TECH GIRLS MOVEMENT FOUNDATION

2017 Search for the Next Tech Girl Superhero Competition

Evaluation Report

by Dr Jenine Beekhuyzen

April 2018

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Executive Summary

This report summarises the results of the post-competition survey, evaluating the 2017 Search for the Next Tech Girl Superhero competition. The survey was funded by Google Australia and Adroit Research, and conducted by members of the Tech Girls Movement Foundation (TGMF) research team – Dr Jenine Beekhuyzen and Dr Sue Nielsen. The survey used the Google Forms Survey platform with a combination of open and closed questions. The data was collected from the three groups of participants - the school girls who participated in teams in the competition, the competition coaches (primarily school teachers and sometimes parents), and the team mentors (female STEM industry role models). The response rate improved significantly from previous years, most likely because of the shorter time lag between completion of the competition and the request for feedback on the program. This report provides descriptive statistics for the closed questions and summaries for the open-ended questions. Correlations will be investigated if further funding is available.

Background and Method

The Tech Girls Movement Foundation (TGMF), led by Dr Jenine Beekhuyzen has conducted an annual competition since 2014 titled the Search for the Next Tech Girl Superhero using the internationally based Technovation curriculum. The competition has grown from 16 individual students in 2014 to 265 teams (up to 5 students each) in 2017, including 50 teams from New Zealand. In 2016 and 2017, one and three teams respectively qualified to participate as exclusive visiting teams in the global Technovation Challenge in Silicon Valley.

The signature competition and other TGMF initiatives are soundly based on international research into how best to encourage female participation in STEM-related careers and education (e.g. Google, 2014). The TGMF has administered pre and post-competition surveys for all participant groups (school girls, mentors and coaches) for the 2017 competition, based on the results of a small survey carried out in 2016 and interviews with mentors during the 2015 competition.

This report summarises the results of the 2017 Search for the Next Tech Girl Superhero post-competition survey. The survey was funded by Google Australia and conducted by members of the TGMF research team – Dr Jenine Beekhuyzen and Dr Sue Nielsen.

The survey consisted of open and closed questions, drawn from three sources – an internationally recognised instrument for measuring STEM career interest (Kier et al. 2014), a survey carried out by Technovation, the organisation which provides the curriculum on which the competition is based (Rockman et al Research, Evaluation and Consulting, 2016), and the results of interviews carried out by Dr Sue Nielsen with 8 mentors from the 2015 competition. Frequently occurring responses to the open-ended questions in the 2016 survey were codified to enable easier comparison between cohorts. The cumulative results of the 2016 and 2017 surveys will be submitted for publication in relevant conferences and journals and a full report will be submitted to the sponsors.

Survey of Female School Students

The student survey built upon the 2016 post-competition survey and aimed to evaluate the impact and success of student participants in the Search for the Next Tech Girl Superhero competition, specifically:

i. The impact of participation and completion on girls' self-perception and career perception about STEM, and on their intentions to pursue further studies and careers in STEM-related fields. The evaluation is based on well-established research in this area.

ii. Students' perceptions of the STEM Entrepreneurship curriculum areas. The evaluation did not attempt to measure objective improvements in skills because of wide variations in curriculum, facilities and teacher practices.

iii. Issues, benefits and problems of participating in the competition.

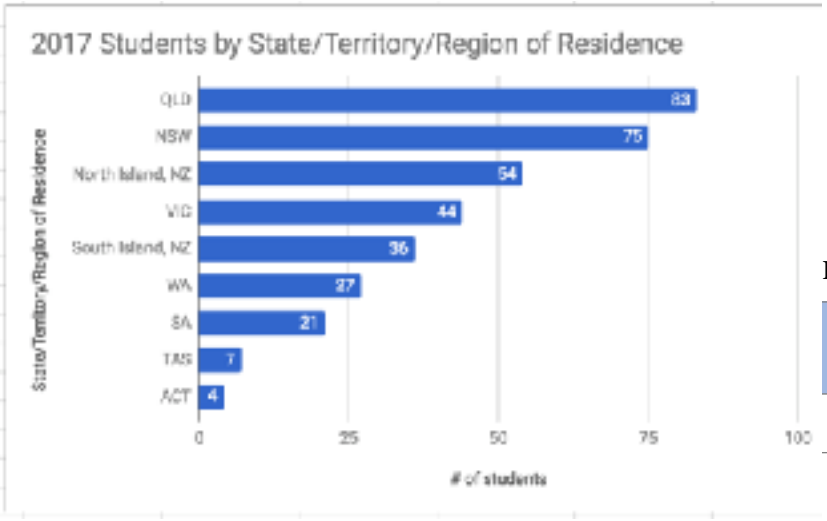
The response rate to the 2016 survey was very low because of time delays. However, where possible we have compared the results of the 2016 and 2017 surveys.

Demographic and background questions

Of the 351 students, most live in Queensland, New South Wales and the North Island of New Zealand. Student participants attend co-education, public (state) or independent schools, and are currently in grade 6. In comparison, in 2016 most students were in grade 9.

Residence	QLD	NSW	NI, NZ	VIC	SI, NZ	WA	SA	TAS	ACT
# of students	83	75	54	44	36	27	21	7	4

TABLE 1: 2017 STUDENTS BY STATE/TERRITORY/REGION OF RESIDENCE



RESIDENCE

Type	Catholic	Other
# of s	83	23

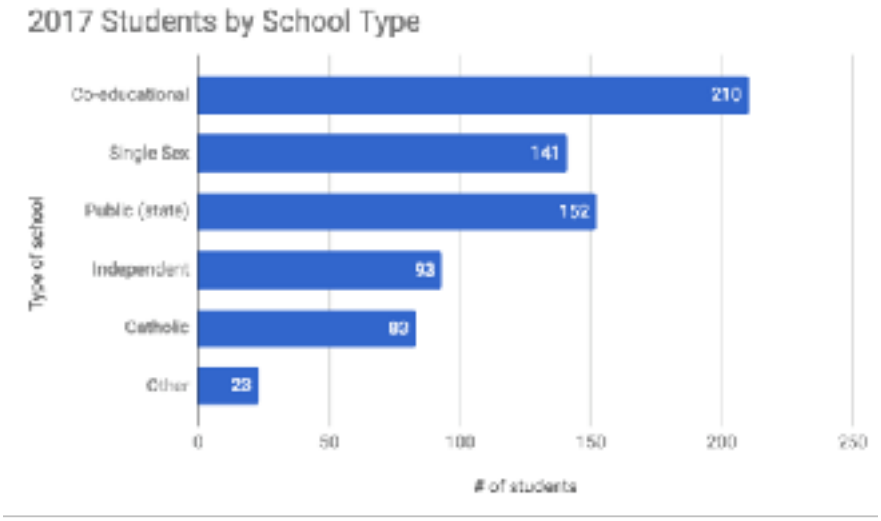


FIGURE 2: 2017 STUDENTS BY SCHOOL TYPE

School Grade	3	4	5	6	7	8	9	10	11	12
Respondents	7	27	36	80	57	48	51	38	4	3

TABLE 3: 2017 STUDENTS BY GRADE AT SCHOOL

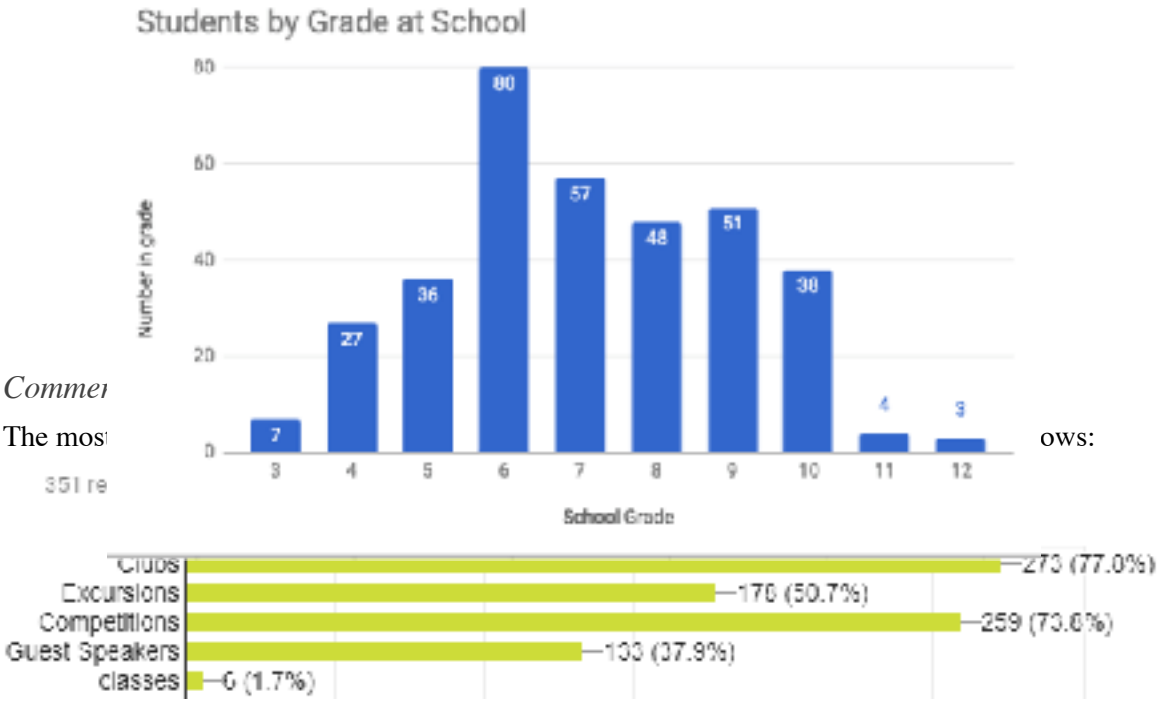


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FIGURE 4: 2017 MOST FREQUENTLY RUN SCHOOL STEM ACTIVITIES

60 girls commented that they enjoyed the activities finding them to be fun, interesting and rewarding. A typical comment:

"**These activities that my school offers are definitely great opportunities to boost a science or computing career in the future**".

"**I think that they challenge us, and teach us to practice using a problem-solving mindset**".

"**It's really good how our school provides opportunities for girls who are interested in science and/or coding, as it allows them to explore those interests and think about a possible future in those areas"**.

Very few girls were dissatisfied with their school program apart from 3 who had problems with the internet speed, and three who wanted more 'technology-related activities' and more focus on coding. "**The science activities are free. There are not many computing activities**".

One girl commented on the value of the competition is that "**all of the events that are coordinated within my school are one-off events that benefit the students. The competition is definitely better as it is long-term**".

Participation in previous competitions

23 students indicated that they had participated in a previous TGAS competition with one from 2014, two from 2015 and 20 from 2016.

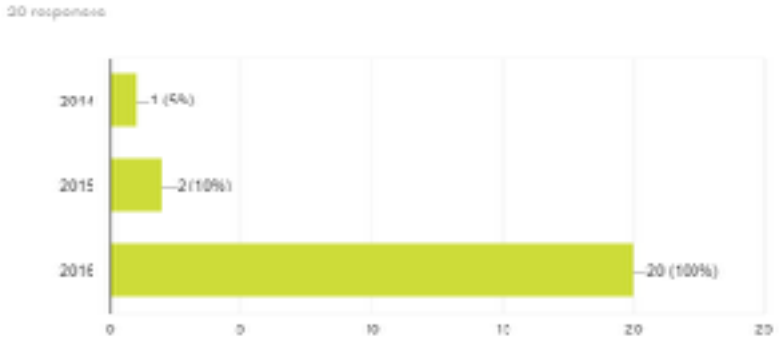


FIGURE 5: 2017 STUDENT PARTICIPATION IN PREVIOUS COMPETITIONS

Three girls reported that they were unable to complete their previous submission because of lack of time (2) and other team members not completing their delegated tasks (1). Seven girls reported that they enjoyed working with other girls but there was insufficient time.

Coding Knowledge

Responses to *how much coding experience the girls had before starting the competition* are shown in the first bar graph. It is pleasing to see that the girls perceived a substantial improvement in their knowledge of coding through their participation in the competition (1= none, 5= a lot). 85.5% of students had some or lots of coding knowledge before participating in our program.

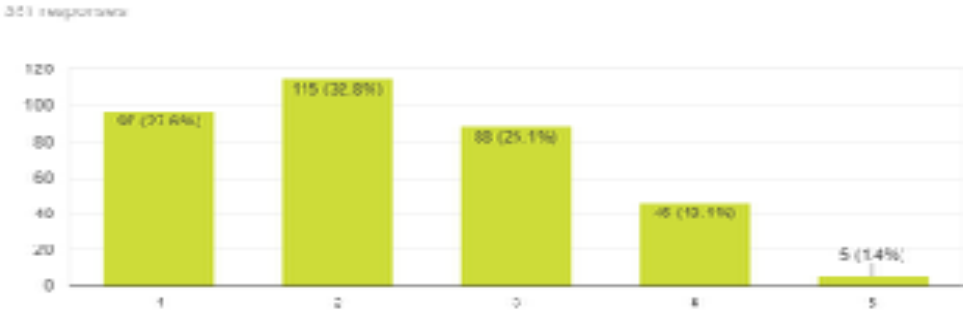
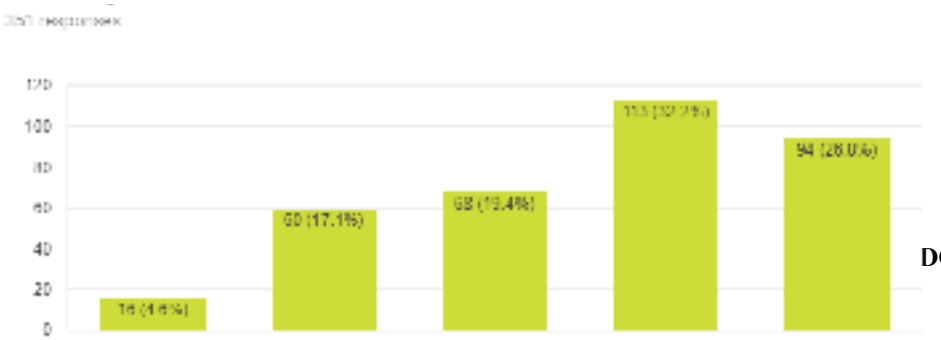


FIGURE 6: 2017 STUDENTS' PREVIOUS CODING KNOWLEDGE

80.4% of students had improved coding knowledge after participating in our program.

61% reported moderate or significant improvement.



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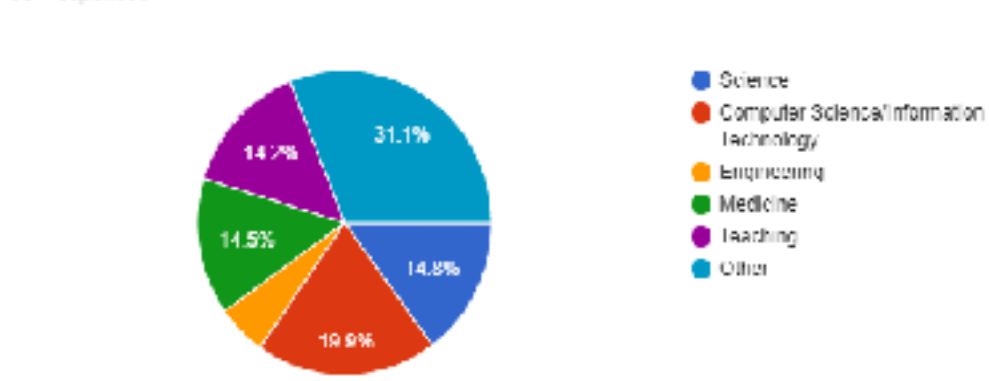


FIGURE 8: 2017 STUDENT INTEREST IN STEM UNIVERSITY STUDIES

The most popular areas of study were cited as Science, Medicine/Health/STEM/Arts:

Area of Study	Responses
Science	40
Medicine/Dentistry/Health Sciences	40
STEM-based subjects	26
The Arts/History/Music/Philosophy	25
Graphic Design/Technology/Creative industries	20
Teaching	18
Vet/Animal Studies	13
Information Technology/Computer Science/Coding	9
Engineering	8
Photography	7
Sport	6
Hairdressing/Beauty/Fashion/Interior Design	6
Archaeology	5
Chef/Cooking	5
Law	5
Architecture	3
Performing Arts/Acting	3
Psychology	3
Journalism	2
Business/Marketing	3
Flight Attendant, Librarian, Nurse	1 each

TABLE 4: 2017 STUDENTS' MOST POPULAR AREAS OF STUDY

Evaluation of the STEM Entrepreneurship program curriculum

Students were asked several questions about the program which consists of the following 12 lessons:

- Lesson 1: Introduction to STEM Entrepreneurship program and App Inventor
- Lesson 2: Defining the Issue – What problem are you going to solve?
- Lesson 3: Brainstorming Solutions
- Lesson 4: User Centred Design – Making sure your app is easy to use
- Lesson 5: Competitive Analysis – What makes your app better than the others that are out there?
- Lesson 6: Branding and Promotion – Develop a strategy for promoting your app
- Lesson 7: Potential Revenue – Determining how to price your app & how to generate income
- Lesson 8: Pitch Guidelines – Telling the story of your app and pitching your company
- Lesson 9: Demo Guidelines – Making and uploading the demo video of your app in action
- Lesson 10: User Feedback – What do people think of your app?
- Lesson 11: Video Editing – Get feedback on your videos - what is and isn't working well?
- Lesson 12: Submission – Make any final edits to your business plan; reflect on your project; wrap up loose ends; and complete the Post Survey

The students found the three most useful lessons to be; pitching your idea, brainstorming solutions, and defining the issue. Interestingly none of the technology-focused lessons were reported to be the most useful.

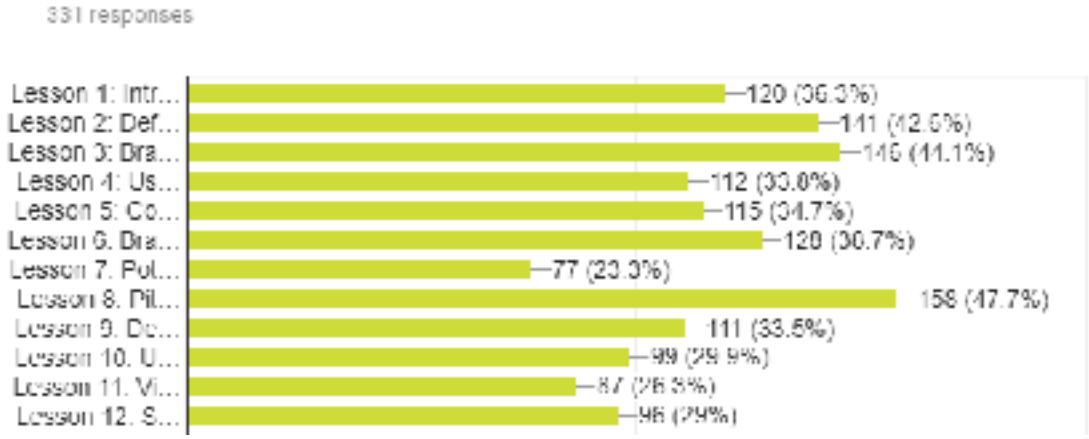


FIGURE 9: 2017 STUDENT IDENTIFIED LESSON USEFULNESS

166 students who responded had no problems with the weekly lessons. Students reported general problems rather than problems with specific lessons (see next section). Three students reported there was "**insufficient or unclear information**". Some lessons were reportedly difficult because "**we had never done those things before, and there wasn't much information on how to do those lessons**". There were minor tech problems and clarity issues over the outside App Inventor resources. "**You did not tell us in which format to submit our submissions eg; zip files, pdf or jpeg**". And "**I had problems with lessons that included the demo videos on how to use App Inventor, they didn't explain it very well**".

The most frequent problem concerned the coding. "**I think there could have been a bigger focus on the coding aspect as it was almost pushed to the side"**. Students reported the difficulty of other lessons as follows:

Student's most frequent problems	Responses

Coding	55
Business Plan (Lessons 5, 6, 7)	28
Problems understanding how to use App Inventor (Lesson 1)	21
Issues with creating pitch video (Lesson 8)	13
Brainstorming/deciding on one idea (Lesson 3)	13
Unable to use App Inventor at school (app was blocked)	6
Issues with creating demo video (Lesson 9)	5
Deciding on the topic and creating the solution (Lesson 2)	5
Issues with uploading documents due to size constraints, number of files (Lesson 12)	4
Issues with uploading videos to YouTube (Lesson 12)	3
Competitive Analysis (Lesson 5)	3
Potential revenue (pricing) (Lesson 7)	3
Bring everything together at the end of the competition (Lesson 12)	3
Editing the video(s) (Lesson 11)	3
Issues with the emulator (Lesson 1)	2
Defining the Issue (Lesson 2)	2
Branding and Promotion (Lesson 6)	2
Naming our app (Lesson 6)	1
Survey monkey (tabulating results of the survey) (Lesson 10)	1

TABLE 5: 2017 STUDENTS' MOST FREQUENT PROBLEMS IN THE PROGRAM

Program issues

Participants were asked if they felt they had sufficient resources to be a successful participant in the program, as well as whether they received adequate support from their coach and mentor.

On a scale from 1 to 5, the following questions were based on the global Technovation survey (Rockman et al, 2016). Students felt more supported by their coach than by their mentor and this is consistent with problems reported in sections 3 and 4. (1= strongly agree, 5= strongly disagree).

I had sufficient resources to be a successful participant

92% of students felt they were given sufficient resources by TGM to be successful in the program.

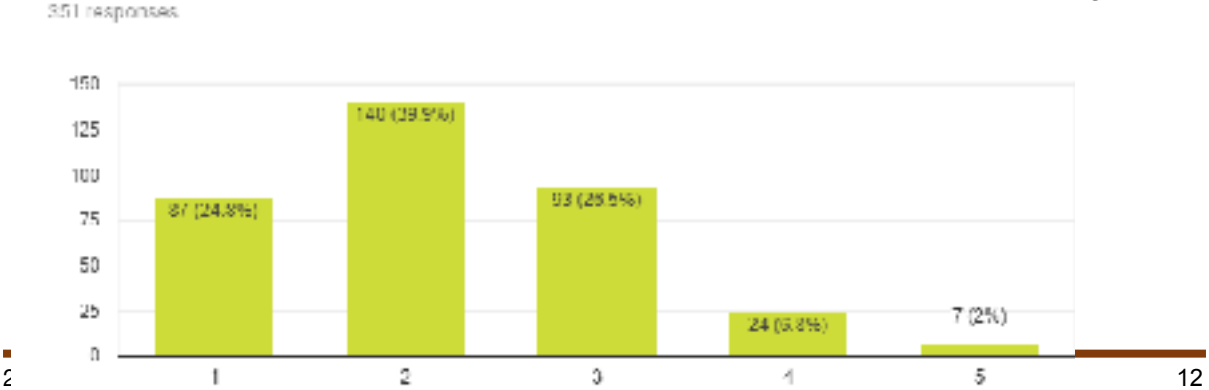


FIGURE 10: 2017 STUDENTS' SUPPORT WITH TGM RESOURCES IN THE PROGRAM

The Coach provided the support needed

92.2% of students agreed that their coach provided the support they needed during the program. 47.9% of those strongly agreed.

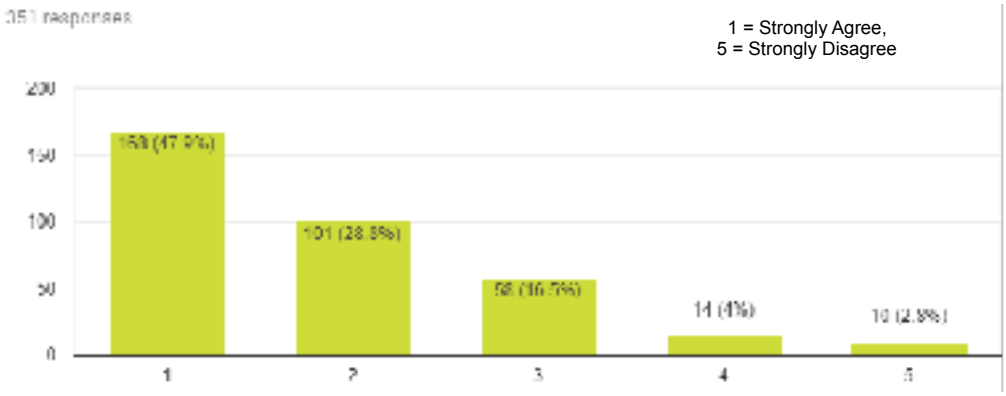


FIGURE 11: 2017 STUDENTS' SUPPORT FROM THEIR COACH IN THE PROGRAM

The Mentor provided support and direction

78% of students agreed that their mentor provided the support they needed during the program. 36.8% of those strongly agreed.

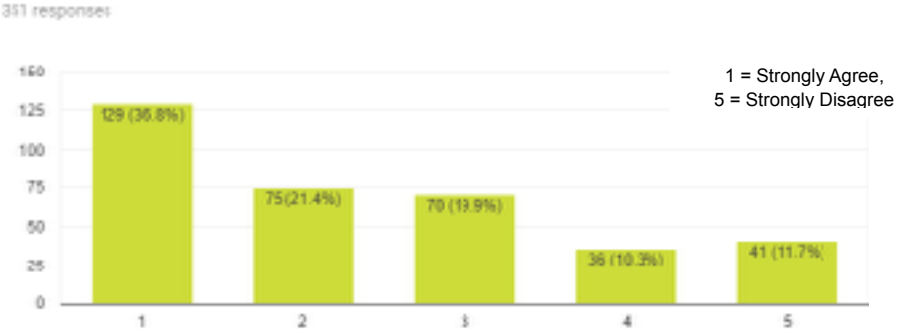


FIGURE 12: 2017 STUDENTS' SUPPORT FROM THEIR MENTOR IN THE PROGRAM

Our team worked well together

87.8% of students felt they worked together well as a team during the program.

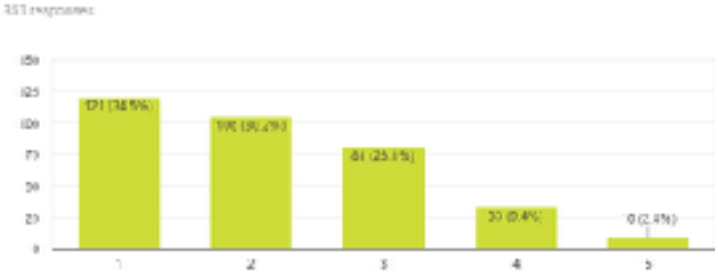


FIGURE 13: 2017 STUDENT PERCEPTIONS OF TEAMWORK COLLABORATION

We had enough time to complete the project

73.3% of students felt they had enough time to complete the program.

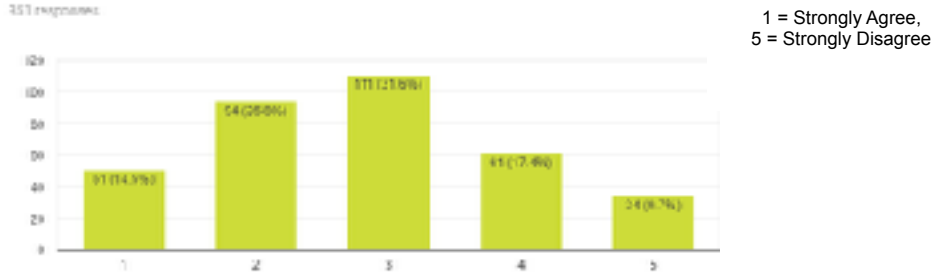


FIGURE 14: 2017 STUDENTS' SUPPORT WITH RESOURCES IN THE PROGRAM

The above results are consistent with reports from coaches and the results of the 2016 survey. The amount of time required to complete all elements of the 12-week program remains a problem for many teams.

Many students reported working well together.

"**Our team worked so well together and our mentor gave us many ideas and helped us along. Overall it was a truly magnificent experience**".

"**I hope that this competition has taught the team how to be considerate and accept others views and ideas. It has taught me to accept that sometimes ideas and original expectations never go as planned. The design process is messy**".

However, other students commented on problems in sharing out the work. "**Sometimes we weren't able to share the workload around evenly so really our lessons were all over the place**".

Scheduling and time management problems, including different class schedules, created some problems, as well as getting down to work early and meeting deadlines. 15 students indicated that there was insufficient time to complete the project. "**We struggled to complete everything we needed to do because we were not prepared for the amount of work**".

Most students were able to organise the work well but 11 complained that many team members did not pull their weight.

"**Towards the end we drifted away from our jobs. For me being a creative marketer I slowly transitioned into the main coder**".

"**During the course of the competition, it became apparent that out of our team of five that only three of us were are actually achieving anything. That caused a lot of stress especially near the due date of the comp**".

Two students indicated that members dropping out made completion on time very difficult. The most frequent topics commented on are as follows: (Positive comments are highlighted).

What worked and what didn't work	Responses
We worked well together	57
Time constraints/didn't feel we had enough time to finish the project	18
Our mentor disappeared/hardly communicated with us	15
We argued at times/had fights/disagreed	15
Mentor was helpful/great/guided us	15
Coach was helpful/great	12
Some members of the team did not do as much work as others/not everyone helped	11
Our roles were well defined, and we stuck to them	10
Our time management could have been better	7
We worked well within the timeline/we felt we had enough time to finish the project	7
Sometimes we got off topic/task/sometimes we were silly	7
Our mentor did not support us/help us/did not communicate with us/disappeared	6
We learned how to brainstorm/problem solve together	5
Our team didn't collaborate/communicate with each other enough	5
We had adequate resources to help us finish the project	5
This was a steep learning curve for all members of the team	4
We were confused at times as to what was expected of us	3
We had fun	3
Our individual skills helped us complete the project	3
We found it difficult to locate information on the website	3
We had inadequate resources (i.e. slow internet)/felt the resources were not very good	2

TABLE 6: 2017 STUDENTS' MOST FREQUENT REPORTED TOPICS

Motivation to participate in the competition

We asked this question of coaches and mentors in the 2016 survey, but not of students. The most frequent responses from students in 2017 were because they enjoy coding and working with technology, and they thought the competition sounded fun and interesting.

Student's motivation to join the program	Responses
I enjoy coding, programming, design & working with technology (STEM-based subjects)	22
It sounded fun/interesting/inspiring/challenging	23
It was compulsory/part of our class curriculum	12
My parents/coach/teacher/sibling/specialist in the STEM field encouraged me	12
Solving a problem I care about/opportunity to help people	12
Wanted to learn how to build an app/learn how to code	11
Friendship/teamwork/working with older students	10
Wanted to test our existing knowledge/skillset	8
To improve the perception of females in the tech industry/opportunities for upcoming STEM careers	6
Opportunity to learn/gain experience	5
Previous exposure to the Tech Girls Movement/Search Competition	4
Spur of the moment decision/decided on a whim	2
Interest in learning about business and marketing	1
Opportunity to travel (to San Francisco)	1

TABLE 7: 2017 STUDENTS' MOTIVATION TO PARTICIPATE IN THE PROGRAM

Students learnt key skills in the competition through gaining new experiences, building teamwork and communication skills, and learning to work more efficiently to deadlines through better time management and organisational skills.

Keys kills learnt	Responses
Experience in building apps/coding skills/technology	52
Teamwork and communication	31
Working more efficiently when under stress/time management/organisation	22
Problem-solving/being creative/research skills	10
Creating a business plan	9
Marketing a product/developing a pitch	8
To gain confidence in my own abilities/resilience	6
To solidify what I want to study at uni/do as a career	6
Being more aware of problems in the community/helping others in the community	5
Editing and creating videos	5
The prize money	1
Learning entrepreneurial skills	1

TABLE 8: 2017 STUDENTS' LEARNT KEY SKILLS IN THE PROGRAM

Impact of the program

Students were asked to rank their answers 1-5. It is not possible to identify the significance of changes in student perceptions objectively until the pre-competition survey is analysed. Overall there appeared to be positive *perceived* changes in attitudes to STEM because of participation in the competition.

Having participated in the competition, I am now more likely to consider a career in science and technology.

77.3% of students are more likely to consider a career in STEM after participating in our program.

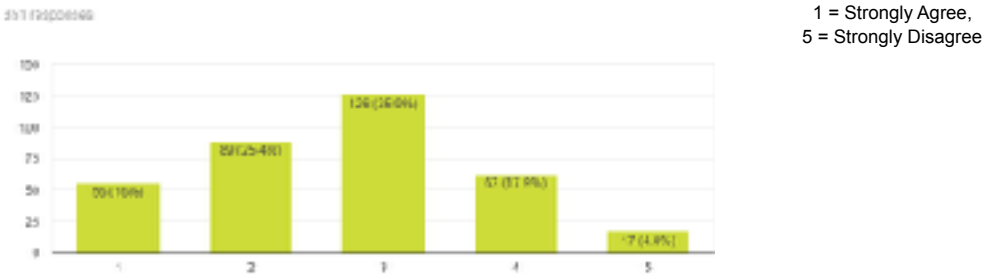


FIGURE 15: 2017 PROGRAM IMPACT - STUDENTS LIKELY TO CONSIDER A STEM CAREER

The above question is ambiguous – since strongly disagree may mean that students simply have not changed their mind. This is clarified by some comments, and the question will be changed in the next survey.

10 students responded that they had always been interested in technology and the competition confirmed this interest.

12 students acknowledged that they were now more likely to consider a science or technology career than before.

Having participated in the competition, I am now more likely to watch television shows about science or technology

66.1% of students are more likely to watch STEM TV shows after participating in our program.

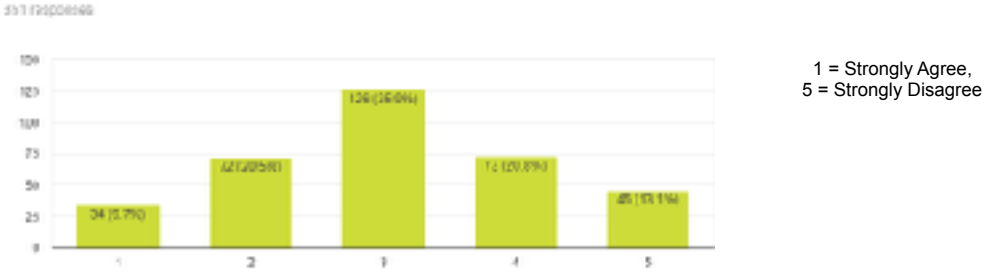


FIGURE 16: 2017 PROGRAM IMPACT - STUDENTS LIKELY TO WATCH STEM TV SHOWS

Having participated in the competition, I am now more likely to start my own business.

69.5% of students are more likely to start their own business after participating in our program.

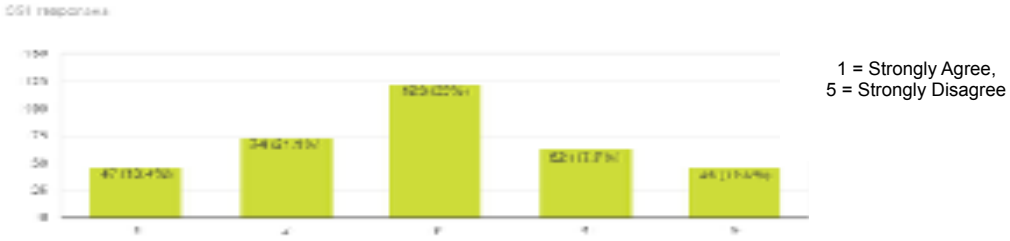


FIGURE 17: 2017 PROGRAM IMPACT - STUDENTS LIKELY TO START OWN BUSINESS

Having participated in the competition, I am now more confident about developing new ideas using technology.

88.6% of students are more confident about developing new ideas using technology after participating in our program.

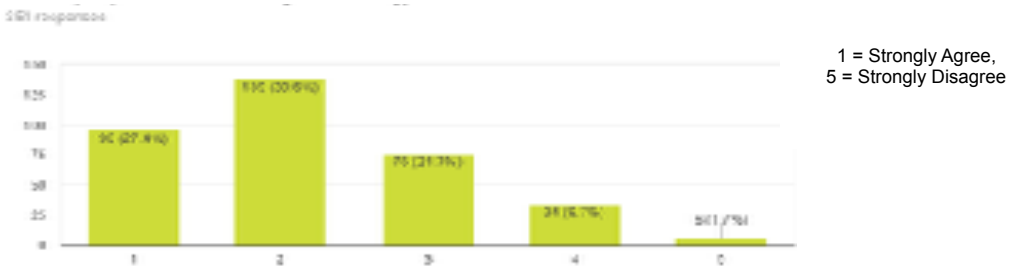


FIGURE 18: 2017 PROGRAM IMPACT - STUDENT CONFIDENCE IN DEVELOPING NEW IDEAS USING TECHNOLOGY

As mentioned above, there appears to be some change in attitudes towards studying IT. Many of the comments indicated interest in other STEM areas such as medicine, working with animals, etc. The most positive comments related to starting one's own business. "**The competition did make me more likely to look into starting a business using technology**", and "**Since participating in the competition my group and I are keen to stay together and create a little business where we create apps".**

A negative comment relates to the problem of insufficient time mentioned by all participants "**This contest was very stressful and made me less interested in business for this reason mainly"**.

Career interest questions

These questions were taken from the Kier et al. (2014) instrument so that comparisons can be made with future international research.

The open-ended responses did not add much to the responses to these questions. Most responses elaborated on finding science and technology fun and believing that a good knowledge of technology was necessary for most jobs. The positive responses most likely result from the motivation the students had for entering the competition – that they are interested in STEM areas.

I enjoy learning about science.

92.6% of students enjoy learning about science.

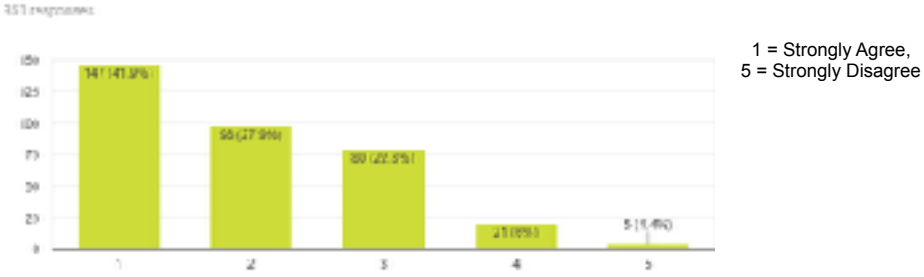


FIGURE 19: 2017 CAREER INTEREST - I ENJOY LEARNING ABOUT SCIENCE

I enjoy learning about technology.

91.4% of students enjoy learning about technology.

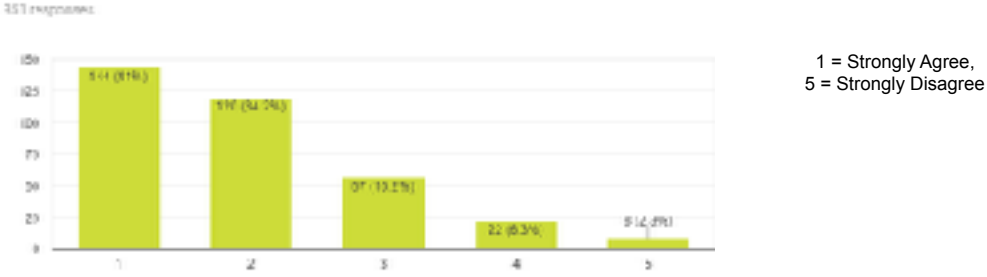


FIGURE 20: 2017 CAREER INTEREST - I ENJOY LEARNING ABOUT TECHNOLOGY

I understand science subjects.

90.1% of students understand science subjects.

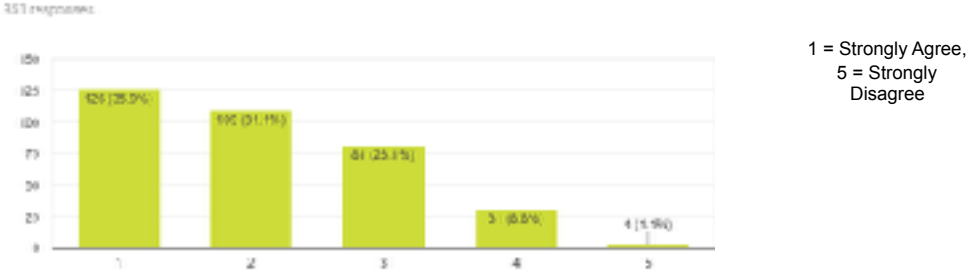


FIGURE 21: 2017 CAREER INTEREST - I UNDERSTAND SCIENCE SUBJECTS

I understand subjects involving technology.

94.3% of students understand technology subjects.

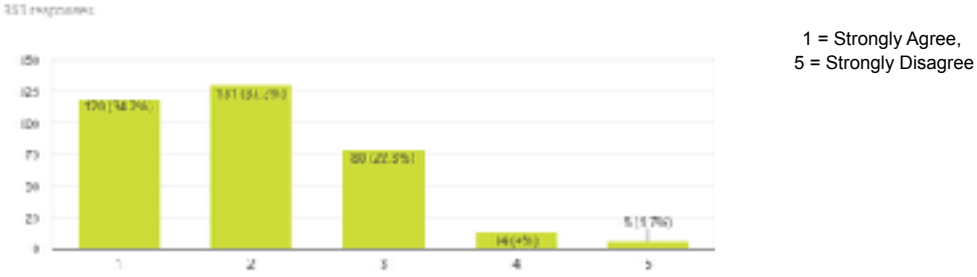


FIGURE 22: 2017 CAREER INTEREST - I UNDERSTAND TECHNOLOGY SUBJECTS

I plan to use science or computing in my future career.

85.7% of students plan to use science or computing in their future career after participating in our program.

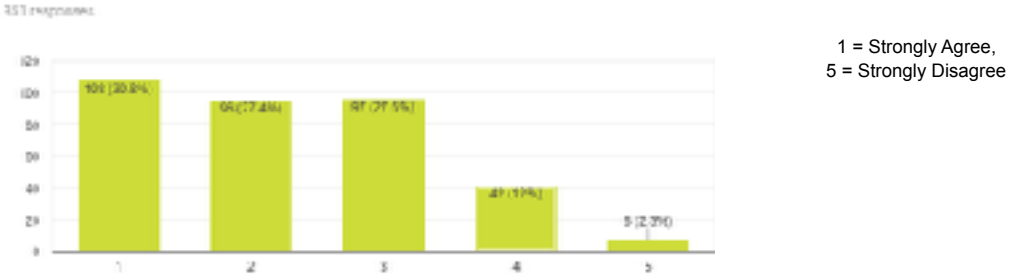


FIGURE 23: 2017 CAREER INTEREST: I PLAN TO USE STEM IN MY FUTURE CAREER

If I learn a lot about technology, I will be able to pursue many different types of careers.

92.6% of students believe that they will be able to pursue many different career paths if they learn a lot about technology, after participating in our program.

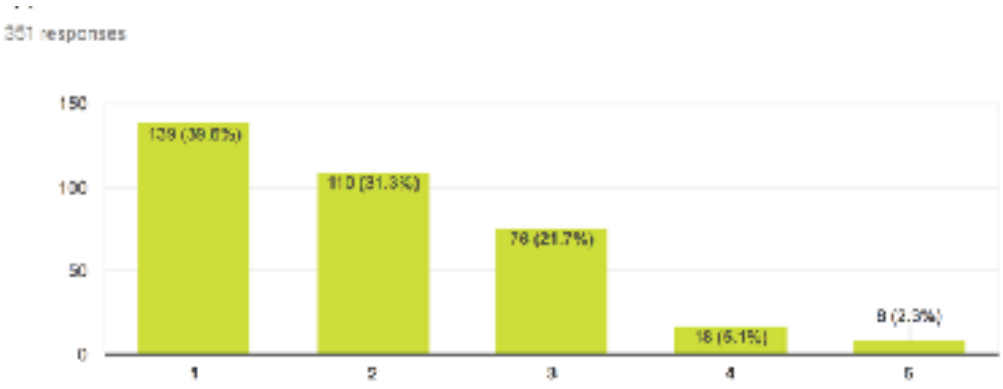
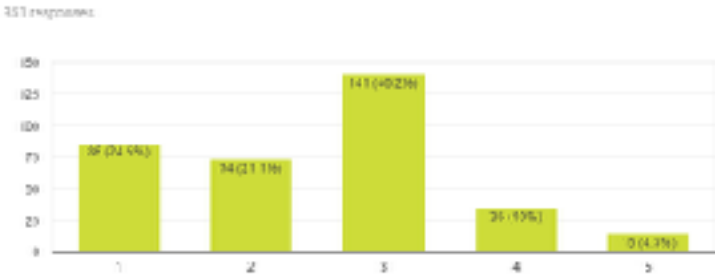


FIGURE 24: 2017 CAREER INTEREST: LEARNING ABOUT TECHNOLOGY WILL PROVIDE CAREER OPTIONS

My parents would like it if I chose a science or computing career.

85.8% of students believe their parents would like them to choose a STEM career after participating in our program.

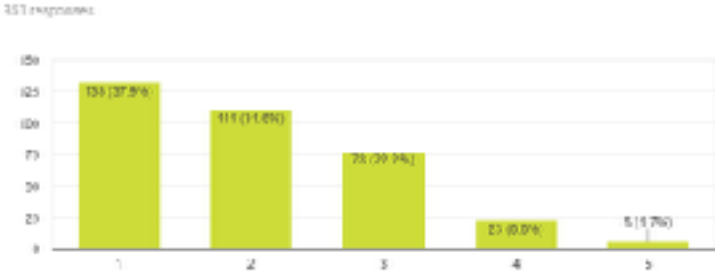


1 = Strongly Agree,
5 = Strongly Disagree

FIGURE 25: 2017 CAREER INTEREST: MY PARENTS WOULD LIKE IT IF I CHOOSE A STEM CAREER

I like my science class.

85.7% of students like their science class after participating in our program.

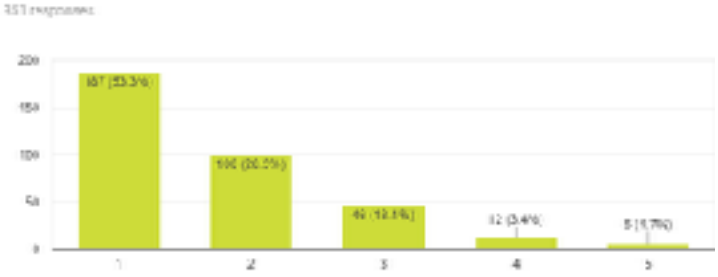


1 = Strongly Agree,
5 = Strongly Disagree

FIGURE 26: 2017 CAREER INTEREST: I LIKE MY SCIENCE CLASS

I feel comfortable using computers.

94.9% of students feel comfortable using computers after participating in our program.

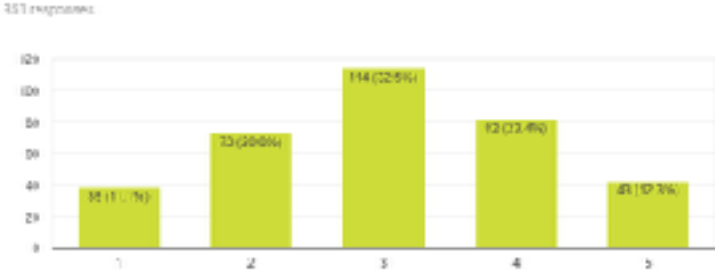


1 = Strongly Agree,
5 = Strongly Disagree

FIGURE 27: 2017 CAREER INTEREST: I FEEL COMFORTABLE USING COMPUTERS

I can cope well with not doing well on science and technology assignments.

64.3% of students agree they can cope well not doing well on STEM assignments since participating in our program.

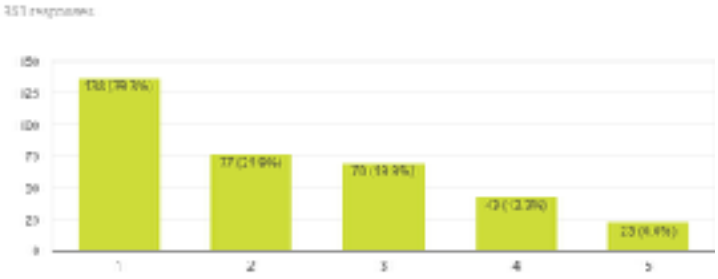


1 = Strongly Agree,
5 = Strongly Disagree

FIGURE 28: 2017 CAREER INTEREST: I CAN COPE WITH NOT DOING WELL ON SCIENCE AND TECHNOLOGY ASSIGNMENTS

I know people who work in science and/or computing industries.

81.9% of students reported knowing people who work in STEM after participating in our program.

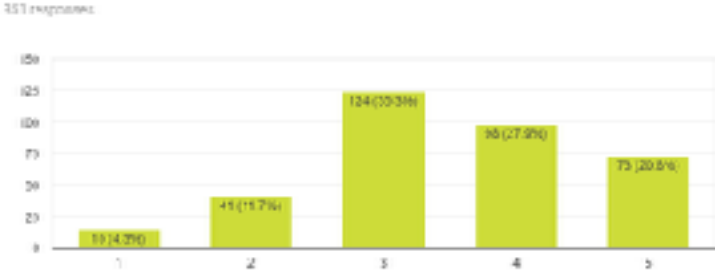


1 = Strongly Agree,
5 = Strongly Disagree

FIGURE 29: 2017 CAREER INTEREST: I KNOW PEOPLE WHO WORK IN STEM

I don't need to know about science to get a good job.

51.3% of students feel they don't need to know about science to get a good job. 48.7% feel they do.

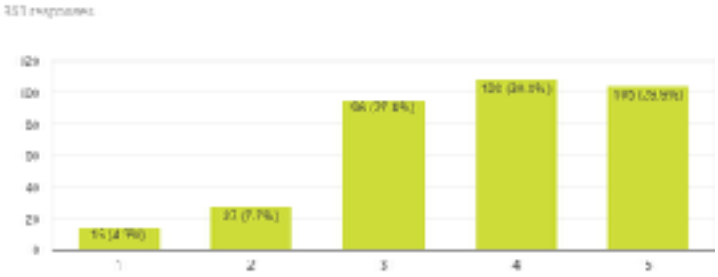


1 = Strongly Agree,
5 = Strongly Disagree

FIGURE 30: 2017 CAREER INTEREST: I DON'T NEED TO KNOW ABOUT SCIENCE TO GET A GOOD JOB

I don't need to know about technology to get a good job

39.4% of students feel they don't need to know about technology to get a good job. 60.6% feel they do.



1 = Strongly Agree,
5 = Strongly Disagree

FIGURE 31: 2017 CAREER INTEREST: I DON'T NEED TO KNOW ABOUT TECHNOLOGY TO GET A GOOD JOB

Survey of Competition Mentors

The survey was based on the results of the 2016 survey and interviews with eight of the mentors from the 2015 competition. Closed and open-ended questions were asked on the following four topics:

i. Motivation for participating.

ii. Problems and benefits.

iii. Suggestions for improvements.

iv. Suggestions for how to expand the program.

Demographics

Many of the 117 mentors who responded to the survey live in NSW and work for large enterprises in the telecommunications sector.

Residence	NSW	QLD	VIC	NI, NZ	WA	ACT	SI, NZ	TAS	SA
Mentors	46	27	16	15	7	3	1	7	4

TABLE 9: 2017 MENTORS BY STATE OF RESIDENCE

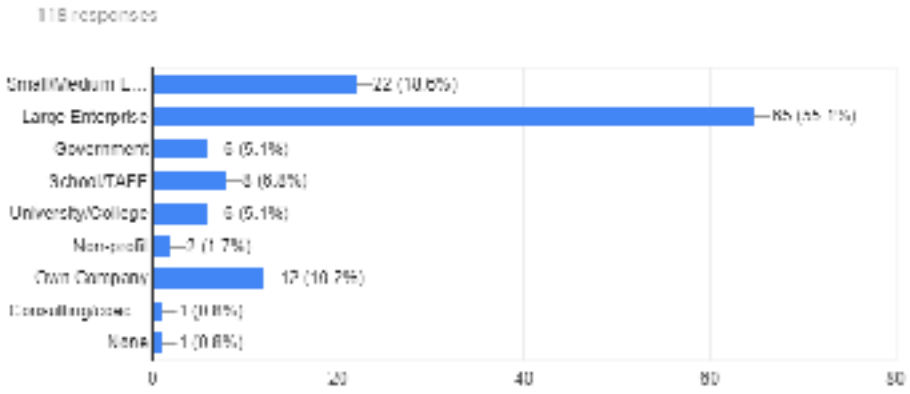


FIGURE 32: 2017 MENTORS' BY COMPANY TYPE

Sector	**Responses**
IT/Telecommunications	63
Education (University, TAFE, Private College)	15
Media	9
Finance	9
Science	2
Defence	2
Health	1
Marketing	1
Energy	1
Market Research	1

Engineering	1
Agriculture	1
Digital Media	1

TABLE 10: 2017 MENTORS' BY SECTOR

The mentors' roles in their organisations are as follows:

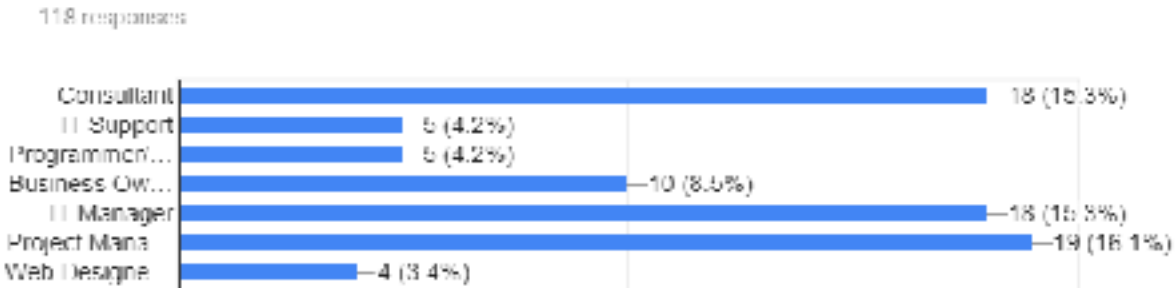


FIGURE 33: 2017 MENTOR ROLES IN THEIR ORGANISATION

Participation in previous competitions

Only 13 mentors had previously participated in the competition.

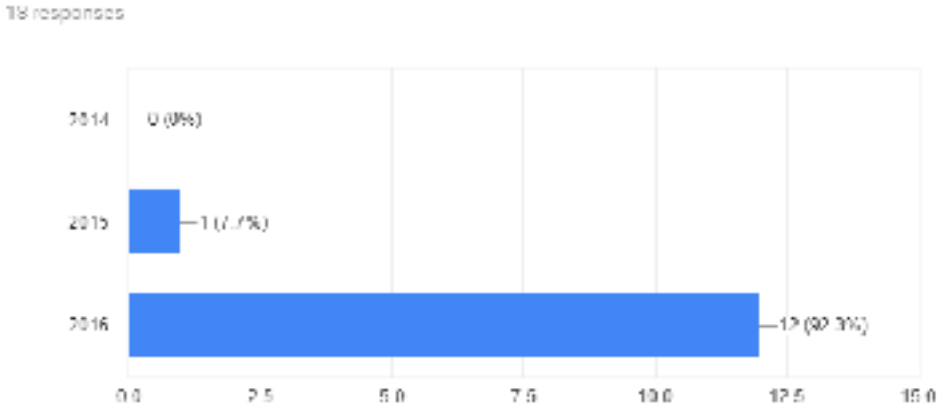


FIGURE 34: 2017 MENTOR PREVIOUS PARTICIPATION IN THE COMPETITION

Motivation to participate

Mentors expressed their motivation to participate as:

Mentor Motivations	Responses
To increase the number of girls taking up science/technology careers	89
To share my enthusiasm for science/technology work	65
To provide more career options for girls	55
To be part of the Tech Girls Movement	50
To show the diversity of careers available	50
To share my love of technology	35

TABLE 11: 2017 MENTOR MOTIVATION TO PARTICIPATE IN THE PROGRAM

Mentors hoped to gain the following by participating in the competition:

Promote STEM	Work with students	Personal satisfaction	Provide expertise	Mentoring experience
31	26	9	7	7

TABLE 12: 2017 MENTORS' REASONS TO PARTICIPATE IN THE PROGRAM

31 mentors made general comments about helping girls become interested in STEM, attracting more students to study STEM subjects or to take up STEM-related careers. "**The ultimate aim would be to increase the participation rates of young women in tech careers**". Five others explicitly mentioned improving girls' self-esteem and confidence, while three mentioned increasing diversity in the industry.

"**Satisfaction that I was helping diversify our industry by fostering enthusiasm for game design in young girls".**

26 mentors were keen to work with young girls, to inspire the younger generation and to understand the way they thought. "**A greater insight into the way students solve problems and view the world around them**". Seven mentors were motivated to participate to increase their own experience of mentoring. Three mentioned providing good role models as their motivation to participate.

"**I never had enough role models in tech growing up, but I've landed in this industry, and I genuinely believe it's one of the best to be in, so I wanted an opportunity to share that with young girls to encourage/inspire them to join".**

Only seven mentors mentioned providing expert STEM-related advice and guidance, and three mentioned that they could provide guidance and motivation. Two mentors wanted to learn more about the relevant technologies.

"**I wished to increase their network in the school sector".**

"Help teachers to understand the modern technology landscape".

Personal satisfaction, 'giving back' and making the world a better place was mentioned by nine mentors.

"**Feeling I was giving something back to the next generation coming through**".

Finally, two mentors mentioned supporting the Tech Girls Movement. "**My main goal is to support the Tech Girls Movement"**.

What worked well in the program

The most frequent response (43) was approval of the support and communication from TGM, including the weekly emails, videos and resources. "**The support from Tech Girls Movement was excellent", "just the right level of detail and frequency**" and "**Communication from the Tech Girls Movement was awesome**". Six mentors also mentioned the commitment shown by the coaches as an area that worked well.

The content (curriculum), modular structure, weekly tasks and the timeline were mentioned positively by 29 mentors.

"**Well structured, exciting content, gamified approach**".

"**Timeline - perfect amount of time to establish/build trust and rapport with the team, and accelerate quickly**".

14 mentors mentioned enjoying the interaction with the girls, sharing their enthusiasm and passion.

"**The team I was placed with was an amazing group of primary school-aged girls who were extremely enthusiastic and willing to learn**".

"**Creative solutions, amazing graphics created by the team and definite coding skills were exhibited**".

Six mentors were happy that they were able to meet face to face or experience 'face-time' with their team(s). "**Lucky for me the team I was placed with was not very far geographically and for the age group that I worked with (grade 4, 9-year-olds), being able to meet with them face to face was invaluable. I do not think they would have been able to get through the program if we didn't have that face to face time**".

Problems with the program

A diverse range of issues were raised. The most frequent being problems in communicating because of distance, not being able to interact face to face and different time zones (17 mentors).

Four mentors mentioned technology problems affecting communication was an inhibitor.

In some cases, communication was not adequate, with some students either not staying in regular contact with their mentor or they were unsure about what to communicate.

"**We had 3 Skype calls which ended up being rather unstructured, and the girls seemed confused about why I was involved or how they could use me**".

One mentor mentioned that the older students seemed to handle this better. This related to unclear expectations about the mentor/mentee relationship, mentioned by six mentors, "**The roles of the coach and the mentor were not clear and/or not well executed**".

15 mentors mentioned scheduling issues because of school holidays, exam periods and the students' class timetables as a problem.

School-related problems were mentioned by 10 mentors – including lack of commitment or technical understanding by coaches (5) and the school 'forcing' girls to participate without providing much support (1). Four mentors mentioned that the teachers did not take into account the mentors' schedules and workloads; for example, lack of punctuality from students, cancelling meetings at short notice and communicating outside designated times.

Seven mentors found the course too complicated, especially for the younger girls. One mentor suggested there could be a junior and senior version.

Four mentors mentioned problems with local regulations in New Zealand and Queensland - that Education QLD blocked tools needed to build apps and to communicate effectively. Three others indicated a lack of access to technology or technical support within the schools as a barrier.

Five mentors were not happy with the App Inventor software they were recommended to use.

"**In particular the emulator program is very slow, and would often crash. We found that the fonts/colours and basic feature options on App Inventor to be fairly rudimentary. These girls (nor I) had not coded before so to get an app going in 12 weeks with limited time to spend together meant that we didn't get to explore how to 'make it look more funky and modern**".

Five mentors mentioned that the Business Plan caused stress and could be simpler, especially for the younger girls. One mentor thought there should be more emphasis on coding.

Future participation

116 mentors responded to the question about why they would, or would not, participate. 75 indicated 'yes', 37 were 'unsure', while four indicated 'no'.

Most of the positive responses to the open-ended question regarding participation demonstrated a general approval for the program. It was unclear from the negative responses whether they would participate again or were unsure. Many of the answers were similar to the responses to the question about what did not work in the program. Most of these seemed to indicate that they would like to see improvements before committing to future participation. The significant responses were as follows:

Yes	No/Unsure
Enjoyment in working with girls and seeing positive outcomes (28)	Problems of expectation and commitment by coaches and students (21)
Commitment to diversity (5)	Problems with lack of face to face contact and communication with remote students in different time zones (19)
Mentoring experience (3)	Other commitments – lack of time, and scheduling problems (7)
	Technical problems with communication and tools (3)

TABLE 13: 2017 MENTORS' FUTURE PARTICIPATION

A typical positive response was:

"**I would participate again because I believe Tech Girls is doing some incredible work and I would love to help young girls still in school find a passion in STEM. I would also love to help support them when they start thinking about career choices, as I found this really hard myself when I had to go through it**".

One mentor mentioned that "**Tech Girls should focus on actively supporting rural/regional participation**".

Problems concerning expectations included responses such as the following:

"**I would want better structure around the mentor/mentee relationship and more explicit expectations**", and, "**Honestly, it felt as if we weren't required. We saw the messages telling teams to contact us go out, and initially thought it might be something we were doing, but after repeatedly trying to get in touch with our teams, we abandoned trying**".

Information required before the program commencement

When mentors were asked if other information should be provided before the program commenced, 18 replied 'nothing' and/or that they found the existing information complete and helpful.

Many of the responses to this question are similar to answers to the question about what did not work. These responses also show the diversity of the mentors' experiences and suggest that providing mentors with more information about possible problems and the variety of potential experiences may be helpful. The major comments were as follows:

Topic	Responses
More information about the teams' and coaches' expectations of mentors	18
Time involved - Much less involvement than expected	3
Time involved - More time required than expected	3
Information about the location of students and time zone problems	11
Examples of previous projects to better understand expectations, process and likely problems	8
More technical information and advice	4

TABLE 14: 2017 MENTORS' INFORMATION REQUIRED BEFORE THE PROGRAM

The majority of comments related to confusion about expectations, in relation to tasks and time. Some mentors were regularly consulted and spent much more time than they expected with their teams, while others were rarely consulted and wondered if they were providing enough assistance. "**The girls needed a lot less help than I thought they would! I assumed they would send me examples of what they had done so I could assist with reviewing it, however, the only involvement I had was half an hour each week**". Another mentor, who spent more time assisting their team, responded with "**I probably should've looked at the amount of time that was involved**".

This relates to some mentors' comments that seeing examples of previous projects and information about how the program worked for teams would help them understand expectations of coaches and mentors. "**My strength is teaching kids to code. I think I would have been a better technical coach than a mentor**". Some mentors felt that the students and coaches did not understand how to interact with a mentor. "**If I had known how hard it would be for the girls to make, and stick to our meeting appointments, I would have developed a group message somewhere initially, to keep in regular contact with them throughout the project. I would then have used the phone/in-person meetings to supplement/expand on our message discussion**".

Such examples of previous experiences would also provide insight into the likely problems, such as varying levels of commitment and skills. For example "**I was not sure how much the girls had to do at the end. We all believed we had to deliver a fully functioning app**". Two mentors commented that it would be helpful to view the judging criteria to assist with the mentoring process.

Comments regarding more technical advice included the following; "**It was not clear in the beginning whether alternate coding platforms to App Inventor were able to be used. We found some of the limitations in App Inventor to be quite frustrating**".

One mentor queried potential support obtained from outside of the competition. "Advice regarding **the extent of how far you can reach out to industry and engage external parties for advice and feedback as part of the research would be helpful**".

Advice for future mentors

Four mentors replied "No". Many of the responses are similar to those to the questions relating to what worked or did not work (Q14) and what information was required before starting (Q18).

Several mentors answered this question by encouraging other women to get involved. "**Be prepared to be amazed at how much these young girls can achieve in such a short time frame! With all of the limitations we had they still blew me away with their enthusiasm/ideas/attitude and outcomes**."

Overall, the responses were similar to those for other questions indicating the wide variety of experiences that mentors encountered and the difficulty of knowing what to expect.

Topic	Responses
Check communication with students and coaches regarding expectations, schedule & process	21
Get organised and start work as quickly as possible	13
Be flexible and stay connected	12
Contact TGM early about problems	4
Connect with other mentors for support etc	3

TABLE 15: 2017 MENTOR ADVICE FOR FUTURE MENTORS

Many of the responses related to how to communicate with the girls. Some teams needed prompting, were unsure of how to use the technology and needed assistance to stick to the agreed schedule. "**The team might need some prompting to ask for help - they didn't want to bother me with questions, even though I was happy to help**". This relates to previous comments regarding establishing expectations and communicating with the coach about roles and tasks.

Answers to the previous question indicated that many mentors faced unexpected issues. 12 mentors recommended staying involved and connected with their teams and remaining flexible.

"**Get involved, and even if you do not have a STEM background it's worthwhile to be a strong female business role model for young women**".

"**Don't answer questions, offer guidance and let them reach the answer themselves - they get so much more excited/ interested when it's their idea**".

Since the timeline is very tight, 13 mentors emphasised the need to getting organised and starting work immediately.

Similar to an earlier response one mentor provided the following suggestion; "**Reach out to the wider network for help with technical aspects**". Seven other mentors mentioned networking with other mentors as well as ensuring TGM were made aware of problems early on.

Advice about how the competition program can be expanded

This question was not explicitly related to the evaluation of the competition. However, some useful suggestions for improvements or changes were provided. Many responses repeated suggestions for improving the program rather than expanding it. Some comments were directed more at recruiting schools and mentors rather than individual girls.

Nine mentors responded N/A or not sure. One mentor queried "**Do you need to expand it?**" and another suggested; "**it is great as is, if it gets too big then it becomes unmanageable**".

The most frequent responses suggested were:

- Word of mouth, including personal interactions, and a 'state summit';
- "Packaging the program so that volunteers can plan ahead and know what they're signing up for";
- Promotion to rural areas;
- Direct promotion to girls via school camps, coding workshops;
- Include it as part of the schools' curriculum;
- Include non-technical women as mentors to increase the pool of mentors;
- Social media.

Survey of Competition Coaches

As with the mentor survey, this survey was based on the results of the 2016 survey. Closed and open-ended questions were asked on the following four topics:

i. Motivation for participating.
ii. Problems and benefits.
iii. Suggestions for improvements.
iv. Suggestions for how to expand the program.

Demographics

Most of the 79 coaches live in Queensland and work for co-educational public schools. The majority teach grade 9, science, technology or maths.

Residence	QLD	NSW	SI, NZ	WA	NI, NZ	VIC	SA	TAS	ACT
Response	22	19	13	8	6	5	3	2	1

TABLE 16: 2017 COACHES BY STATE OF RESIDENCE

School type	Co-ed	Public	Independent	Single Sex	Catholic	Other
Response	60	41	22	19	10	6

TABLE 17: 2017 COACHES BY SCHOOL TYPE

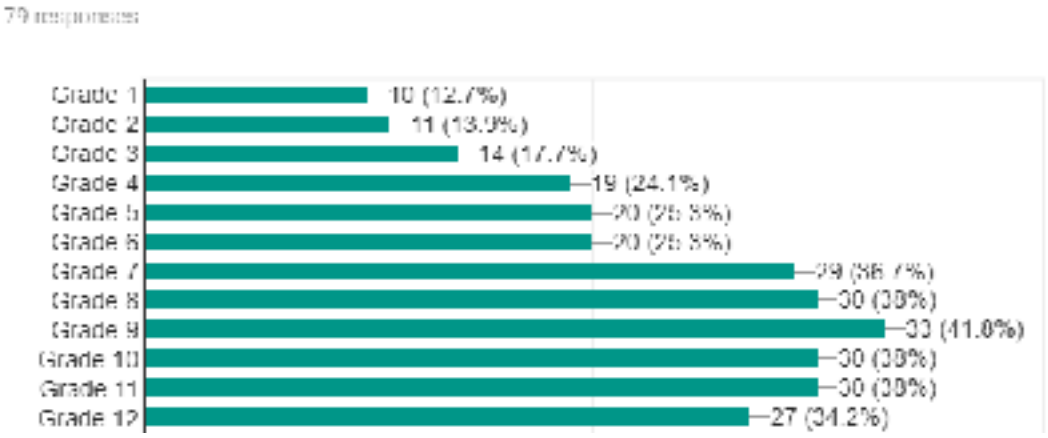


FIGURE 35: 2017 COACHES TEACHING YEAR LEVELS

Most teams were from schools that had more than 300 pupils (84%).

How many pupils attend your school?

Student numbers	Per School
<100	8
101-300	9
>300	62

TABLE 18: 2017 NUMBER OF PUPILS PER COACHES SCHOOL

In which of the following areas do you regularly teach? (top 8 responses)

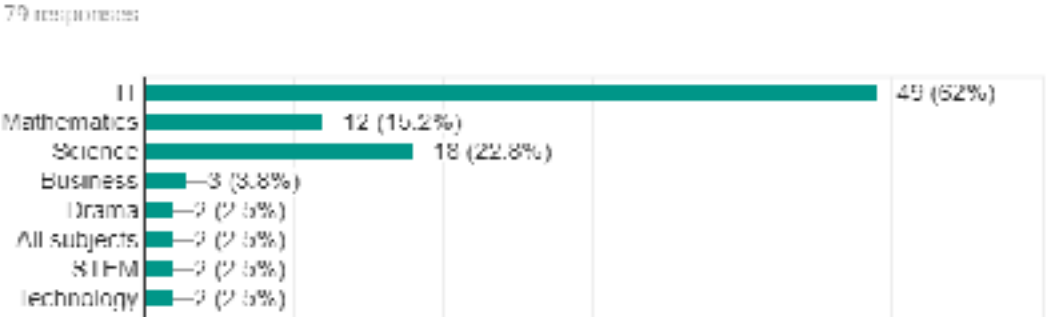


FIGURE 36: 2017 COACHES' REGULAR TEACHING AREAS

Concerning skills level, 59 noted that they had attended a professional development program in IT within the last five years, while 20 had not. 39 responded 'no' to the question on IT related qualifications and eight responded 'yes'. Of the more detailed responses, the following were the most frequent:

Qualification	Responses
IT degree	6
Postgrad IT qualification	5
IT - the level not specified	8
Industry certification (Google etc.)	2

TABLE 19: 2017 COACHES BY QUALIFICATION

The primary positions held by coaches were as follows (note ten coaches are parents):

Position	Responses
Classroom Teacher	29
Lead Teacher	18
Parent	10
Department Head	7
IT Support	3
Principal/Assistant Principal	3
Librarian/Teacher Librarian	3
Volunteer	1
STEM Coordinator/Coach	2
Writer in Residence	1
Gifted Ed Teacher	1

TABLE 20: 2017 COACHES BY PRIMARY ROLE

Participation in previous TGM competitions

19 coaches indicated previous participation and 60 stated they had not, as follows:

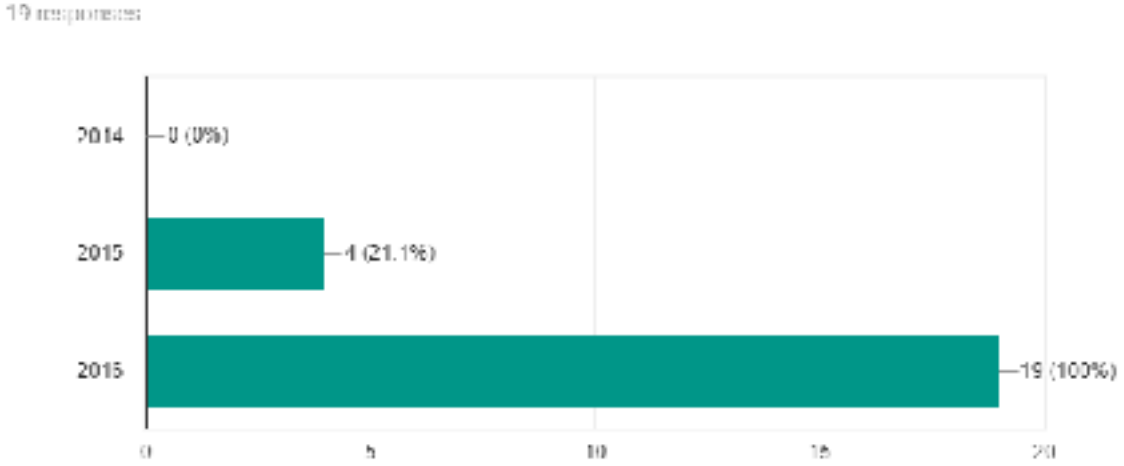


FIGURE 37: 2017 COACHES' PREVIOUS COMPETITION PARTICIPATION

Nine respondents indicated that they submitted their deliverables for the 2017 competition, one did not, and nine indicated that some did, some did not. Reasons for non-completion were as follows:

Reasons for non-completion	Responses
Poor communication with mentor	1
School students workload, lack of time	4
Poor organisation by students – spending too long on one element	2
Lack of commitment by all team members	2
Not all requirements submitted	1

TABLE 21: 2017 COACHES' REASON FOR NON-COMPLETION OF THE PROGRAM

14 coaches indicated that they had not participated in any related competitions. YCITE, Gamechangers and robotics were the only similar competitions mentioned.

Motivation to participate

Coaches gave the following general reasons for participation:

Coaches' motivation to participate	Responses
To increase the number of girls taking up science/technology careers	53
To provide more career options for girls	39
To share my love of technology	38
No other teacher volunteered	3

TABLE 22: 2017 COACHES' REASONS TO PARTICIPATE

Most of the coaches mentioned supporting and stimulating girls to study or engage with STEM or to increase their confidence with technology. "**To inspire curiosity and determination, and the realisation that careers for women in STEM are not only possible but also desirable**".

This included helping girls understand the design process, problem-solving in teams and understanding the business context. "**Give the girls an experience of setting up a business and letting them know there is a big wide world out there. Careers do not have to be about Uni but can be made by your own business**".

17 coaches made comments about improving their own skills and understanding of technology or to develop their coaching skills, possibly with a view to future participation in the competition.

The main topics covered in responses were as follows:

Topic	Responses
Engage and stimulate girls re: STEM in general	29
Help girls learn to code and feel self-confident about coding and technology	22
Show business side of technology & entrepreneurship & build partnerships with industry	8
Help girls understand the design process, problem-solving & how to work in teams	19
Help girls engage with real-world problems	7
Improve own understanding of coding, app development & technology in the curriculum	12
Improve own understanding of 'coaching' role	5

TABLE 23: 2017 COACHES' REASONS FOR PARTICIPATING BY TOPIC

What worked well in the program

Many of the responses related more to the outcomes of the program for the girls, such as the amount learned, the increase in girls' confidence and learning how to work in teams.

Many coaches found the structure, resources and support for the program very good.

"**The access to resources, the update emails and Jenine's encouraging videos**".

"**The weekly emails and updates were fantastic. The curriculum is so well prepared and easy to follow. It made the process so much easier, especially being a first timer**".

The second most frequent response concerned the value of the mentors.

"**We had great mentors who really valued the girls' ideas and asked good questions**".

"**The mentors were awesome in volunteering their time, both in person and over the phone/ online. Most valuable part of the competition for me**".

The most frequent responses are listed below:

Topics	Responses
The 'process' and structure of the program, including support	33
Interactions with and support from mentors	19
Increase in girls confidence with coding etc	10
Learning App Inventor	3
Learning how to work in teams	9
The overall concept and 'big picture' and the business context	3

TABLE 24: 2017 COACHES' - ON WHAT WORKED WELL IN THE PROGRAM

Problems with the program

The most frequent responses concerned scheduling students on different timetables, keeping up the momentum over the holidays and the overall issue of getting all the tasks completed in the available time.

"**It was hard to motivate girls as they would have to put a lot of time in outside of class time".**

"**The task was also too big for Year 4 students to do over the 12 weeks, especially because there were holidays in the middle of those two weeks**".

"**There needs to be two separate challenges. The amount of teacher support it required was huge**".

In particular, "**The business plan was very big and required a lot of explicit teaching because the primary students had never before encountered these things (like competitor analysis, business costs etc.)**".

The most frequent responses covered the following issues:

Issue	Responses
Lack of time in relation to the amount of content to be covered	19
The business content was difficult for younger students to understand	10
Scheduling – getting team members together and working around holidays	17

Contact with mentors, including problems with communication online	13
Coding (App Inventor) required was too difficult	9
Technical problems – App Inventor and internet etc. and lack of access to support	14

TABLE 25: 2017 COACHES' BIGGEST CHALLENGES IN THE PROGRAM

Several coaches mentioned issues communicating with mentors (especially online),

"**Very challenging for the younger girls but worked well for, the older ones. I feel the younger ones need face-to-face mentoring**".

"**Would be awesome if there was funding to release the mentors to come to the schools at least two times - in the beginning, and towards the end**".

In some cases, the mentor did not remain in regular contact or was "not responsive".

In relation to problems with coding and the use of App Inventor, some coaches mentioned that the mentor did not have the expertise to help, was too busy, or the guidance given was above the students' understanding. One coach indicated that it was difficult to run the program in a co-educational class since the boys were not involved.

Future participation

Of the 79 coaches who responded to this question, 57 indicated that they would participate in the program again, while three stated that they would not, and 19 were unsure.

As with the mentors' responses to this question, most of the positive responses were generally enthusiastic - "**a great program**" etc.; specific positive responses are listed below. However, it is not clear from many of the negative reactions whether the coaches would definitely not participate or were unsure of future participation. Many of the negative responses were similar to the coaches' answers about what did not work in the program.

Yes	Unsure/No
The enthusiasm of girls (9)	Scheduling problems and time required by coach (10)
Great experience and opportunity for 'real world experience' (8)	Not enough time to complete the program (6)
Contact with mentor and exposure to industry (6)	Problem learning App Inventor (4)
Coach learned a great deal (3)	Problem scheduling the work for girls in a co-ed class (3)

TABLE 26: 2017 COACHES' ON FUTURE PARTICIPATION IN THE PROGRAM

The girls' enthusiasm was frequently mentioned;

"**I would do it again as I witnessed two groups of girls collaborating, planning, designing and creating an app. They learned skills that will prepare them for high school and beyond. I hope they continue to develop what they have learnt and done**".

Many coaches appreciated the opportunity provided to the girls;

"**Great program with a real-life outcome at the end, doesn't get any more authentic than that**".

"**Fabulous opportunity for the girls to make connections outside the school community and experience the entire process required for an IT specialist in a "real" work-life situation**".

The most frequent negative responses concerned scheduling problems, the amount of time the coaches had to commit to the program and the difficulty some teams had in completing the work on time (some coaches referred to problems with the Business Plan content).

"**I love the program. Unfortunately, I don't feel supported enough by my school, and so I will not do this again due to the amount of work it actually requires to organise and work with teams. It's more work than leadership realise (or they simply don't care)**!".

Only one coach explicitly mentioned increasing girls interest in STEM, but this idea was probably a given, considering the nature of the program and was also covered under the "**opportunity for real-world experience**".

Information required before the program commencement

13 coaches replied - No (nothing else needed).

Again many of the responses were similar to those given in the questions about participation and what did not work in the program.

Topic	Responses
Time involved	9
Access to experiences from previous projects – typical problems etc	4
Access to judging criteria to ascertain expectations, e.g. to what extent the app should 'work'	4
More technical information and advice, especially coding and App Inventor	14
More information about the Business Plan – unfamiliar content for most coaches	3

TABLE 27: 2017 COACH SUGGESTIONS FOR PRE-COMPETITION INFORMATION

Nine coaches were not prepared for the amount of time required to help the students. Four indicated that having access to experiences about previous projects, along with access to the judging criteria may help them to understand typical problems. Access to the judging criteria would also assist the coaches in knowing how the students' product would be assessed.

14 coaches mentioned that they needed more technical understanding and support. "**That we needed to have a better knowledge of coding**". Two coaches suggested that coaches should be better informed about what level of technical skills would be required. Similarly, three coaches mentioned being new to the idea of the Business Plan.

Advice for future coaches

Five coaches replied that they had no advice to give, with one indicating that it was "a well-structured program". The most frequent responses were as follows:

Advice for future coaches	Responses
Get school support	4
Start as early as possible and learn prior to commencement	8
Allocate sufficient time and plan	15
Keep students focused and on task	7
Choose students carefully and assign roles appropriate for their strengths	4

TABLE 28: 2017 COACH ADVICE FOR FUTURE COACHES

Most of the coach responses related to the amount of time involved. "**Think of an amount of time you are prepared to give the competition, then treble it"**. The need to start early and get organised, including learning as much as possible before the start of the program was a key theme expressed by respondents. "**Plan your time wisely**".

Starting early and engaging in prior learning was mentioned by eight coaches. "**Learn App Inventor before brainstorming game ideas - our ideas were amazing, but it turned out we didn't have the ability to code it**".

The remainder of the comments mainly focused on managing the teams, including choosing "**students who need to be extended**" and grouping them according to their abilities. "**All the girls want to have a hand in the technology component which is awesome, but in a real-world team, not everyone does everything. You do need the designers and the marketers too**". "**Ensure you divide your team into roles and set tasks for each role to complete**".

Keeping students focused and on track is also important. "**Keep regular contact and stick to checkpoints, what undid our group was the "we will catch up" attitude".**

School support was mentioned by four coaches; for example "**Get school funding support for relief in the lead up to deadline**". And "**Check the support before you agree to coach**".

Advice about how the competition program can be expanded

This question was not related to the evaluation of the competition. However, some useful suggestions for improvements or changes were made.

Seven coaches indicated that they were not sure how this could be done. As with the mentors' responses, several suggestions related to recruiting more coaches and mentors, rather than increasing girls' and schools' participation. Many responses related to expanding the content rather than the reach of the program, or modifying and adding to the existing program via 'mini-competitions' etc.

Two coaches suggested that the current reach was satisfactory and the program should grow 'slowly'. "**From your publicity, it sounds as though the growth is just at a manageable level**".

Showing videos, having visits from mentors, successful student teams and experienced coaches, and offering pre-competition workshops and professional development were the most frequent suggestions for expanding the reach of the program. The latter ideas probably relate to earlier comments regarding coaches' lack of relevant knowledge and the need for more technical support.

Results

The results of the 2017 Student Post Evaluation Survey are consistent with the smaller 2016 pilot study survey. Overall the response from participants was positive with most girls showing a keen interest in a career in Science, Technology, Engineering & Mathematics (STEM) after participating in the program. Additionally, the majority of coaches and mentors were also willing to participate in the competition again. Twenty girls had participated in the competition in previous years indicating sustained interest in further development of their app.

Schoolgirl responses

Of the 351 students a majority live in Queensland, New South Wales and the North Island of New Zealand, attend co-education, public (state) or independent schools, and are currently in grade 6.

- 85.5% of students had some or lots of coding knowledge before participating in our program.
- 80.4% of students had improved coding knowledge after participating in our program. 61% moderate or significant improvement.
- 92% of students felt they were given significant resources by TGM to be successful in the program.
- 92.2% of students agreed that their coach provided the support they needed during the program. 47.9% of those strongly agreed.
- 78% of students agreed that their mentor provided the support they needed during the program. 36.8% of those strongly agreed.
- 87.8% of students felt they worked together well as a team during the program.
- 73.3% of students felt they had enough time to complete the program.

- 85.7% of students plan to use science or computing in their future career after participating in our program.
- 92.6% of students believe that after participating in our program they will be able to pursue many different career paths if they learn a lot about technology.
- 85.8% of students believe their parents would like them to choose a STEM career after participating in our program.
- 85.7% of students like their science class after participating in our program.
- 94.9% of students feel comfortable using computers after participating in our program.
- 64.3% of students agree that since participating in our program they can now cope better if they don't do well on STEM assignments.
- 81.9% of students reported knowing people who work in STEM after participating in our program.
- 92.6% of students enjoy learning about science.
- 91.4% of students enjoy learning about technology.
- 90.1% of students understand science subjects.
- 94.3% of students understand technology subjects.
- 51.3% of students feel they don't need to know about science to get a good job. 48.7% feel they do.
- 39.4% of students feel they don't need to know about technology to get a good job. 60.6% feel they do.

In relation to the STEM Entrepreneurship curriculum, the Revenue lesson was the least popular and students wished there had been more focus on coding, even though their perceived competency in coding increased substantially. There were very few comments regarding problems with specific questions with most students reporting more general issues with the program, such as shortage of time. This was the most reported issue in the 2016 survey and is also confirmed by mentors' and coaches' comments.

Overall the support from schools, coaches and mentors is perceived as good or satisfactory, and the students thought they worked together well in teams. A small percentage reported that team members dropping out caused problems.

Student motivations and expectations mainly centre on the enjoyment of the area and the desire to become more competent, to work together with other girls, and to enjoy the challenge.

There was a moderate to good improvement in girls' perception of, and interest in, STEM areas through participation in the competition. Questions based on the Kier, Blanchard, Osborne and Albert (2014) instrument also showed favourable attitudes towards STEM with a slightly higher percentage of girls believing that technology was more important than science for future jobs.

Mentor responses

The 2016 survey collected mentor and coach responses in the same survey. However, since the issues appeared somewhat different, in 2017 we mounted separate surveys.

Most of the 117 mentors who responded to the survey live in NSW and work for large enterprises in the telecommunications sector. 13 mentors had participated in a previous competition.

The majority of the mentors who responded were motivated to participate in the program to increase girls' interest and participation in STEM. 50 mentioned their motivation was to be a part of the Tech Girls Movement. Communication and support from the TGMF were cited by the majority of students as to what worked well in the program, followed by approval for the curriculum and program structure. The major issue raised related to problems of communicating remotely with the teams and

coaches across different time zones and working around school schedules and holiday or exam periods.

Around 65% of the mentors affirmed they would participate in future competitions. 32% were unsure while only four said no. Reasons for possible non-participation focused mainly on problems with communication and a lack of clarity about expectations of coaches and students regarding the mentor role.

In terms of further information required before starting the competition, the majority of mentors reiterated the need for clarity regarding roles and expectations, as well as the amount of time required in the mentor role. Similarly, advice for future mentors focused on checking communication with students and coaches regarding expectations, scheduling and processes.

Coach responses

Many of the 79 coaches who responded live in Queensland, and work for co-educational public schools. The majority teach grade 9 in science, technology or maths. 19 had participated in the competition previously. The majority work in schools with over 300 students. Most coaches have received a professional education in IT in the last five years but responses regarding IT qualifications were not clear. This question will be formalised in future surveys. 10 of the coaches this year were parents. The majority were classroom or lead teachers.

The primary motivation for coach participation was to increase girls' participation in STEM studies and open up more career opportunities for girls. The structure and support for the program and interactions with mentors were cited as the things that worked best, while the lack of time, scheduling issues and difficulty understanding the business content were cited as the major problems.

72% of the coaches indicated that they would be willing to participate again. 25% were unsure while three stated they would not. Scheduling problems and the time required were cited as the main reasons for doubt. Allocating sufficient time and keeping the girls on track were the main pieces of advice they would give future coaches.

Directions for future research

Many of the questions for this survey were codified based on results of the 2016 survey. It will be useful to do this in future surveys to obtain more precise answers. Comparison with the results of the pre-competition survey will be carried out if further funding is available. To obtain more in-depth information, interviews with teams and their mentors and coaches would help to confirm the survey results and assist in making further improvements to the conduct of the competition.

Conclusion

Each of the three groups (students, mentors and coaches) found the program to be an overall positive experience, with many respondents expressing their desire to participate in future competitions. The main findings from the student survey demonstrated a high number of students wanting to enter STEM-related studies or future STEM careers. Both mentors and coaches found the program to be a suitable tool for enhancing the profile of female involvement in the STEM industries, with this being a prime motivator for many mentors and coaches to get involved in the competition initially. Any suggestions for program change or enhancement were consistent across the respondents. These areas related to methods of communication across groups, better scheduling to work better with teams, and more examples of past competition projects and assessment criteria to assist in the mentor/coach role.

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