of course declined in the past decade.

But one factor that had driven this decline is because mathematical subjects are not required anymore for STEM-related degrees, which means that students will start a STEM degree without necessarily having the appropriate and adequate background in order to be able to continue the STEM studies.

This can also result in students not actually completing their degree because it doesn't meet their educational expectations. We can see that the volume of STEM-related courses, especially in first year, can get quite overwhelming and I felt that as well as a person who undertook first year, about two years ago now. We have seen that there is a negative perspective of how the ATAR is affected from mathematics subjects because of all the scaling that goes on and how mathematics fits into the grading system, which can dissuade the students from choosing it. It's not only about the time and the effort and the stress that is caused.

Then in policy five, we look at how students can be incentivised and even rewarded when they undertake higher levels of mathematics for the possibility of undertaking STEM courses in the future. As I said earlier, there is this perception that studying high level maths will negatively impact a student's ATAR because of this absence of appropriate scaling and even if this scaling is perceived as beneficial, it might not compensate for the time, stress and effort that I keep mentioning.

Martin Mulcare: Okay. Thanks, Margarita. I think it's clear that they're quite vexed issues and let's move on to the final position while we're talking about vexed issues. David, the last position? Position six.

David Barnes: Thanks Martin. Position six is where we lend our support to policies that make maths study, and particularly higher maths study, more attractive for women.

- David Barnes:** What really strikes me as very problematic in the current environment is that we still have roughly twice as many males studying advanced maths as we do females in school and so this position is around supporting any initiatives that are going to address that and change that. We recognize that these sorts of issues don't change overnight, and it requires a long-term solution to some of these things.
- David Barnes:** But if that differential still exists in our school system today, that differential's still going to exist in broader society tomorrow. We've got to start fixing it in the school system in order to create the change that we're all wanting to see more broadly.
- Martin Mulcare:** **And in terms of that broader change, it's not just about numbers and equality, is it? What, in your opinion, is one of the consequences of not having as many women in higher maths and hence in STEM type careers?**
- David Barnes:** I think the impact is multifaceted, but I think maths is really a key enabler for a lot of different professions and a lot of different things that people can do in life. If an entire gender is dropping out of maths much faster in school, likely before great consideration has been given to subsequent vocational pathways, then that opportunity is removed from them and we know STEM professions are highly remunerated, highly rewarded, highly respected, and, within the actuarial profession and others, there's a push to make sure that we've got equitable representation of men and women across senior positions in industry and things like that. If they're chucking out those opportunities' way back in school, then it's going to be very hard to get there. I think it's really important that we do what we can to address that.
- Martin Mulcare:** **That equity issue then becomes an economic issue for women as well. Okay. Thank you. There's a lot in that statement and a lot, perhaps, beyond the immediate influence of the actuarial profession. So how does the Institute plan to use the policy statement, Clare?**
- Clare Hughes:** The policy statement can be used as a reference tool when we're talking to journalists and other interested parties around HSC results time, when the Institute goes to careers fairs and when we're in discussions with other broader stakeholders, such as other STEM professions, recruiters and, of course, the universities. The policy statement is a living document and that shows what our view is right now. But it will need to be reviewed from time to time to check its relevance.
- Martin Mulcare:** **That makes sense as well. Now just to give some flavor to this episode, Margarita, you mentioned earlier that you're only a relatively recent graduate from school. Tell me about your experience and how that motivated you to sign up for the working group?**

Margarita Psaras: Definitely, thanks Martin. This was around February time where I was looking at my emails and I suddenly found an expression of interest for the Higher Maths working group at the time and the minute I saw 'high school', I thought oh, this is something that is relevant to me and maybe I could give some insight to this.

Margarita Psaras: When I initially joined the working group, it was great to meet other people within my profession who had similar thoughts and perspectives about the bigger problem, which is the declining maths participation. It was also an opportunity for me to have a look at what goes on under public policy. I have never been involved in public policy before, so it was very insightful to see the process from the beginning to the end and the amount of approval that is needed for anything that we write for the sort as well.

It really made me enthusiastic about how public benefit is in the core of an actuary soul essentially and it was great to bring this actuarial thinking, but also my own thinking as a recent high school graduate as to how to solve this problem. Definitely very motivating that I could work with a great team. There was a lot of team cohesion, which I would say is not very common to find depending on what kind of thing you're working in. So it was great to research the issue behind why there is a STEM shortage and how that is going to evolve in the next decade. I definitely got the value, the teamwork and the effort and the knowledge everyone has brought to the working group.

Martin Mulcare: Thanks Margarita. I'm sure the working group appreciated having a relatively recent graduate among them to give a relatively recent perspective on school. So, thank you. That's all we have time for today. I hope everyone listening to this podcast has enjoyed this discussion.

Please check out our Actuaries Institute podcast for more actuarial content. If you look at this and you have more questions or comments, we'd love to hear from you. You can view the public policy statement on the Institute's website and the article on Actuaries Digital. There are links to these in the podcast description to make it more convenient. Plus, please keep an eye on your inbox for emails and on the Institute's social media channels. David, Clare, Margarita, thank you so much for joining the podcast today.

David Barnes: Thanks for having me, Martin.

Clare Hughes: Thanks, Martin and to all the members of the working group, who made such impressive contributions.

Margarita Psaras: Thanks so much, Martin, for facilitating and thanks to all the members as well for your cooperation.

Martin Mulcare: I'm Martin Mulcare. Bye for now.

“Where have all the higher maths students gone?”

<https://www.actuaries.digital/2021/07/09/where-have-all-the-higher-maths-students-gone/>

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