techgirls»
movement
FOUNDATION

2019

Search for the

Next Tech Girl Superhero Competition Evaluation

Analysis and report prepared by the

Tech Girls Movement Foundation

Sponsored by

rubrik

Table of Contents

Overview of the report

This report is generously funded by our sponsor, Rubrik.

The report summarises the results of the pre and post-competition surveys for the 2019 Search for the Next Tech Girl Superhero. The survey is aligned with international research, and was conducted and analysed by the Tech Girls Movement Foundation research team led by Dr. Jenine Beekhuyzen (CEO).

The study replicated the survey from previous years to allow a longitudinal comparison, with the pre-survey was delivered through Survey Monkey, and the post-survey though our bespoke competition Portal. The surveys consist of open and closed questions. Three groups of participants were surveyed before they commenced the 12-week program, and again at the completion of the competition during the submission process. These groups were the school girls who participated in the competition, team coaches (school teachers/parents), and mentors (women working in STEM). The response rate was higher than in previous years due to the emphasis on completing it as part of the submission process. Even some students who did not complete their submission and provide an entry submitted their feedback via the post-survey.

Funding is sought for further analysis of the results longitudinally over six years, and to publish these in relevant academic journals and conferences, and professional and industry outlets.

Overview of the program

The Tech Girls Movement Foundation has a vision of a society in which girls confidently lead in STEM entrepreneurship and contribute to their community and the economy. We do this by championing Australian school girls using hands-on learning to transform their future and encourage equity in the technology industry. We help girls to get excited and connected with technology in a way that is meaningful and life-changing, and we aim to give every girl the opportunity to participate in tech girls' activities and realise their potential to lead.

The annual Search for the Next Tech Girl Superhero competition began with 16 students in 2014, and it has grown to up to 1000 students per year. We have engaged more than 10 000 girls in our hands-on program over six years. To date, we have over 40 winning tech girls teams as Ambassadors to Silicon Valley in the USA to pitch their ideas and apps.

This award-winning program is based on 20 years of research on gender, diversity, STEM, and entrepreneurship. Through the program we have reached thousands of schools, both online for the competition and face to face for classroom workshops. Hundreds of teachers have participated, and 1000+ industry female mentors have participated in the program, volunteering tens of thousands of hours to their teams over the past 6 years.

Research Cohort

In 2019, <u>146 teams</u> registered in the competition from across Australia and New Zealand, from <u>57 schools</u>; <u>78 primary</u> and <u>68 secondary</u> school teams. There were <u>30 public schools</u>, 1<u>9 independent</u> and <u>8 catholic schools</u>; this includes 48 co-educational schools and 11 single-sex schools. 21 coaches had participated in previous years.

<u>137 female STEM industry mentors</u>, representing <u>55 STEM industry workplace</u>s were matched with teams. 33 mentors had previously mentored in this program.

<u>85 industry judges</u> (women and men) helped with <u>127 competition submission entries</u>. Each entry was judged by at least 3 industry judges.

We had mostly Australian teams, with only 3 New Zealand teams. New South Wales had the most teams by State with 69, with Queensland close behind with 58 teams.

2019	Mentors	Coaches	Students
Total participants	146	80	559
Pre responses	105	60	422
Post responses	53	47	273

Most mentors were in consulting, project management, or programmer/analyst roles in their workplace. Most mentors are based in NSW, followed by Qld and Vic. Most mentors are in the IT/Telecommunications sector, with fewer in health, finance, and education.
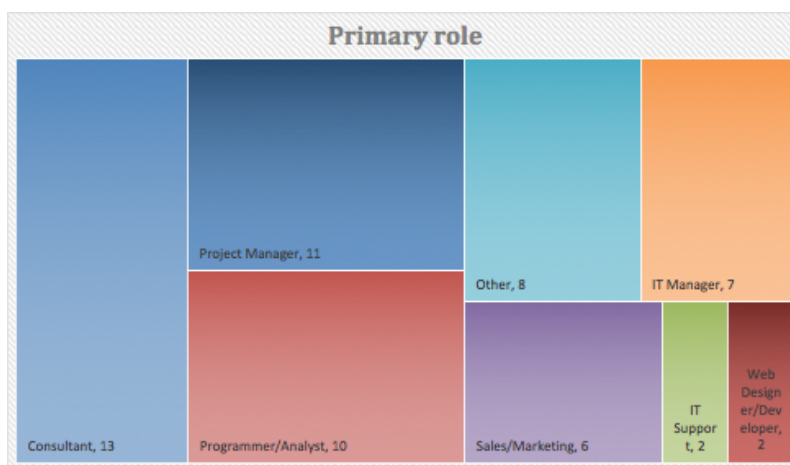
Mentors Pre

What do you hope to gain from the competition?

Before mentors began the program and were matched with a team of girls, they were asked what they hoped to gain from the competition. Many reported they would gain altruistic rewards through supporting, inspiring and encouraging girls to actively engage in STEM. Others were hoping to gain personal and professional skills relevant to bettering their career: better networking skills, to share their knowledge, gain insight into young minds and how they think and feel about technology, "[I hope] to gain an insight into how the upcoming generation thinks of today's world problems. I believe when we look at a problem we have many biases instilled in us and that doesn't let us try out many possible alternative pathways while the new age kids might make me learn to view things from a different perspective".

A number of mentors were participating in order to grow the cause of the Tech Girls Movement Foundation, because they believe in the grassroots effort, "continuing the good work of the Tech Girls Movement", and they are keen to be role models, "I hope to gain the warm and fuzzies that come along with showing girls they can achieve anything in the tech industry". Many were also looking for "a rewarding experience".

Others felt it was somewhat their duty to participate and give back to their community, "[I want to] know that I am part of the solution in building females in tech. Learn more about what inspires and motivates students and how we can continue to build the pipeline of females".

What motivated you to join the competition?

Mentors were primarily motivated to join the competition to *increase the number of girls taking up a STEM career".* Overall, mentors reported very similar motivations in the post-survey and reported that they gained what they hoped to from the program.

Many mentors understand just how important role modeling is for young women in STEM, "I hope to become a role model for the next generation of STEM professionals. I am very excited to see what students can achieve when they work hard and have a passion to make the world a better place. When asked what motivated them to join the program, overwhelmingly they want to encourage the girls to *think* about real-world problems, *empower* them to solve them and *encourage* them to follow a career in STEM.

Mentors Post

What worked well in the program?

Mentors reported that many things worked well in the program. Overall, the student's enthusiasm helped mentors have a positive overall experience, "The girls were super excited". The mentor's experience generally was aligned with the amount of interaction and the regularity of activity they had with the team. Often those who were physically closer to their team had more contact. Teacher experience also contributed to the mentor's experience, "I was blessed with a terrific group of committed and enthusiastic students, as well as an experienced coach/teacher at a school that was local to me and hence I was able to visit and form a real bond with the team". Other positives were:

- Weekly guidance; communications via video and emails; progress prompts

- Quick responses/follow up from Techgirls when emailed

- Very defined scope and clear information of what was required every step of the journey

- School coaches were very experienced and had a good framework to support the team with their entry for the competition

- The staged model introducing new concepts worked well and assisted the girls to break down the project into smaller manageable parcels of work, while also encouraging the thinking process towards the final goal

- Face to face interaction with the teams

"From what I observed the competition has been put together extremely well and has given the girls involved an opportunity to create something amazing".

Many "loved the experience" and found it "very rewarding". One mentor was impressed that she made a difference to the aspirations of her team members, "mentoring my team was very

valuable when one of them said she would be interested in pursuing a career in tech and that she found the coding exciting!" Overall it was a "great way to give back to an industry I feel passionate about", and "I enjoy the fresh ideas with young minds".

Many found that they had adequate information to commence and successfully complete the program, "All the information I found before the competition started was very thorough so no surprises".

What didn't work so well in the program?

There were also a number of challenges for mentors in the program. Some mentors were unable to meet up with their teams at all, and they did not get to see what the team's app was. In some cases, the mentor wasn't sure if there was a problem with the process, or if the team didn't need her. Limited time for team availability was a hindrance. Other issues reported:

- Girls not understanding their commitment and utilising the available resources

- Mentees not contacting their mentor

- Technical issues in meeting their mentor (online tools, firewalls)

- Matching availability times to meet between teams, coaches and mentors, and working across timezones

- Not enough support on tutorials - difficulty in troubleshooting

- Too much emphasis on the business aspects, not enough on actually coding the app

- Girls had non-existent coding skills making this a big learning curve

- A lot to do in a very short time

When asked what they would have liked to know about the competition before it started, mentors gave some useful suggestions:

- "When to call it quits with the team assigned to me"

- "I wasn't sure what the coaches would cover and what the girls would need from me"

- "More info on how the judging would work"

- "The particular platforms that were used for the creation of the app"

- "How to connect better with a remote team"

Advice to future mentors

Advice to future mentors is to "manage expectations", and this can be done through "be[ing] clear on your coding skills", "understand[ing] the roles and skills of every girl in the group", and "making sure the girls understand the commitment and effort from the beginning". For any difficulties, mentors recommend to "contact the coach".

Engaging early with the team is recommended as "time slips by very quickly in the first four weeks". Setting regular meeting times and communication channels early is also key, "try to set up a cadence to meet ongoing week by week". While some feel that there is more value in face to face interactions, "better to attend in person", however, this is not always possible, and the program was designed with this in mind. To "get face time with the girls" is necessary whether face to face or virtually, and many mentors do make this work successfully in a virtual environment.

Encourage brainstorming, and sharing of all ideas, big and small, "be open to the students' ideas [because] some that don't sound so great can develop into something fantastic". Most of all "start small and build", "encourage them to pursue their ideas and dream big". Although mentors can put as little time as one hour per week into mentoring, some spent more time than required, but they said it was worth it, "there is a lot of work, but very worthwhile". "Be flexible". "Always enthusiastic". It is necessary to keep the overall goal of the program in mind too, "enjoy, have fun, it is not about 'winning', but empowering girls to think about solving global problems locally".

Expanding the program

Advice from mentors for expanding the program:

- Kickstarting the program with a mentor/mentee/coach meet-up session and outline key deliverables.

- Showcase previous years' apps as part of the introduction to the program

- Involve male mentors

- Making it part of the curriculum for digital technologies in schools

- Make it compulsory in schools

- More corporate sponsorship

- Target disadvantaged, marginalised communities

- Regular virtual workshops for teams outside capital cities

Coaches Pre

A coach is usually a teacher, sometimes a parent, and they register the team online and guide them through the 12-week program. They are the contact point between the Tech Girls Movement Foundation and the team. Coaches were asked what their primary position was in schools, with most reporting being a teacher, working in the classroom, or a librarian.
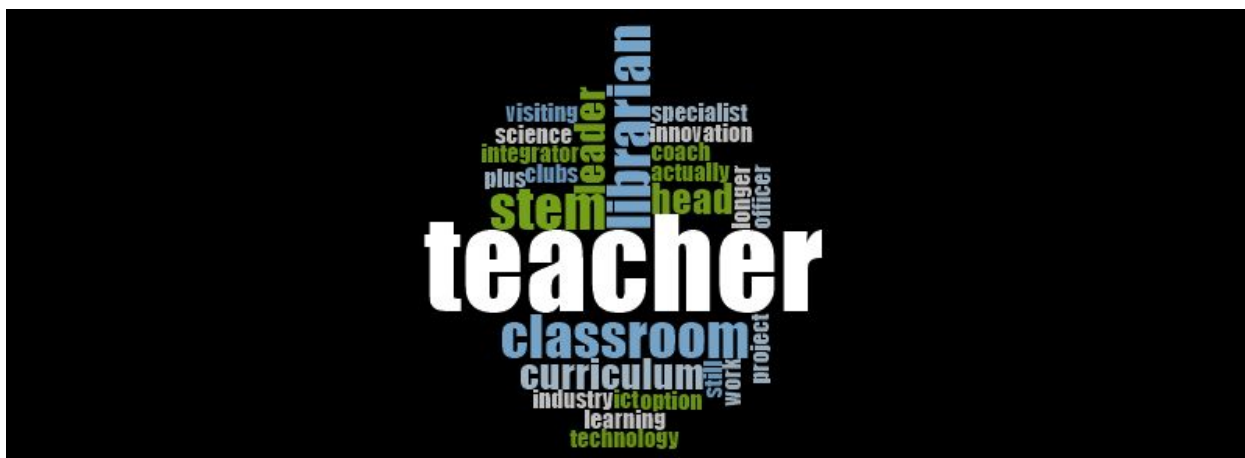
What other STEM programs does your school engage in?

Coaches discussed other similar competitions to our program that their school engages in. Overwhelmingly they reported on Young ICT Explorers and First Robotics. They also reported RoboCup, hackathons, the Premier's Coding Challenge, and a video game competition. Hour of code also got a mention from one coach. Outside of this research, we know that one of our winning tech girls teams has participated in Young ICT Explorers for a number of years, and in 2019 they were told by one of the longest standing judges that they gave the best pitch he had heard in all of his [ten] years of judging in the competition.

What motivated you to join the competition?

Many coaches participate because they would like to grow the engagement of girls in STEM at their school, "[I'd like] more engagement with girls in Tech, [and the] ability to create a framework specific for girls that can be sustainable across the school". In doing this, they hope to provide rich STEM experiences and encourage girls to find their STEM passion, "[I hope to gain a] greater love for the learning of stem and hopefully it filters through the school".

Many coaches were motivated to participate in the program to increase the number of girls studying STEM subjects at school and to share their love of teaching. Other motivations for coaches included:

- "To provide opportunities for girls in STEM and open their eyes to this way of thinking"

- "To support the young students undertaking the program and the other teachers involved"

- "To provide extra-curricular options for students interested in IT"

- "My students asked me to"

Most coaches who are teachers engaged in this program are also actively engaged in their own professional development in the program, and they may use that in their wider teaching, "[I hope to] develop my learning and skill in this area and engage students in learning beyond the classroom and connecting them to their world"; others want "a greater understanding of app building and tech industry-related careers so I can share this in my teaching". Overall they want to increase the engagement of girls in STEM in their schools.
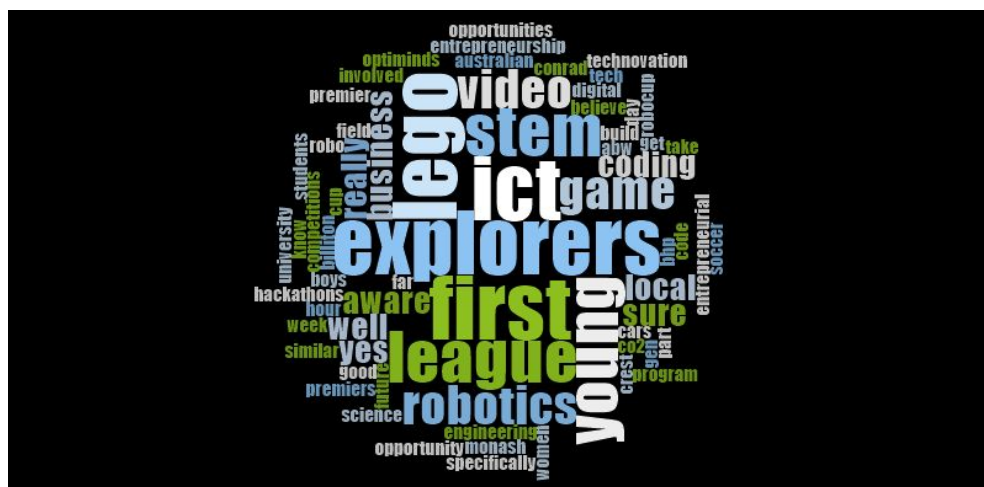
Some coaches engage in our program year after year, which is a sign of success. In 2019, some coaches were participating for their fourth time. All teachers are our champions in the schools we reach. Without them, we would not have a solid and scalable basis for the program.

When coaches were asked why their teams did not submit in previous years, time and technology were the biggest barriers. Some reported that "students did not have enough time to complete the app", and "technical difficulties and sudden block of the tools".

Others understood from the beginning that the program is not easy, and it is not meant to be and that we expect a non-submission rate of approximately 30% based on previous years' experience. What we have found, however, is that those that do not submit often return the following year and enter the program again from the beginning, learning from their experiences, "I think the amount of commitment required to see the submission through is, quite rightly, very high. I have learned to accept the level of attrition as being an indicator of the program's rigor".

## What do you hope to gain from the competition?

When asked what they hoped to gain by participating in the program, they focused on a number of positives for themselves and for their students:

Benefits for students	Benefits for coaches
Increased overall confidence	Grow IT skills and confidence
Greater knowledge of the skills for STEM careers	Be a role model for young girls
Showcasing innovative student work	To show girls that we can do anything
Empowered to enter STEM fields	Work with professionals on real-world projects
Increased engagement with STEM	Inspire students to have a go
Grow deeper problem-solving skills	

Coaches were very open about what they hoped to gain in the program. Many obviously have a passion to inspire their students and provide them with STEM opportunities, and many really do understand the philosophical basis for our program, and why a competition with structure and deadlines is important, "Personally I'd love a win! :) However, I know that the process for the girls throughout the competition (learning, collaboration, team communication, creating an app, research, business plan, etc.) result in a range of wonderful experiences for them and I simply love to see how excited they get. My long-term goal is to improve the IT subject offerings at my school next year (Year 9/10 electives that will flow into senior Digital Solutions in 2021) and I don't want the girls to miss out".

Coaches Post

Only a few coaches reported having formal qualifications in an IT-related area. Coaches report regularly teaching in the following areas:
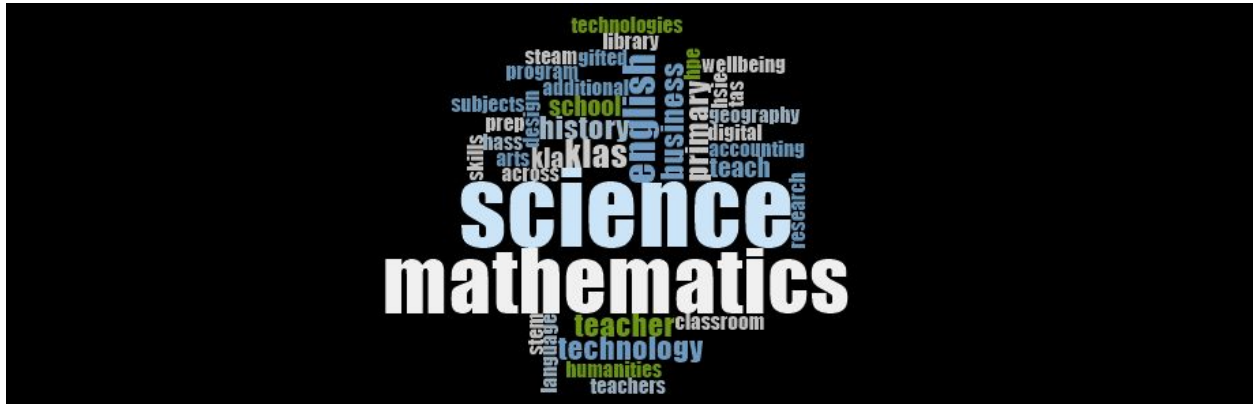
What worked well in the program?

Having engaged students, adequate support materials for the program and constant communications about what was required on a weekly and quarterly basis were the things that worked well in the program.

Some coaches were really happy with the timing and flexibility of the modules and curriculum, "the timing of the program works very well. The flexibility across weeks was good so students didn't feel pressured but at the same time had some help around creating personal deadlines". Some found the "weekly videos from Jewella" [Jenine] were invaluable.

- "The girls learned a large range of skills - planning, marketing, designing and coding. They also learned about sharing the workload and efficient time management"

- "Mentors based in the same city. Primary school children seem to work better when they have met the person face to face although one of the mentors worked very hard to establish a relationship with the team by phone and email"

- "Teamwork, collaboration, project management, independence, and great mentor"

- "Starting earlier in the year and running design thinking sprints to help the students identify real problems they are passionate about. Using resources from the Global goals helped with this"

Even those most experienced champion coaches in the program find they learn new things each year, "this is my 4th year and every year I learn more and more, but there is always something new. I think you just need to jump in and know that help is at hand".

Overall, coaches reported the program as a worthwhile STEM activity to invest their time and energy into, even though it was not easy, "the girls found the competition worthwhile, challenging and exciting. The girls had no coding experience but learned along the way". Other

comments were clearly supportive of the program, and showed teachers' commitment to continual involvement:

- "Although it was a lot of work, it is such a rich experience. The girls learn a lot about time management too (which does not come naturally to them)

- "I would [do it again] because my girls gained some great skills as well as self-confidence"

- "I was blown away by what our students came up with... continually surprised by them"

- "We learned so much this year I believe we will be a lot better next year"

- "The girls really feel empowered when they achieve their goals"

- "The girls have grown in confidence and competence as creative digital collaborators. They have an awareness of project work and how to use real tools to solve real-world problems"

- "I feel like this year helped me to find my feet and learn some lessons about how to be a better coach. I would 100% do it again because working with those five girls is literally one of the best things that I've done"

- "Love the challenge. the girls thrive. leadership opportunities, real-world links"

- "Linking girls with industry mentors is a big motivator"

Some innovative teachers have found ways to embed the program into their curriculum, "[we] will definitely participate in the program again depending on student interest. I am hoping that if we get our Girls in Tech elective running at Year 9 that I can embed participation in the program into this class". While there will always be a struggle with school holiday breaks during the program, there is not really a way to avoid them so we need to prepare teams for them.

And one coach commented that sometimes the less you know, and the less prepared you are, the better, "I didn't know very much about the competition and came across it by accident; sometimes not having the chance to think about things too much is an advantage!"

What were the biggest challenges in the program?

Some felt the 12-week program did not allow enough time to complete the required deliverables; we receive this comment each year. While we acknowledge that it is a strict, difficult timeline and schedule to manage, we do it purposely to teach skills related to deadlines and teamwork.

We take great efforts at the Tech Girls Movement Foundation to provide fast and informative support for our stakeholders during the competition, and we received positive feedback on our responsiveness and relevance, which is appreciated by our coaches, 'I think we were kept

updated and in the loop by the organisers and this helped a lot. I don't feel there was any more you could do as organisers so well done!"

Some felt that, as a not for profit, the Tech Girls Movement Foundation need to provide more justification for the $50 registration fee for the 12 week STEM entrepreneurship program. The fee was introduced for the first time in 6 years in 2019. The reasoning was to help us to be long term sustainable as an organisation and for the program we deliver. We have calculated that it costs $500 to support each student in the 12-week program with our ongoing curriculum development, a welcome pack, and our ongoing support through the competition, teacher professional development, mentor training and support, and our showcases and prizes. While some may see the registration cost as a barrier, we are surprised by this as we offered to waive the registration fee for anyone who cannot afford it, with no questions asked. In 2019, we waived the fee for approximately one-third of the teams in the program.

Not all teams submitted their entries, and we asked coaches why their teams didn't submit. There were a number of reasons:

- Team members left and others lost momentum
- Tasks were dominated by one student
- Difficulty maintaining motivation

One of the biggest challenges each year is always time management. A lot is expected in 12 weeks, and the program requires teams to actively engage in the program early. Those that struggle, often turn those learnings into a new entry the following year, "we started 4 weeks late. [We] have learned so much and look forward to a better competition next year".

Time commitments are always a challenge each year in the program, and timing is designed for students to learn about the importance of deadlines, "It's definitely a worthwhile program but also a lot of time needs to be dedicated to it to do it properly"; "just comes down to time and would we be able to fit it into our school calendar next year". Even getting the girls together in a room on a weekly basis regularly was a challenge for many, as the girls often had many other extracurricular activities.

Would you participate again?

Coaches reported working with industry and community as a bonus, "the people we meet, working with people in the industry, operating at this level as a group is an opportunity for all involved including our school community", "It's a great opportunity for both teachers and students to connect with industry mentors". While this was positive for some teams, others found it challenging to create any kind of meaningful connection with their mentor which, it is suggested, could be overcome by an early organised connection between the coach and the

mentor, "It would have been better if the coach could have met with the mentor in advance in order to organise dates to meet and to plan the modules".

Overall, 64% of coaches said they would definitely participate in the program again, 30% would maybe participate again, and 7% would not.

Some have found significant structural barriers in their school to ongoing participation in the program, "I mostly wouldn't participate because of structural issues at my school. The (male) technology co-ordinator did the initial organisation and allowed the group issues to occur whilst informing students but not the teachers who were supposed to be the coaches about the program at the beginning. And later on, when group issues compounded, the relieving technology co-ordinator (also male) intervened rather than allow the coaches to deal with things".

Some reported technical challenges with the new portal submission system, "as first-timers, it was hard to know if we were on the right track [with submitting]. While we recognise these difficulties, and are working to fix them in 2020, we make every effort to support new and experienced coaches through the STEM entrepreneurship journey, even if it isn't always easy, "we were very inexperienced in all areas, so it was a challenge to complete the task especially working with 4 teams. The financial side and the app-building and coding was new to all of us. [It was a] huge learning journey for us (but not always a bad thing!)".

While some teams were brave and submitted incomplete entries, they took it as a positive learning experience, "Even though we didn't get all areas completed with the business plan and had challenges learning the coding and fitting all in over a couple of lunchtimes a week. We would participate again as the students did enjoy it and the majority feel that they now understand more and would be more successful next year. Even though they haven't completed all of the parts we submitted so they could gain the experience and feedback and learn from this for the future". Recommendations to change parts of the program may help with this in the future, "I think less emphasis on the business plan and more emphasis on the user interface and user experience before developing the app concept".

Expanding the program

Coaches believe the program could be expanded, and that they would like to see the competition open to all students, boys, and girls; they would like more training, and they would like more opportunities to expose their students to real-life workplaces:

- "I love the format of the Tech Girls competition but would also love to see a separate competition in the same format that is not exclusively for girls. I know this is not part of the organisation brief, but as a rural teacher I feel that both our girls and boys struggle to have an understanding of the diversity of potential STEM careers and access to a range of role models"

- "Industry/site visits. Seeing women in IT in their work environment"; "Perhaps hold after-school sessions with industry professionals that the girls could attend in person or via skype"

- "Proper app development programs, with training/courses on how to do it, rather than just suggesting a couple of programs to use and letting us fumble through trying to figure it out".

Others were all about celebrating team successes, big and small, "I do think that celebrating the small success helps the students to reflect positively on what they have learned and what they can work on for the future. I think the celebrations also allow for words of a peer to inspire others to have a go".

The feedback that is not unexpected is in regard to primary and secondary students being required to submit the same business plan. While we do expect less content from primary students, some coaches would still like us to provide two submission options, "Maybe not expanded but I would like to see the Business Plan for the primary school scaled back. It is very complex (although I appreciate the red writing to guide them through it)". Others feel we should bring other aspects into the judging, to expand beyond the business plan, development and pitching to include connecting and communicating to customers in a digital world, "Encourage more points to be allocated towards using all aspects of technology (not just coding - for example website building, facebook pages, video blogs about the journey) ... the more hands-on students are with technology the more comfortable it becomes".

Other feedback relates to our exposure in schools, and our word of mouth advertising, and that we should expand it, which we plan to do in 2020, "I heard about it through a student - I did not get any notification through my school so wider advertising of the event".

Advice for future coaches

- "Help is at hand, you can never know everything, but you can develop the mindset to find out. Have fun and don't take things too seriously, but try to be organised".

- "Jump in. Refine your plan & approach each year. Embrace the mentoring aspect".

- "Read everything that gets sent out and then summarise it to present it to the girls".

- "Make sure you have a great mentor because, without ours, I seriously don't know how we would've done it all".

- "Just enjoy the experience. It can feel overwhelming at times but it is so worthwhile to do. I am so glad I decided to do this".

- "If this activity is not embedded as part of a class or structured club it is very hard for students to maintain motivation and time to work on this project (particularly within school hours)".

- "Only take it on if you have a lot of free time!"

- "Make sure all students have buy-in to the project and understand the time commitment involved".

- "Really utilise the mentors expertise".

- "There is a lot of work for the students to do so really use the planning materials in the planner with the students, make sure they are actually recording their work. The more time they have to put into the project, the easier it will be to complete the workload".

- "Ensure that students who are focussed and have shown evidence that they can work in a team are in the one team".

- "Try and get on board as many teachers as possible. It's a great learning curve for both parties".

- "Start early, work on a pilot, connect with someone who has completed it [if possible]".

- "Choose a team with a wide variety of skills and talents. Teach the girls how to work as a team and allocate a role that they are responsible for".

- "One to 2 teams would be heaps! Start early in introducing the notion of the comp and the sustainable goals to the girls so when it's time to start, they have formed teams and are well on their way to being prepared in their thinking".

- "Arrange a meeting time with your group and stick to it, meet regularly as a team and with your mentor".

- "Keep to the timelines strictly - don't rush at the end".

- "Learn a lot about coding cause the program gives you nothing really".

- "Run some sessions in app creation coding prior to starting so the girls have an idea of what is possible. Use past entries as examples to inspire students and to demonstrate what needs to be done. Start straight away with the business plan".

- "Be patient, start early and learn with the girls.

- "Open and regular communication and negotiation is key!

- "Get started early! We were behind from about week 1, and it felt like we were always scrambling to keep up".

- "If you're in a school, trying to get kids who are not spread across campuses could be helpful. Talk to your principal/school organiser about ensuring that there is a clear time during lunch breaks where you will not be rostered on for a yard duty- even better if you can get that included in your load".

- "Set aside weekly times to work with the group, allow the task to be student lead (which can lead to noncompletion but this has great learning opportunities).

- "Learn how to use MIT app inventor and Thunkable early on so they know what's possible to make on those platforms.

- "Read all the resources first".

- "Start planning teams in the middle of Term 1. Hold afternoon sessions. It's impossible to complete during school lunchtimes".

- "Give students plenty of example of what is expected".

- "Don't wait to be asked questions - offer advice from the beginning so the girls feel supported the whole way. Perhaps a weekly email detailing what direction we should be taking/up to at that point? Since none of us had done it before, we didn't even know what questions we should be asking to make use of your skills".

- "Having more than one team is quite difficult to keep on top of".

- "Just say yes".

Students Pre

What activities does your school offer for students who are interested in science and/or computing?

It is clear from the word count associated with this question, that STEM activity is core to activities in the classroom.
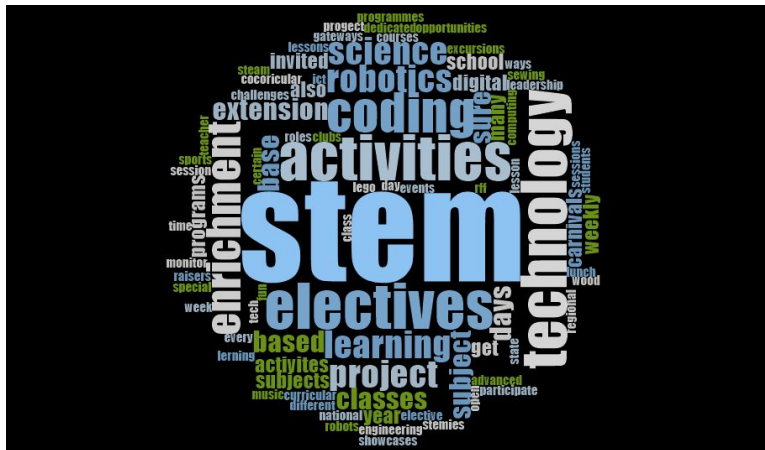
Do you enjoy the STEM activities your school runs?

Students were asked for comments about the STEM activities their school runs. Some liked them, some thought they could be better thought out to encourage engagement.

- "It gives students a chance to try something new".

- "They could be better organised and more accessible to beginners".

- "At our school. we run a STEM squad for all students in years 7-9. It is a fun welcoming environment with great teachers".

- "I am excited to participate in the tech girls are superheroes competition as I think it will broaden my horizons and be an exciting opportunity.

Others acknowledged the role that their teachers have in their future decision making, "I think that the teachers have a real impact on what I decide to do with my life and that they are really helping, making my decisions easier".

41 students had participated in the program previously. When asked why they may not have completed the competition while registered in previous years, "we fell behind", and "we did not

complete the app because we did not know how to use the coding app"; were reported as significant barriers to completion.

What are you most likely to study at university?

When asked what they are most likely to study when they go to university, they reported the following mix of interests:

What was your motivation to join the program?

Students were asked to provide more detail about why they joined the program, and what matters to them. Some were influenced by role models in the family, "I have a dad that loves science and so do I", "I now have three amazing teachers that help me learn more and more every day"; "I don't have very much knowledge about coding, however, I think that Tech Girls are Superheroes will be a great opportunity and I am excited to learn and be able to create my own application. I am also interested in improving my coding skills".

Others have had great support in their STEM learning, and have had many positive experiences in the school system, "I have had a lot of support from school teachers, friends, and family. I agreed with many of these statements mainly because I've received so much support". Some reported feeling out of their depth, "In some things, I feel comfortable, some ok and others not at all comfortable".

As we already knew, some young people are really hard on themselves in regards to failure. At the Tech Girls Movement Foundation we regard failure as a good thing, a learning experience, and a chance to reflect, learn and build better (more robust) practices in the future. "My parents don't care what kind of job I get as long it's one I want. I don't like it when I fail at things I tried really hard for"; "I hate failing at things but I have also never been involved in anything to do with coding, but I like science so that's cool".

It's really enlightening that some students view our program as a way to improve their academic rankings while making the world a better place. "I now have three amazing teachers that help me learn more and more every day". "I answered the way I did because I believe the world will be better off with more useful tech and I think Tech Girls might help me work better in a team and also help me not scold myself if I don't get good results/ grades (eg my report card)".

Some students think they may consider a career in STEM after our program, before they even begin, "I have had great teachers in the past for technology and science...I enjoy learning and doing things that involve these subjects...I would also love to pursue a job that involves technology and science". A quarter of the students responded that they were considering a career in STEM before they started the program (agree or strongly agree).
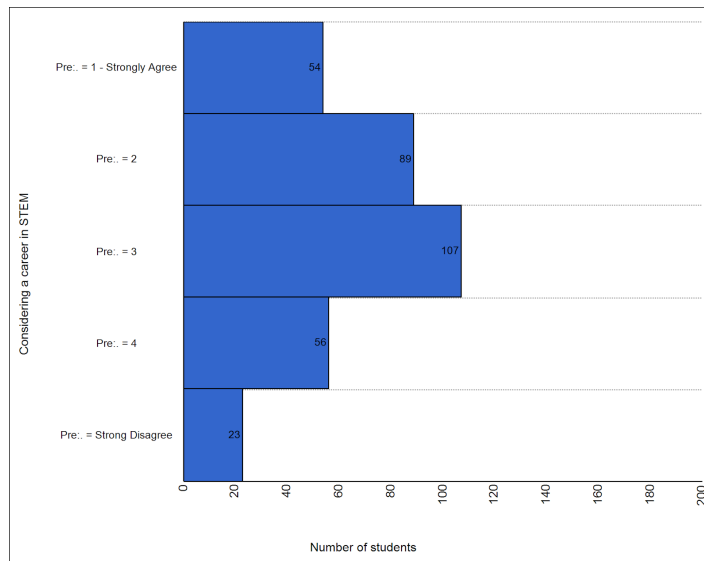

Less than half of the students watch TV related to science and technology (agree or strongly agree).
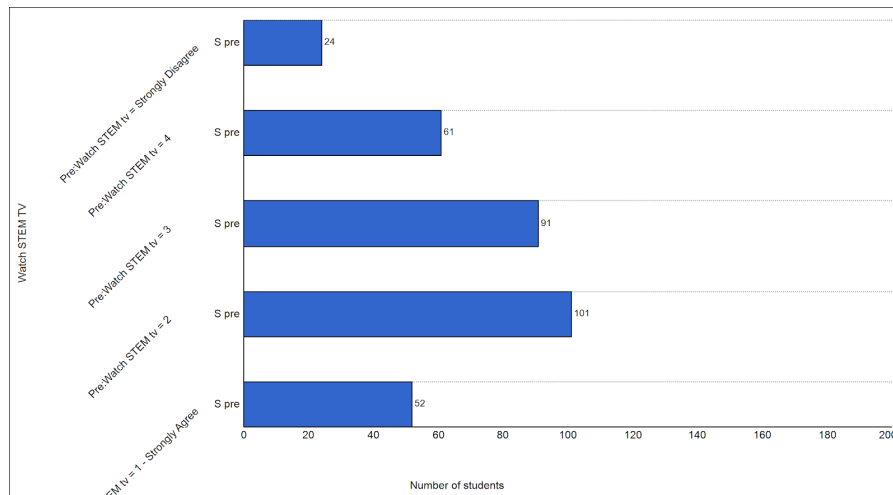
What is your level of coding knowledge?

Students self-reported their coding knowledge at the start of the program. 7% reported no coding knowledge, 25% had a small amount, 20% had quite a lot, and 6.5% had a lot. 41.5% found themselves with some but not a lot in the middle of the bell curve.
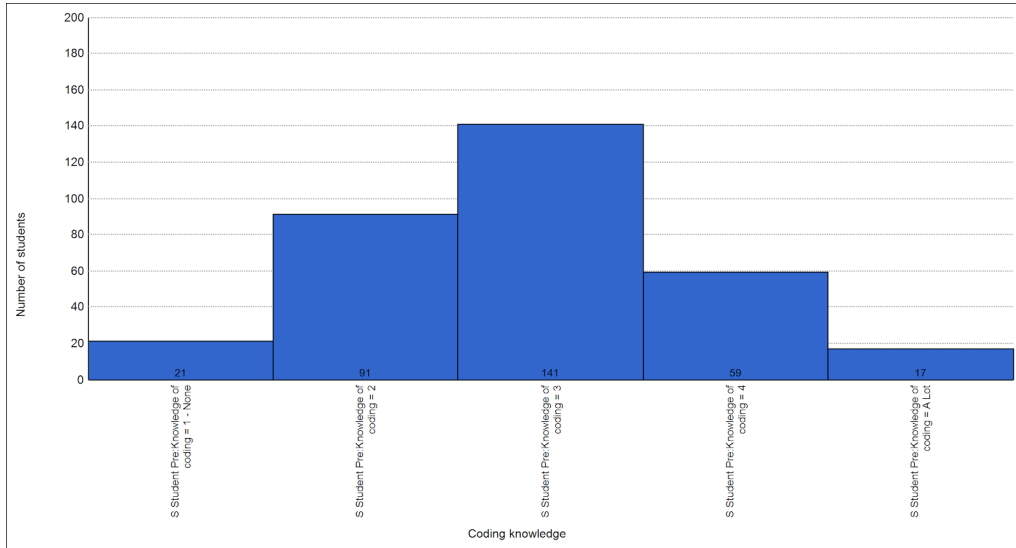
What is your confidence in developing new ideas with technology?

In terms of confidence in developing new ideas about technology, 29% strongly agreed, 41% agreed, and 25% were neutral. Less than 5% reported not having any confidence. This confidence, however, did not necessarily translate into an ability to cope with not doing well on assignments, with nearly 40% of students agreeing or strongly agreeing that they can cope, and more than half the students not able to agree that they can cope.

Do you know someone working in STEM?

Surprisingly, 213 of the 577 students knew someone working in STEM before the program. 54 weren't sure, and 62 didn't know anyone. 29% reported a possibility of starting their own business when they leave school, 40% weren't sure, and 31% did not think they would.

Students Post

Do you enjoy STEM activities at your school?

Students commented that they generally enjoyed the STEM activities their school runs (like tech girls), and that "we are lucky to have these opportunities to try something new!"

What are you most likely to study at university?

Interestingly, the students reported quite different areas they are most likely to study in, in the post-survey, to the pre-survey. There is no doubt that the areas reported post-competition are more STEM-related than the areas of interest reported in the pre-survey, suggesting that the program has had a positive impact on them choosing to study in STEM-related areas.

Why did you not submit your entry in previous years?

Students were asked why they were unable to submit to the competition in previous years:

- "We didn't complete the competition because everyone in my group wasn't committed and quit so everything was up to me to complete and it was too much for me to do by myself".
- "We completed most of it we just weren't able to complete all of the tasks".

What is your level of coding knowledge?

After the program, students were asked to think back and report on how they ranked their knowledge of coding prior to commencing the program. We compared this to what was reported in the pre-survey. In the post survey, 47% reported that they began with little to no knowledge, however 32% self-reported they began with little to no knowledge prior in the pre-survey, suggesting that some participants overestimated their initial coding knowledge.

26.5% of students reported some to a lot of coding knowledge prior to the program, however only 20% reported beginning with this level of coding in the post survey, suggesting that again, students overestimate their coding knowledge prior to the competition.

Do you think participating in the competition has improved your knowledge of coding?

58% of students reported that their knowledge of coding has improved somewhat or a lot as a result of the program, 22% were neutral, and 20% not much or not at all. These results fit with expectations, as not all team members engage in coding activities, so it is not expected that all of them will have improved their coding skills.

Did you have adequate resources in the program?

	Post
I had sufficient resources to be a successful participant	79.5% SA/Agree 17% Neutral 3.5% Disagree/SD
The coach provided the support needed	86% SA/Agree 10% Neutral 4% Disagree/SD
The mentor provided support and direction	73% SA/Agree 12.5% Neutral 14.5% Disagree/SD
Our team worked well together	81% SA/Agree 14% Neutral 5% Disagree/SD
We had enough time to complete the project	55% SA/Agree 28% Neutral 17% Disagree/SD

Pre and post comparison of responses

Having participated in the competition...	**POST**	**PRE**
I am now more likely to consider a career in Science or Technology *Pre - I am considering a career in Science or Technology*	13.5% SA 30.5% Agree 38% Neutral 18% Disagree/SD	20.5% SA 33.5% Agree 27.5% Neutral 18.5% Disagree/SD
I am now more likely to watch tv shows about Science or Technology *Pre - I watch tv shows about Science or Technology*	10% SA 18% Agree 46% Neutral 26% Disagree/SD	17.5% SA 36.5% Agree 26% Neutral 20% Disagree/SD
I am now more confident about developing new ideas using technology *Pre - I am confident about developing new ideas with technology*	23.5 SA 44% Agree 24.5% Neutral 8% Disagree/SD	29% SA 42% Agree 25% Neutral 4% Disagree/SD
I am now more likely to start my own business *Pre - I expect to start my own business when I leave school*	10% SA 22% Agree 48% Neutral 20% Disagree/SD	11% SA 18% Agree 40.5% Neutral 30.5% Disagree/SD
I now feel more comfortable with computers *Pre - I feel comfortable with computers*	45.5% SA 38% Agree 14.5% Neutral 2% Disagree/SD	57% SA 30.5% Agree 10% Neutral 2.5% Disagree/SD
I can cope better now with not doing so well on Science or Technology subjects *Pre - I can cope with not doing so well on Science or Technology subjects*	12% SA 23% Agree 40% Neutral 25% Disagree/SD	19.5% SA 27.5% Agree 22% Neutral 31% Disagree/SD
I now know people who work in Science or Technology *Pre - I know people who work in Science or Technology*	33.5% SA 27% Agree 22.5% Neutral 17% Disagree/SD	46% SA 23.5% Agree 16% Neutral 4.5% Disagree/SD

What were the biggest challenges in the program?

While students didn't generally have difficulty with the curriculum and lessons per se, some teams acknowledged their own shortfalls in the competition with not checking emails regularly and forgetting to do things, and "procrastination". Some continued to change the problem they were wanting to solve well into the competition (which we don't encourage), with other teams honestly reporting that they were challenged because they "fought a lot". Some other teams reported technical problems with the app platforms suggested.

Sometimes the simplicity of "getting the whole team to work on the project" is the biggest challenge. Limited time per week to work on the project, meant that teams had to push through till the end "the last few weeks when we had to push to get everything done". Some reported the financial part of the business plan as the most difficult, however, we continue to include it because we believe that it is an important part of the entrepreneurial journey. Many struggled with the coding, as we don't provide coding lessons per se, but in saying that, many found innovative solutions to learning to code, often via Youtube.

What were the most useful parts of the program?

The top 3 most useful lessons in the program reported by students were:

Lesson 2: Defining the issue - what problem are you going to solve?

Lesson 3: Brainstorming solutions

Lesson 8: Pitch guidelines - telling the story of your app and pitching your company

Conclusion

This report highlights what worked and what didn't work in the 2019 Search for the Next Tech Girl Superhero competition. The analysis reveals a highly successful program for each stakeholder group: mentors, coaches, and students. Mentors felt valued as part of the program, and were inspired by the students they mentored. Coaches enjoyed finding a way to bring STEM into their school, inspiring students to try new things. Students, like the other cohorts, enjoyed the challenge and they reported significant gains in their knowledge and application of STEM.

In 2020, the program will no longer be called the Search for the Next Tech Girl Superhero. In line with rebranding of the Tech Girls Movement Foundation and feedback from mentors, coaches and sponsors, the competition will be known going forward simply as Tech Girls.