

Impact Report



Science Resources Africa
Building Science in Africa

2017

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1. Introduction

Science Resources Africa (SRA) is a non-profit initiative spearheaded by Bridget Bannerman (PhD Cambridge, University of Sierra Leone, Jean Piaget University, Guinea Bissau) which believes that significant and lasting positive economic and social change can be enacted in sub-Saharan Africa through development of capacity in science education. Since the organisation began in 2012, it has supported numerous programmes in Sierra Leone and Guinea Bissau and is currently in the process of expanding to The Gambia, Nigeria, and Zimbabwe.

This report will overview some of the key programmes SRA has carried out and show the impact of past, current, and future operations of the organisation. This report is meant to give specific quantitative and qualitative insight into particular programmes and therefore complements the overview of SRA given in the general report document.

2. Overview of SRA aims

SRA acknowledges the need for greater capacity in science education to bolster the social and economic growth of the continent by enhancing the education, opportunities, and career possibilities for young people. The organisation takes a holistic approach, with projects directly targeting students, targeting teachers, and creating networks between professionals and wider communities in order to discuss and work on these issues.

3. Participating countries

While SRA originated in Sierra Leone, its long-term goal is to expand across the continent. As such, within the organisation there are projects to scale up the work to be viable across broader geographies. 2017 is an exciting time for the organisation as thanks to generous donor funding operations are being expanded to The Gambia, Nigeria, and Zimbabwe, by late 2017/early 2018, as *fig.1* overleaf shows.

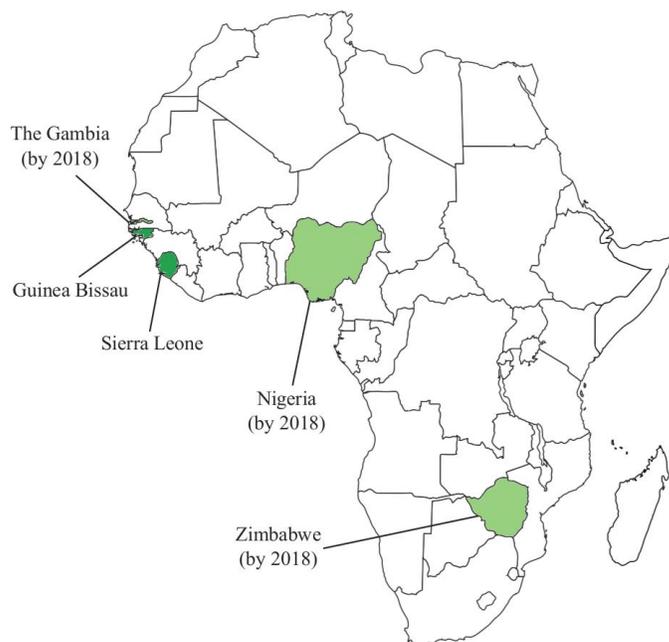


Fig. 1. Map of current and future countries covered by SRA initiatives.

4. Reaching non-urban communities

Within these geographies, SRA has worked over the course of the past 2 years to expand our activities to reach audiences not only in the capital but in other cities and in more rural areas. Specifically in Sierra Leone, SRA began by operating initiatives both in the capital of Freetown (population of 1.1 million in the 2015 census) and in the provincial areas. A science summer school was launched in Bo, the second city of Sierra Leone. SRA also contributed to a 2014 programme in Kono which is being self-sustained by partners there.

5. Interim summary

Having now presented an overview of the SRA mandate, the locations in which SRA works, and the partners and stakeholders involved, this report will now turn to consider each of the four types of SRA projects and evaluate their impact: (i) science education workshops, (ii) capacity building, (iii) community engagement, and (iv) international outreach.

6. Projects

6.1. Science Education Workshops

6.1.1. Introduction

Science Education Workshops are core to SRA's programmes. SRA has hosted a workshop annually, with an online forum being used in 2014 as a result of the Ebola crisis. The workshops bring together students from different schools for a multi-day programme involving quizzes, discussions, keynote speeches, prize giving ceremonies, experiment demonstrations, and poster sessions. In the months running up to the workshop, a science essay competition is set up, where students can submit an essay on key topics such as "*Science Education in Sierra Leone, current limitations and future development.*" Such competitions get students engaged in science education and often produce incredibly innovative and thought-provoking ideas for capacity building in the sciences.

The inaugural workshop in 2012 was planned from the results of a survey conducted in 2011 in Sierra Leone and The Gambia, which asked for opinions about what were the greatest inhibiting factors for science education. The results identified (i) a lack of laboratory equipment, (ii) not enough practical sessions, and (iii) shortage of textbooks. The workshops were therefore planned to engage students and use donor funds to provide resources. Moreover, SRA wanted to combat the mindset that failures in science education are only due to external factors – instead, SRA believes that innovation is key to shaping progress in sub-Saharan Africa, and thus an essay competition and student projects are included in the science workshops in order to get young people invested in providing solutions.

6.1.2. 2012

The first Science Education Workshop was held from 24th – 26th April 2012 in Freetown, Sierra Leone, and was made possible through generous sponsorship from Professor Mark Carrington (Department of Biochemistry, University of Cambridge), Dr Stephen Middleton (University of Cambridge), Dr Jenny Koenig, and the Festus Bannerman Education Foundation. 3 students were awarded prizes from the science essay competition, 2 students were awarded prizes for the science and mathematics quiz competition, and all participants received a complimentary prize for their participation.

6.1.3. 2013

After the success of the 2012 workshop, a further Science Education Workshop was held in 2013 in Freetown, Sierra Leone, from May 15th – 17th, which 7 schools participated in. In addition to the programme offered in 2012, a demonstration of DNA extraction and microscopy techniques was performed for the students.

Lecturers from the University of Sierra Leone attended and helped out as judges for the science projects presented by the students, using the criteria of (1) scientific principles and applications, (2) innovation, and (3) potential for socioeconomic development. 3 students were awarded prizes for their presentations, and all students received lab coats, maths sets, and calculators; each participating school was also given 1 computer and accessories, and 1 teacher was awarded a laptop donated by the Jackson Laboratory, Maine, USA, through the category of Best Teacher. Press representatives from national TV, radio, and newspaper outlets attended the award ceremony.

As a result of the 2013 workshop, a computer lab was set up at the University of Sierra Leone thanks to donations from the University of Cambridge. The Sierra Leone Association of Women in Science and Engineering (SLAWiSE) was also set up with support from the Cambridge Association for Women in Science and Engineering (AWiSE), with a mandate of organising future science workshops. The 2013 workshop was funded by: the Cambridge-Africa Alborada Research Fund; the Biochemical Society, UK; Marshall Aerospace and Defence Group, Cambridge, UK; the Medical Research Council, Cambridge, UK; The Jackson Laboratory, Maine, USA; the Departments of Biochemistry, Pathology, Chemistry & Medicine, University of Cambridge, UK; the Festus Bannerman Education Foundation, and the Schlumberger Foundation, Faculty for the Future Programme.

6.1.4. 2014

In 2014, SRA's operations were struck by the Ebola crisis, which meant bringing people together for workshops was not viable. However, students and staff were passionate about continuing the workshops, and so this led to the innovation of an Online Science Fair. Learning groups on social media (Facebook and WhatsApp) were created which students could access through their mobile phones, and there was a daily schedule of group discussions in the areas of physics, chemistry, biology, and mathematics.

The success of the 2014 Online Science Fair shows that the Science Education Workshop model can be extended to the online sphere. This means that future SRA projects can overcome barriers such as epidemics, rural and inaccessible areas, and therefore reach audiences across larger geographies; the Online Science Fair was a key learning point for SRA as well as a means of continuing student and staff engagement and training in science.

6.1.5. 2015

In January 2015 the 3rd Science Education Workshop was held, with 8 schools participating. The workshop included student experiments, science quiz competitions, poster presentations, and keynote speeches.

6.1.6. 2016

The 2016 SRA annual Science Education Workshop was hosted by the University of Sierra Leone, Fourah Bay College, and took place from the 15th – 17th October. The student scientific project competition was contextualised within the UN Sustainable Development Goals, which projects falling within the categories of Nutrition, Health, Environment, and Engineering.

As well as 18 prizes across the student science project competition categories, funding from donors was used to provide Annual Tuition Scholarships of Le100,000 to 6 participants. The Sierra Leone Association of Women in Science (SLAWiSE) Faculty for the Future Award was also launched during this workshop; the award recognises young girls who have engaged in the science workshops and gone on to pursue careers in STEM fields. SLAWiSE will provide career mentorship for the award winners, meaning that SRA is facilitating projects that tackle the gender gap in STEM subjects.

6.1.7. 2017

In July 2017 Masta Sabi and his team ran a summer school in Bo, Sierra Leone's second city, themed "Introduction to Electronics". 85 students attended the summer school, which included practical demonstrations and experiments. The school was a successful case of expanding SRA's Science Education Workshops into other parts of Sierra Leone, and we look forward to seeing other programmes in the near future.

6.1.8. Overview of participation

Since SRA first started, we have seen a great expansion. The infographic summarises this both in terms of student participation and the number of teachers and facilitators involved in SRA initiatives.

Expanding our reach: 2013 to 2016 in numbers

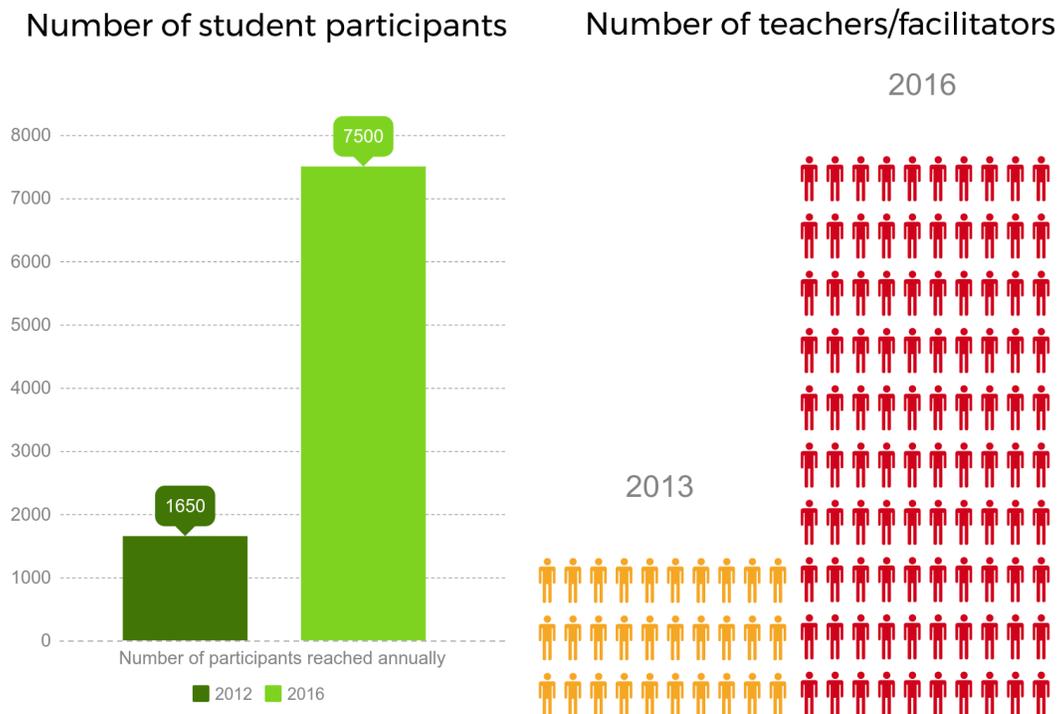


Fig. 2. Infographic showing increase in (a) student participation (2013: $n=1650$, 2016: $n=7500$), and (b) number of teachers and facilitators at SRA science education workshops (2013: $n=30$, 2016: $n=150$)

6.1.9. Spotlight on gender

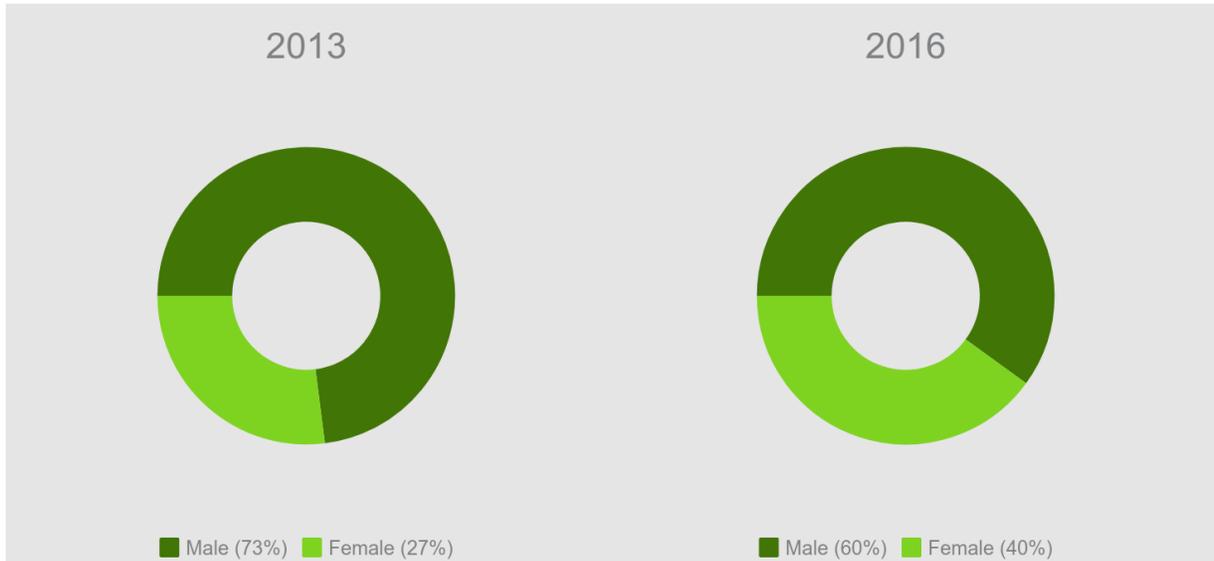
SRA is committed to providing educational opportunities in STEM subjects for all genders, and as such has been working to address the gender imbalance in access to and attainment in the sciences.

Since setting up the Sierra Leone Association for Women in Science and Engineering (SLAWiSE) in 2013, there has been a noticeable increase in the proportion of female students both participating in the science education workshops and also receiving prizes in the student competitions.

The infographic on the next page illustrates these trends.

Narrowing the STEM gender gap

1. Participation in SRA programmes by gender



2. Prize recipients by gender

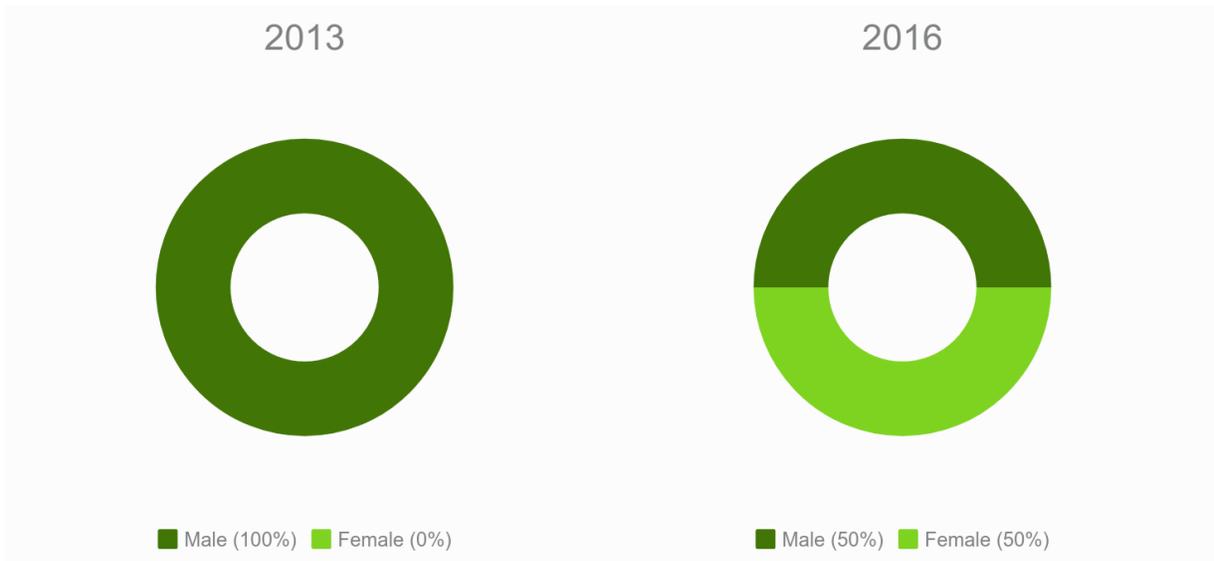


Fig. 3. Infographic showing the increase in female participation and attainment from 2013 to 2016.

6.2. Capacity Building

In addition to Science Education Workshops, SRA works to build capacity through various different projects:

- **Introduction of new elective courses** at the university of Sierra Leone: Introduction to Computer programming in Matlab, Advanced molecular biology techniques and Arcview GIS.
- **Mentorship programme** for Science Resources Africa alumni include online mentoring programmes and Summer Schools with the Madanyu initiative (<http://www.madanyu.org/>).
- **Gender promotion initiative:** To support the growth of the Sierra Leone Association of Women in Science and Engineering (SLAWiSE) for the mentorship of women and girls into careers in science and maths and as future leaders in the community. Mentorship is being provided by the Cambridge Association for Women in Science and Engineering (CamAwise) <https://camawise.org.uk/>
- **Educational TV programme:** Advancing a dedicated TV channel for the delivery of quality educational content whilst promoting the 4th UN sustainable development goal – Quality Education
- **Organising symposia** for newly appointed outreach co-ordinators; this project is being organised in partnership with SLAWiSE

6.3. Community Engagement

SRA is proud to support the ongoing outreach activities of Umu Sall, the Sierra Leone Association for Women in Science and Engineering Faculty for the Future Award Winner of the 2016 Science Fair Competition.

Recent inspirational talks and donations were made by Umu and her team to the Milton Margai School for the Blind and the New England Primary School in Sierra Leone.

6.4. International Outreach

6.4.1. Introduction

SRA has organised and participated in various events around the world to share strategy plans and create partner networks. These projects help the organisation improve its in-country operations by hearing about educational projects in other countries and through receiving feedback from various

experienced professionals on the SRA projects. International outreach also enables the organisation to connect with donors and partners, and so is a valuable part of the SRA model.

6.4.2. *The University of Cambridge*

A key SRA partner is the University of Cambridge in the United Kingdom, where several SRA patrons are based. From June 27th – 30th 2017 SRA invited representatives from Sierra Leone including the Vice-Chancellor of the University of Sierra Leone to Cambridge for a series of strategy and networking meetings. These meetings were a valuable means of sharing ideas between SRA members and partners.



2017 Cambridge SRA Schedule

Tues 27th June – Reception dinner between SRA patrons from the University of Cambridge and representatives from the University of Sierra Leone (pictured)

Weds 28th June – Meeting with the Cambridge-Africa programme (pictured)



Thurs 29th June – Conference with the Cambridge Association of Women in Science and Engineering about SRA and the Sierra Leone Association of Women in Science and Engineering (SLAWiSE)

Fri 30th June – Faculty of Education team meeting

6.4.3. UNESCO conferences

SRA has presented at several UNESCO conferences in order to disseminate the aims and activities of the organisation and create valuable relationships with partners including policy makers through networking.

To date we have presented at 4 conferences, as *fig. 2* below shows:

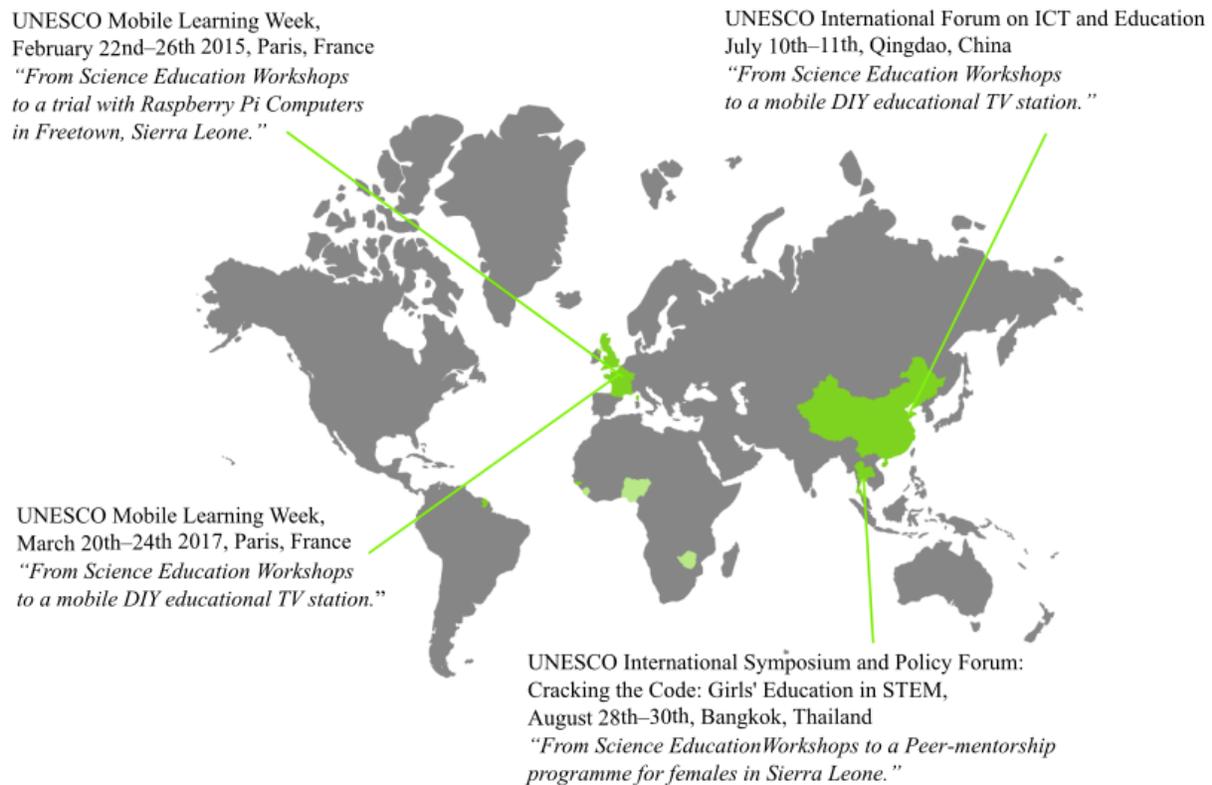


Fig. 2. Annotated map of 2017 UNESCO fora SRA attended, with titles of SRA presentations.

Case studies of SRA initiatives were presented at each of these conferences, where Science Education Workshops were shown to have an impact of inspiring various subsequent projects, including a Raspberry Pi trial and one young person’s innovative mobile DIY educational TV station.

As an example of a case study presented, the 2015 presentation in Paris, France discussed training teachers to use mobile technologies to aid students' learning, with a focus on educating girls. Raspberry Pi computers were used for their low-cost and computational power and teachers in Sierra Leone used them for one-to-one tuition of secondary school pupils. The trial involved 8 students (4 girls and 4 boys) who were taught basic programming using Scratch on the Raspberry Pis. The teachers were able to pick up needed technological competency and students were highly engaged in the programme and able to learn through fun activities such as creation of virtual environments such as a shopping mall. The pilot project therefore showed that investment in low-cost technology can have a transformative impact on students' engagement with science learning. Training teachers how to use such resources is also vital for the success of such programmes.

Finally, looking to the future, the Rachel pi (Remote Areas Community Hotspots for Education and Learning) is an example of how raspberry pis could be further incorporated in the context of school education; this is a local offline server which can serve as its own wifi hotspot, thus allowing a classroom to connect to educational content without the need of high-cost equipment and extensive electricity infrastructure. The raspberry pi initiative is therefore able to adapt well to rural schools which currently lack infrastructure for teaching of computing.

7. Summary

In summary, SRA invests in science education in sub-Saharan Africa through 4 types of projects: (i) science education workshops, (ii) capacity building, (iii) community engagement, and (iv) international outreach. The organisation is currently active in two countries (Guinea-Bissau and Sierra Leone) and is in the process of increasing regional coverage to three more countries across the continent (The Gambia, Nigeria, Zimbabwe), expected to be launched by early 2018. While activities have taken place capital cities, SRA has a long-term plan of providing educational access to children in rural areas, and has been working towards this by expansion into second cities as well as through events held in rural areas and online.

Science Resources Africa

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<http://scienceresourcesafrica.com/>