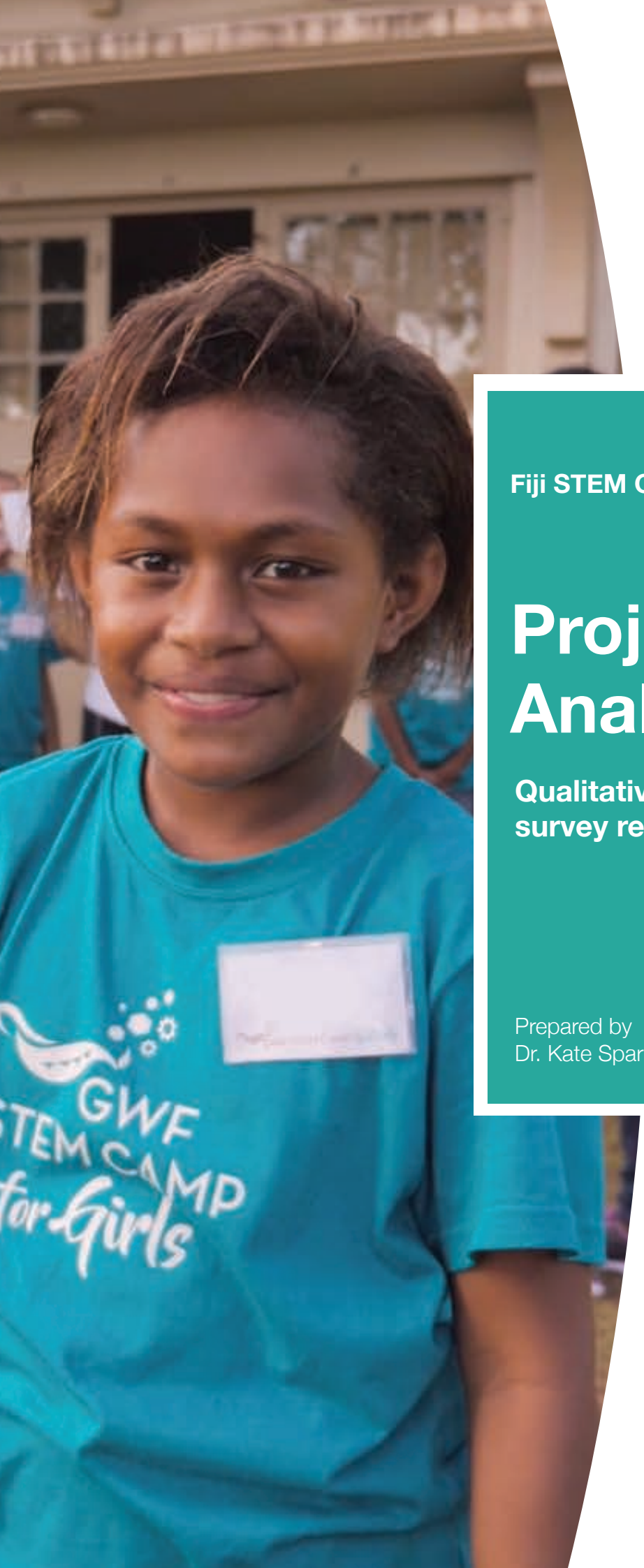

Fiji STEM Camp (April-May 2019)

Project Impact Analysis

Qualitative analysis of participant survey responses.

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NANOGIRLLABS

Summary Report

Qualitative analysis of survey responses

Executive Summary

Nanogirl Labs Ltd collected responses to survey questionnaires from both students and trainers participating in the first GWF STEM Camp for Girls, with the aim of understanding how far we had achieved the standards of success set out before the camp. Those standards were to change the attitudes that "STEM is not for girls," to empower students to feel confident in STEM subjects and to leave behind confident trainers who can spread STEM through their communities.

Key outcomes from surveys were:

- 80% of student participants reported that they do not study science in school.
- Students who did not previously study science were able to clearly explain their "favourite" experiment by the end of the camp.
- There was a large increase in awareness of what scientists and engineers do for work, as this knowledge was almost entirely absent among students before the camp.
- Students made the link between 'being a scientist/ engineer' and the jobs in which their trainers work, validating the decision by GWF to have all the trainers be women recruited from STEM fields.
- Trainers reported that they felt the main benefits to them were an increase in their ability to communicate complex STEM subjects in a manner which young children can understand, and a sense of empowerment in their own abilities and achievements throughout the camp.

Background

Nanogirl Labs Ltd partnered with Graduate Women (Fiji) to design and deliver a STEM Camp for girls living in informal settlements in Suva, Fiji. Trainers and students recruited by the Graduate Women (Fiji) **(GWF)** to take part in the first STEM Camp delivery in May 2019 were provided with survey questionnaires before the beginning and after the end of their camp experiences. The surveys contained open-ended questions and were aimed at assessing the attitudes of the respondents towards the camp as well as their confidence in any new learning which had taken place. All participants completed both the Before and After surveys. Qualitative responses were analysed using a ground-based concept driven coding approach. This document has been prepared with the aim of increasing stakeholder engagement with the responses, and drawing out data to model the key measurements of success.

Key Measurements of Success

As reported to Nanogirl Labs Ltd (NGL) before the camp, the key measurements of success were:

1. Change the attitude that STEM is "not for girls."
2. Empower students to feel confident in STEM subjects
3. Leave behind confident Trainers who can spread STEM through their communities.

This document will address these areas separately.

Changing attitudes that STEM is 'not for girls'

Among the teachers, who are already STEM professionals, the prevailing attitude was that they could change attitudes among young women by **"model[ling] the pathway to becoming a potential graduate,"** and that **"as a female I hope to help young girls reach their highest potential in the future."** The awareness of teachers as proof that stereotypical attitudes towards women in STEM can be changed was a driver of attitude change amongst the students. One student said that **"My favourite [thing] was that my teachers tell us about science!"** This response validates the decision by Graduate Women (Fiji) to recruit women working in STEM fields as the camp leaders.

Leaders reported that self-empowerment was the strongest emotion associated with their experience of the camp

Students understanding of the roles of scientists and engineers changed over the course of this camp. Before the camp, only 30% of student responses to the questions **"What does a scientist do for a job?"** and **"What does an engineer do for a job?"** were answered. The majority (50%) of students did not know any scientists and had never seen a scientist before, so did not know what scientists did. One respondent gave the specific example of "**She shows me pictures of plants"** indicating a personal relationship with a female scientist - in fact it was the students' aunt. In 27% of responses, there was an understanding that **"Scientists do experiments."** Awareness of the job of an engineer was even lower (56% answered **"I don't know**") than awareness of the job of a scientist. Of those who did give an answer to that question, most gave vague examples such as **"Fix things"** (4%) indicating some general awareness of the role of science and engineering within communities. Survey questions were not able to capture any awareness of mathematicians or technologists.

After the camp, 91% of students understood that "[Engineers] build things" (77%) or that "Engineers fix things (14%).

When asked what engineers do for a job, there were some specific examples given of the types of jobs which engineers can do, for example building boats and fixing aeroplanes. There were fewer specific examples given in response to this question than to the question about what scientists do for a job, and some answers still indicated a lack of understanding, for example one student answered that **"they swim in the sea."** These responses probably reflect the fact that there were fewer engineers than scientists amongst the teachers. After the camp, 100% of students were able to give an example of a type of job which a scientist would do. Responses indicated an awareness that the camp leaders were mostly scientists, and reflected the jobs which teachers normally did, for example **"Computers"** was a common response as two of the teachers worked as Computer Scientists.

A small number of responses (10%) linked together the ideas of 'being a scientist' and 'teaching science' which probably reflects the understanding that the teachers were also scientists in this camp. The diversity of the responses indicates that the students were given multiple examples of types of jobs which scientists can do.

By the end of the camp, students were able to see themselves as scientists and engineers through confidence in their own abilities to understand, carry out and communicate the science content of the lessons. The main driver of attitude change which emerged from the survey was the increase in knowledge of what scientists and engineers actually do, rather than a change in attitude towards previously known scientists and engineers. This conclusion probably reflects both the age group of the students and the lack of high-profile Fijian STEM professional role models.

Empowering students to feel confident in STEM areas

Over the course of the camp, there was an increase in student confidence and familiarity with STEM subjects. As 80% of students reported that they did not study science in school, there was a lack of basic STEM knowledge amongst the students prior to the camp, as well as a lack of 'hands-on' science experience. Before the camp, 67% of the students liked doing science, probably reflecting that the pool of applications came from families of children who were already interested in these subjects. After the camp, 93% of students reported that they liked doing science, an increase of 26%. When asked what they most enjoyed about the camp, 68% of students responded that they enjoyed the experiments, with most of them giving a specific example of the experiment they enjoyed the most. The favourite experiment was **"Chicken in a Cup"** with 13% of the responses. Of the 32% of responses to this question which did not mention an experiment, 30% of those reported that **"Learning new things"** was their favourite part of the camp.

When asked to write down in the After survey one interesting thing they had learned, 67% of students were able to answer with a specific example of something they found interesting, indicating that they had retained that knowledge. One student responded that **"I learned [that] I like doing science"** and others gave examples such as **"[I learned that] bacteria go away when we wash our hands with soap and water."** Being able to clearly communicate a specific example of new learning is a good indicator that students felt confident in their new STEM knowledge. Further surveys conducted at regular time intervals after the camp has finished would be able to determine if the knowledge gained has been retained and added to in the long-term.

Leaving behind confident trainers

Before the camp, teachers generally felt excited to be given the opportunity to take part. Teachers felt that their own teaching experiences as well as their academic backgrounds qualified them to teach this camp. Alongside a general feeling of hope that the camp would be successful, there was a small amount of anxiety about their individual suitability for the role and how they would perform. Some teachers hoped to use their experiences in this camp as an opportunity for their own professional development. All teachers reported that they felt like they were already role models for young women in STEM, as one teacher reported, **"If I can pursue a career in science then they can be motivated to do the same."** This self-confidence could stem from the anecdotal evidence that many of the teachers are already the only female STEM educator in their respective faculties.

After the camp, teachers felt that their experiences formed a solid basis for them to continue teaching STEM to this age group. Teachers reported that self-empowerment was the strongest emotion associated with their experience of the camp. This empowerment appears to come from an increase in practical teaching and communication skills among the group of teachers as well as the confidence to be a role model in STEM teaching. One teacher stated that **"this [camp] really helped me to bring down my university level of teaching to the lower level and try to explain engineering in simple terms."**

Conclusions

Overall, the feelings around the camp were positive, and both students and teachers enjoyed their experiences. The families of student participants in this first camp have agreed to provide information to GWF detailing the course of the students' education and training over the next 15 years This style of ongoing data reporting will be beneficial to assessing the long-term impacts of these camps on the future of the student participants. The high levels of confidence and competency amongst the trainers should form a solid basis for this camp to continue.

For More Information

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