



Practical  
Education  
Network  
Hands - on, Minds up

# 2019

## ANNUAL REPORT

*... a year of firsts*

Reporting period: January 01 – December 31, 2019

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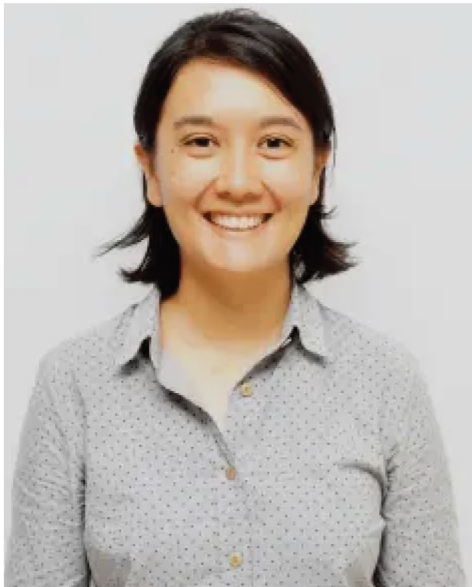
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Special Acknowledgements





## LETTER FROM THE FOUNDER & CEO



**Dr. Heather Beem**  
*Founder & CEO, Practical Education Network*

Dear friends,

I write with great joy to share Practical Education Network's first ever Annual Report.

At the end of 2018, we had won a \$10K award from MIT SOLVE's Teachers and Educators Competition (which included a \$25K contribution from an anonymous donor to whom we are grateful). Our team of two full-time staff and two volunteers was excited, but we could not yet appreciate how 2019 would be such a successful Year of Firsts.

For the first time, we were able to invest in renting our own office and purchasing our own car, which proved key in stabilizing our operations. With guidance from the Board of Directors and after a multi-month search, I was able to hire our first two staff in management roles, something I had been praying for years for, but was unable on my own to envision exactly what it would look like.

Working with Quaye and Desmond has not only been helpful for strengthening our operations, but it has been a personal joy for me. The firsts continued with our invitation from the Ministry of Education's National Council for Curriculum and Assessment (NaCCA) to support them in revising the national primary school curriculum.

To our knowledge, we are the only NGO who was invited by NaCCA in such a capacity, across all subjects- a testament to the value that our approach has in the eyes of key stakeholders. Through this, we were able to infuse PEN's hands-on content into Ghana's national primary school science curriculum, a major success in our STEM systems building work.

For the first time, we were able to clearly measure the impact of our approach on Ghanaian students and communicate it widely with the Ghanaian audience. This included TV and radio appearances and hosting our first STEM Research Dissemination Meeting, carried out in collaboration with Ashesi University, Michigan Technological University and MIT, and with attendance brimming at capacity.

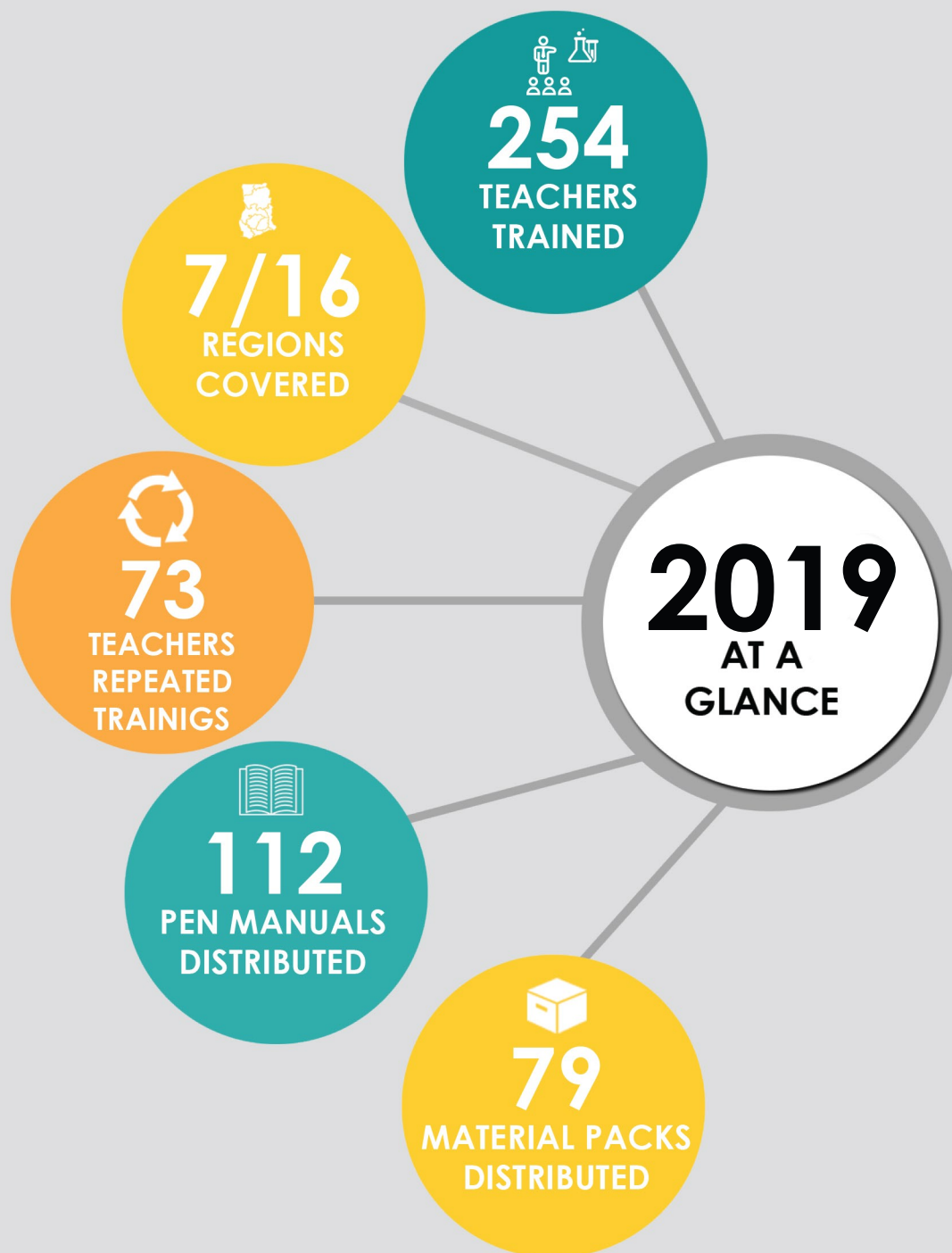
And the final first, but certainly not the least, is that we secured our first corporate partnership through ExxonMobil Exploration & Production (Deepwater) Ltd., who boldly committed to invest in STEM as soon as they entered the country in 2019. We are delighted to work with them to strengthen the local STEM pipeline and to be able to officially expand our operations beyond Greater Accra.

As my MIT SOLVE mentor said, "the seeds you've been planting in the ecosystem for the last few years are starting to bear fruit!".

I hope you'll enjoy getting a picture of what our small but mighty team has been able to achieve in our pursuit to improve STEM education on the continent.

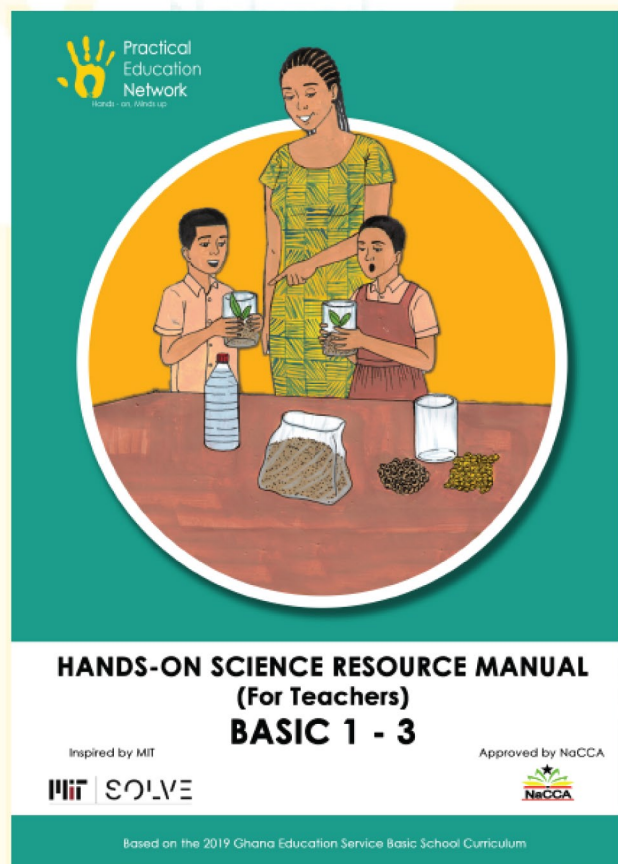
Sincerely,

Dr. Heather Beem  
CEO & Founder, Practical Education Network





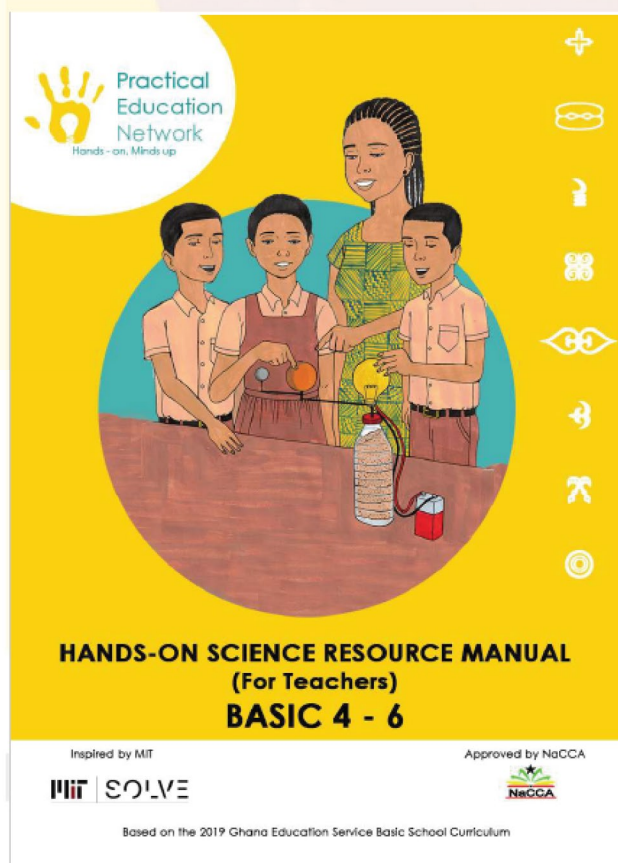
# Designing hands-on manuals to support teachers to deliver effectively on Ghana's new basic school science curriculum



PEN's Hands-on Teacher Resource Manual is the key document we have provided to teachers at our workshops over the years. It provides an extensive set of low-cost, hands-on activities that are aligned to, and in the order of, the national science curriculum. The manual provides instructions (including materials, procedures, applications, etc.) for teachers to draw from, as they work to bring any lesson in the syllabus to life.

In 2019, we created the first version of this document for the primary school level. This was done to come alongside the new national curriculum for these grade levels. Having worked on the curriculum itself, we knew which areas teachers would appreciate extra support in. We designed this resource to support them in executing the new curriculum with excitement and confidence. We enlisted the support of a young up and coming Ghanaian illustrator, who diligently drew around 250 images to colorfully bring the activities to life on paper.

Special thanks to ExxonMobil Exploration and Production (Deepwater) Ltd., who is supporting the production of the first 2,000 copies. We can't wait to share this resource with teachers across the country.



To be printed with the kind assistance of:

**ExxonMobil**



# STEM RESEARCH DISSEMINATION MEETING

Brought to you by:

PRACTICAL EDUCATION NETWORK, ASHESI UNIVERSITY & MICHIGAN TECHNOLOGICAL UNIVERSITY

**THEME:** *Practical STEM Education in the Ghanaian Classroom; its Impact and the Way Forward*



COCONUT GROVE REGENCY HOTEL, ACCRA



27TH JUNE 2019



8:30AM

PARTNERS:  ASHESI



MIT | SOLVE

## PEN held its first STEM Research Event

PEN partnered with Ashesi University and Michigan Technological University (MTU) to organise its first national stakeholders event and disseminate its STEM education research findings. The event brought together over 80 participants from relevant government institutions, educational institutions, the development community, Ghana STEM network, teachers and educationists.

The partnership between PEN and MTU's Department of Cognitive and Learning Science led to a first of its kind research study on the impact of practical, hands-on education using low-cost materials in the Ghanaian classroom.

The control study followed the performance of 324 JHS students in 6 public schools in the Greater Accra Region over the course of the 2017/18 Academic Year. "Difference-in-differences" measurements were made on student attitudes towards STEM and their BECE exam scores in science. The lead researcher, the Principal Investigator and participants (trainers, teachers, and students) of the study shared their perspectives.

Dr. Kari B. Henquinet, represented MTU's Department of Cognitive and Learning Science in the event



**Dr. Kari B. Henquinet**



**Dr. Heather Beem**

Dr. Heather Beem, the CEO & Founder of PEN, opened the event by introducing PEN's work and framing its intervention along three questions 1) What does it look like to have an MIT-style, practical STEM education manifest in the Ghanaian context? 2) What impact does such an intervention have on the Ghanaian child? and 3) How do we scale the success of such interventions?

A presentation was made by Jacob Babb, a masters student and researcher from Michigan Technological University. The research tested the impact of PEN's intervention in 6 Ghanaian classrooms, measuring its effect on teacher outcomes, student attitudes, student exam scores and student critical thinking skills.



The study was carried out at six control and six experimental public schools located in Kwabenya, Ofankor and Kofi Kwei within the Greater Accra

Region. Pre-intervention tools were provided at all schools before the academic year and post-intervention tools were provided at the same schools. The three experimental schools received weekly training by a PEN Trainer on the use of hands-on activities for the coming week. The control schools conducted their business as usual.

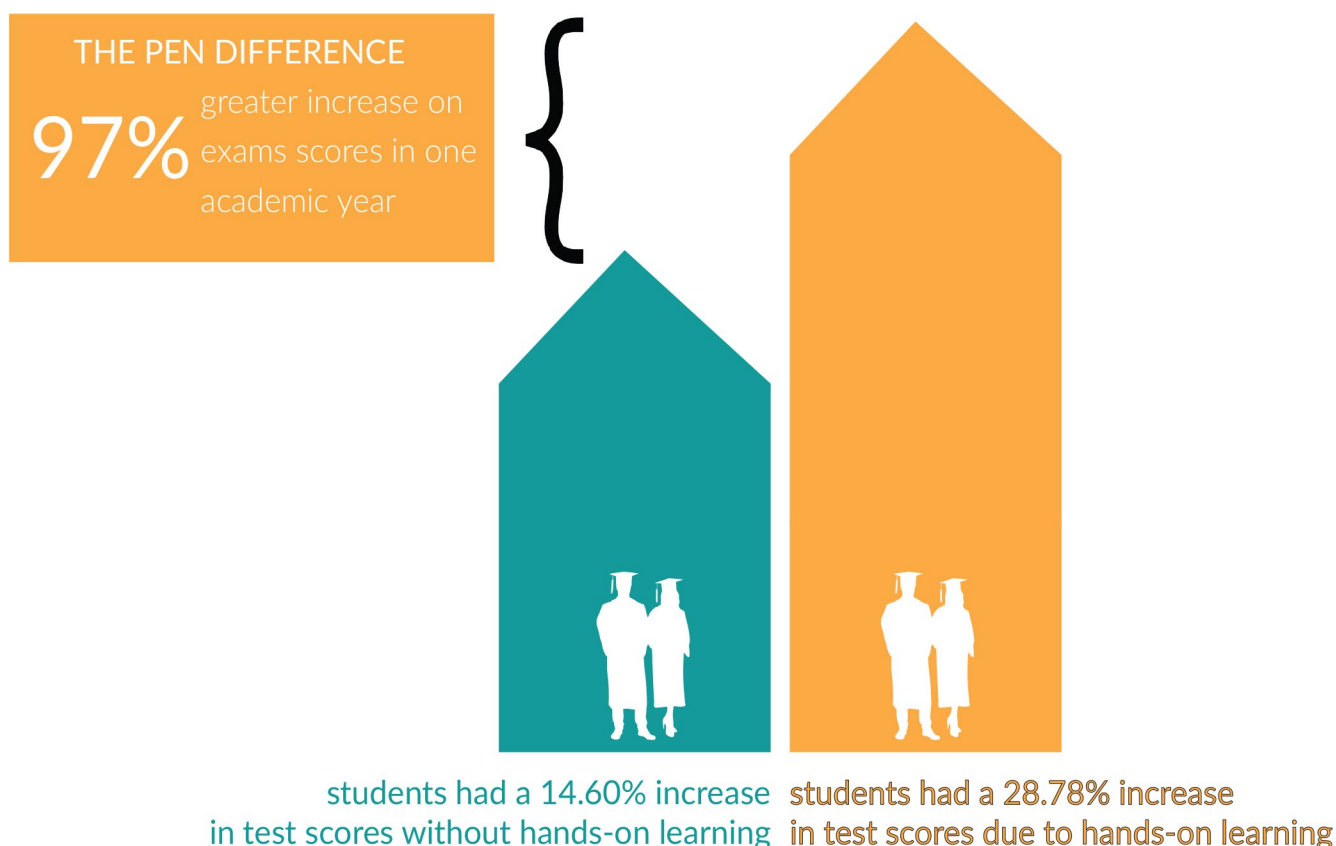


**Jacob Babb**

## Results

The experimental schools' test scores increased 97% more than those at the control schools. The official B.E.C.E results showed a higher number of students from experimental schools scoring more in the best 5 grades (Grade 1 – 5). Also, students' attitudes towards science decreased over the course of the academic year at the control schools, whereas they stayed the same or increased at the experimental schools. There were, however, no significant statistical trends in critical thinking.

## STUDENTS' TEST SCORES



Participants discussed the importance of critical thinking and reached a consensus that critical thinking is not a subject that could be taught but a value that should be nurtured by allowing students to find solutions to problems.

Two virtual panelists, Professor Jeff Grossman and Mr. Ed Moriarty, both educators at MIT, joined in the discussion via video conference and shared their insights on hands-on education, reiterating the findings in the research.



**Prof. Jeffrey Grossman**

According to Prof Grossman, most of his students choose his course because of the hands-on approach. He shared pictures of his students sending their projects from class to dinners and holidays, demonstrating that class activities increase excitement in students.

Ed Moriarty analyzed the universal purpose and mission of education. He said it should not merely emphasize the transfer of knowledge but should focus more on the development of the human being by empowering the

learners to become contributing members in a society. He said students should be more involved in their education process.



**Ed Moriarty**

The Chairman of the event, Anis Haffar, a renowned Ghanaian educationist, pointed out that education should serve a purpose, yet we do not seem to care about the state of the environment that the students are in. He stated that the learning environment must be of excellent quality which should be included in a student's education process.

Dr. Elena Rosca shared how her students from Ashesi competed at the International Genetically Engineered Machine and engineered a bacteria to detect gold particles in water samples. Most of them have no background in biology, but



**Anis Haffar**

they cited their ability to do this as being related to the hands-on approach. She stated that in having ownership of their learning and discovery, students can build on their creativity and create answers and solutions.

Dr. Evelyn Oduro, former Executive Secretary of the National Teacher Council commented on the mindset of educators and learners alike. She stated that they should be urged to appreciate the holistic characteristics of education and having access to the pipeline of teachers who care about and understand pedagogy.

The Head of Science Education Unit of the Ghana Education Service, Mr. Andrews Quaning observed that one of the obstacles to hands-on learning is the general attitudes of teachers towards a new way of doing things. He cited an



**Dr. Evelyn Oduro**

example where learning materials which were given to 300 schools ended up unused and left to gather dust.



**Dr. Elena Rosca**



**Mr. Andrews Quaning**

### Other Key Pointers Raised

- Improvement of the pipeline of equipped STEM teachers
- The need of raising the standards that all STEM teachers are being held to
- Requirement that all STEM teachers carry out practical activities in their lessons
- Mobilization of all players within the ecosystem to improve STEM education





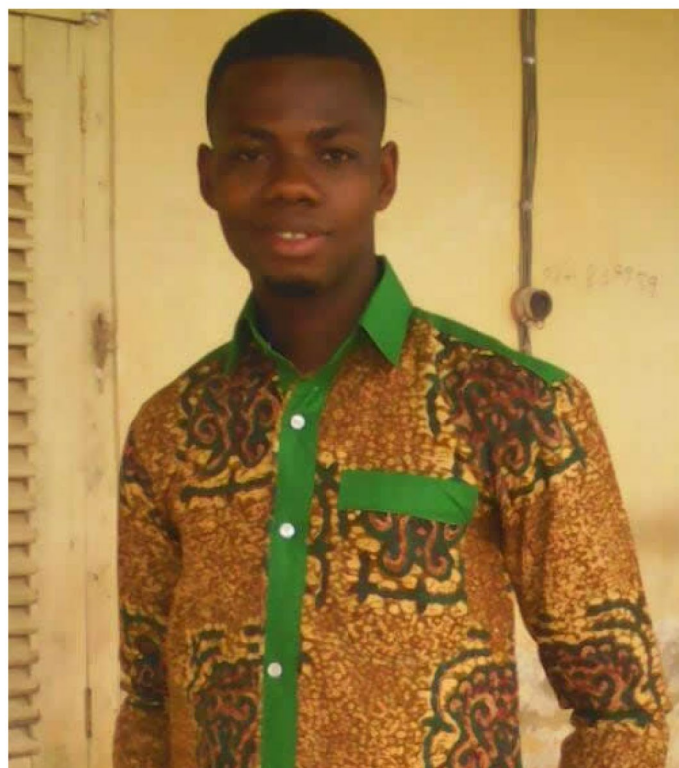
## PEN Teacher Roadmap launched



Based on the findings of the research study, PEN designed a holistic teacher development programme - PEN Teacher Roadmap. It aims at equipping STEM teachers to become innovative and practical teachers. The roadmap has six stages, each of which includes a combination of training, in-person and remote follow-up support and encouragement. Teachers start by being introduced to the possibility of teaching practical science and reach the end goal of being able to guide their students to design locally-relevant projects. High performing teachers will be able to access Bronze, Silver, and Gold Levels, as they demonstrate evidence of quality implementation. The PEN Teacher Roadmap was officially launched by Anis Haffar.

Arthur John Kwabena is a Basic 6 to Junior High School (JHS) 3 science teacher at Ridoana Comprehensive School in Kpone-Katamanso District in the Greater Accra Region. He has received training in a PEN workshop and feels capable of handling what science topics in a practical and effective way.

PEN has really enlightened my knowledge on most science topics I found difficult to handle. I will say that the impact of PEN has been really great because most students who initially had the thought about science being a difficult subject are now enjoying and loving it through the practical activities. I believe if this should go far and reach every Ghanaian pupil it would be better for them to develop their interest for the science.



**Arthur John Kwabena**  
*Trained PEN Teacher*

Emmanuel Omang Ocquaye is the Ga East Municipal Coordinator of Science, Technology, Mathematics Innovation and Education (STMIE). He is a distinguished teacher and a PEN master trainer whose passion is seeing basic school learners doing hands-on practical activities in STEM fields with great confidence, demystifying STEM subjects and using the knowledge gained to solve daily challenges they find in their school and home environments.



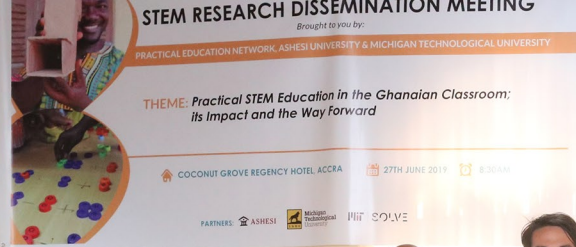
**Emmanuel Omang Ocquaye**  
*PEN Master Trainer*

PEN has made a tremendous impact in my classroom by getting all the learners actively involved in the lessons and producing tremendous reports. It has resulted in the majority of the learners always going for STEM subjects at the Senior High. There have been situations where I have had over hundred learners in my class and yet science lessons have been interesting because of PEN Activities and strategies.

PEN enforces hands-on use of no cost or low cost locally available materials. Due to the friendly nature of the materials, it helps learners to be completely at home with the materials. It is the best alternative for Ghana in the absence of structured and standard laboratories.

The PEN approach can be practised in any type of classroom and anywhere in Ghana









Working with stakeholders for higher impact

## PEN's Partnerships Overview for 2019

PEN's programmatic interventions in Ghana are hinged on a partnership approach that brings together key stakeholders to achieve a collective impact. PEN believes that stakeholders from government, civil society, the United Nations systems, educational institutions, teacher unions and associations, the donor community, corporate Ghana, STEM networks and movements and the media remain crucial in transforming STEM education and making it practical, hands-on, experiential, relevant and beneficial to society and the national economy.

### Strengthened collaboration with Government

Although Practical Education Network's core programming is our teacher training program, we are learning that the successful realization of our Vision for STEM education requires influencing of the entire education ecosystem. Curriculum must include hands-on activities, teacher licensing must require use of practical approaches, and pre-service training must expose teacher trainees to these pedagogies from the beginning of the pipeline.

It is a mighty challenge to take on, but given the Government of Ghana's recent inclusion of STEM into its Education Strategic Plan, it is clear that the change is desired.

In 2019, PEN is proud to have made a major step forward in this. The Ministry of Education's National Council for Curriculum and Assessment (NaCCA) commenced a revision of the national primary school curriculum, which was last created in 2007. Thanks to a combination of key relationships built over the years, persistence, and clear stakeholder recognition of the value of PEN's content, PEN was invited by NaCCA to join the revision process for the primary school science curriculum. We supported the Science Panel to infuse PEN's hands-on activities into the curriculum document itself.

Practical activities appear at a higher frequency than before! We also joined NaCCA's team in designing a nationwide training for teachers on the new curriculum. Finally, we co-authored the Teacher Resource Pack, a supplemental resource to the curriculum, and which was distributed to all primary school teachers. Through these efforts, part of PEN's content and approach is now available to one hundred and fifty thousand (150,000) primary school teachers in Ghana.

Read here for more information on our work with NaCCA: <https://solve.mit.edu/articles/practical-education-network-revises-ghana-curriculum>

PEN also strengthened our relationship with another key government partner - the National Teaching Council (NTC), which sets the teacher standards and also sits under the Ministry of Education. NTC invited PEN to join a collaborative effort between NTC, GES' Girl's Education Unit and UNICEF to run teacher trainings in two remote Districts (Dambai and Kpandji) in the Oti and Northern Regions of Ghana.

We look forward to furthering our relationships with these key government stakeholders and seeing to the infusion of practical pedagogies throughout the ecosystem.



## Working with Teacher Associations

In the year under review, PEN built upon its already successful existing relationship with the Ghana Association of Science Teachers by officially signing a Memorandum of Understanding that set a stage for more effective collaborative work with the most vibrant subject teacher association to expand its training of science teachers across the country. This will make entry into other regions smooth and implementation of training programmes more structured and effective in the coming years.

## Working with Corporate Ghana

Corporate social responsibilities are at the heart of well-meaning businesses and corporations. PEN successfully entered into a partnership agreement with ExxonMobil Exploration and Production (Deep Water) Ghana Limited to enroll one hundred teachers on its flagship PEN Teacher Roadmap programme in the Ahanta West and Nzema East Districts of the Western Region of Ghana. This partnership programme will equip the hundred teachers with PEN's hands-on pedagogy and make those beneficiary teachers very competent and effective science facilitators (teachers) in their classrooms and trainers to their peers in the teaching of science. The partnership agreement aims at printing and distributing two thousand (2,000) free hands-on science resource manuals in year 2020 for teachers in basic schools in line with the new school curriculum. This will spread PEN's content to all districts of Ghana in order to test and scale up the publication in the following years.



### Resources Secured

Overall, PEN secured a total of **USD 50,936.00** from grants and proceeds from teacher training activities to sustain and grow its operations in 2019.



# Faces that made 2019 a success for PEN

## STAFF



**Dr. Heather Beem**  
*CEO & Founder*



**Joseph Quaye Amoo**  
*Operations Manager*



**Desmond Asamoah**  
*Partnerships & Resource  
Mobilisation Manager*



**Nancy Ewurum**  
*Marketing &  
Communications Officer*



**Fredrick Opoku**  
*Logistics Officer*



**Sawyer Sabia**  
*Monitoring, Evaluation  
& Learning Coordinator*



**Jake Babb**  
*Research Officer*



# VOLUNTEERS & INTERNS



My internship period with PEN has been an amazing one. My passion and talent in the art of drawing and painting inspired me to intern with PEN. During my time at PEN, I was able to create illustrations to match hundreds of activities in the new basic school curriculum to enable teachers understand the instructions in PEN's teacher resource manuals. For me it has been a great pleasure working with PEN to improve and grow STEM education in Ghana.

Emmanuel Okai, Intern



My name is Amy Zhou, and I'm a rising 4th year student at Harvard College studying Computer Science & Women Gender Studies with a minor in Education. I started working with PEN in February 2019, developing a teacher training guide for hands-on learning. In particular, I focused on the importance of collaborative, project-based, and movement learning. In June 2019, I spent a week in Accra working with PEN. I visited schools to gain teacher feedback and got a firsthand experience of the Ghanaian culture. I will never forget the friendliness of Ghanaian people, and of course, my favourite local food - waakye.

Amy Zhou, Intern



I was fortunate enough to spend three and half weeks with the PEN team as part of an international pro-bono assignment organised through Accounting for International Development (AfID). The purpose of my assignment was to build on the work of a previous AfID volunteer and assist the PEN team with various aspects of its financial operations.

My time with PEN was a thoroughly enriching and rewarding experience, allowing me to apply my professional skills in support of a flourishing non-for-profit organisation. Aside from the focus of my finance work during my placement, I was also able to view some of PEN's practical

Azeezat Akande, Professional Volunteer



PEN has given me the avenue to impact STEM learning Ghana/Africa which is something I have always been passionate about. I interned with PEN as a content developer in June 2019. During this period, I worked on the mathematics manual for basic schools in Ghana based on the new curriculum. I also put together a team of 13 students who dedicated 40 hours of our semester period working on the math manual as our service learning at Ashesi University.

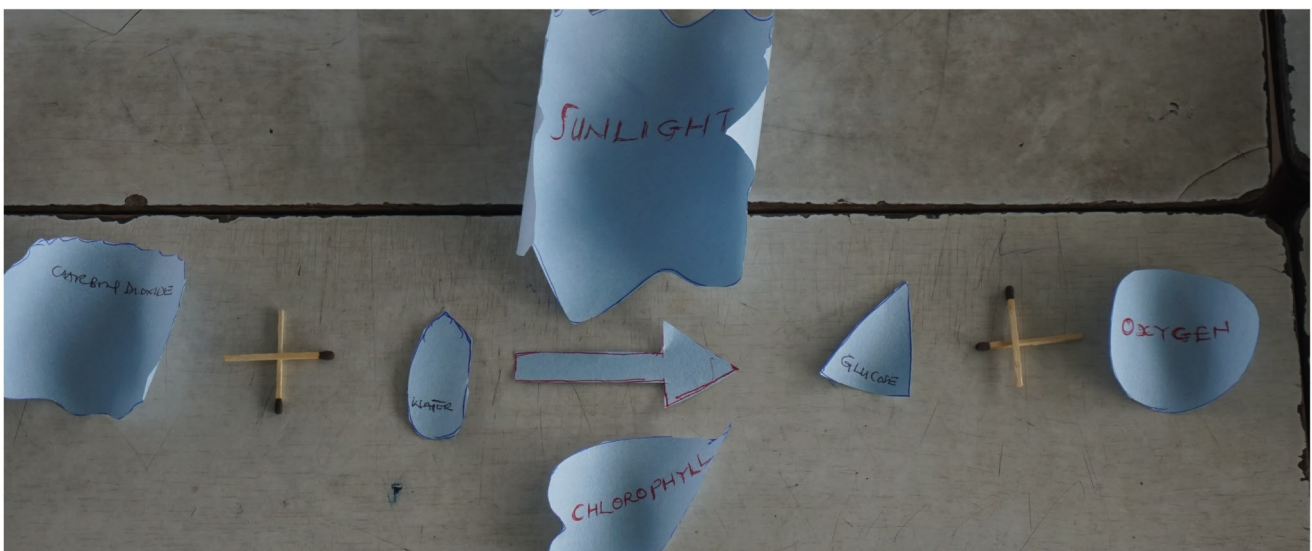
Alhassan Issifu, Intern





L – R: Jordan White (volunteer) , Aurthur John Kwabena (PEN teacher) , Fredrick Opoku (PEN staff) , James Morris (volunteer) , & Max DeMumbrum (volunteer)

We were members of the Student's Consulting Club at Indiana University in the US. Our work with PEN was multi-part. Broadly speaking, our goal was to help PEN scale their endeavor while maintaining its high value to teachers. Our team served PEN in a strategic consulting capacity, looking to solve business challenges related to new "customer" acquisition, establishing consistent and streamlined revenues, incentive management, and hiring practices.

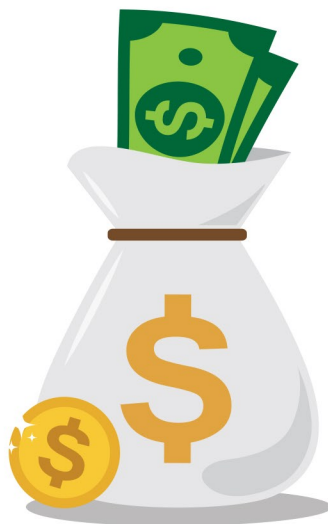




## **INCOME & EXPENDITURE ACCOUNTS**

*(All amounts are stated in US Dollars)*

	<b>2019</b>	<b>2018</b>
	<i>5.2 Ghana Cedis = 1 USD</i>	<i>4.7 Ghana Cedis = 1 USD</i>
Income	\$ 50,936.10	\$ 15,942.34
<u>Direct Costs</u>	<u>\$ -4,611.78</u>	<u>\$ -658.09</u>
<b><i>Gross surplus</i></b>	<b>\$ 46,324.32</b>	<b>\$ 15,284.26</b>
 <i>Other Income</i>		
General and Administrative expenses	\$ -18,912.85	\$ -6,950.00
Financial expenses	-	-
<u>Other expenses</u>	<u>\$ -1,791.88</u>	<u>\$ -648.94</u>
<b><i>Surplus</i></b>	<b>\$ 25,619.59</b>	<b>\$ 8,015.11</b>
 Interest income	-	-
Interest expense	-	-
<u>Net finance income</u>	<u>\$ -</u>	<u>\$ -</u>
<b><i>Net profit before tax</i></b>	<b>\$ 25,619.59</b>	<b>\$ 8,015.11</b>
 <u>Income tax expense</u>	<u>\$ -</u>	<u>\$ -</u>
 <b>Excess Income Over Expenditure</b>	<b>\$ 25,619.59</b>	<b>\$ 8,015.11</b>





Education is the most successful weapon to fight poverty

## You can change the future for thousands of children in Ghana

Over the past 4 years, the Practical Education Network has established success: STEM education keeps children in school.

Our work has just begun....

The results tell the story. Now we need to scale up to reach every child in Ghana.

Every gift is one step more towards equipping students to succeed:

Your gift of

\$25 prints and distributes one hands-on resource manual to one Ghanaian science teacher

\$250 illustrates one STEM lesson to be shared digitally to our network of 3,000+ teachers

\$800 produces one STEM radio lesson for the hardest-to-reach students in rural Ghana

\$1,200 produces one instructional video of a STEM activity using local materials. Your gift makes it possible to deliver this material to over 3,000 teachers

\$ 4,000 equips one school with an online training package (3 months of support to develop 4 digitally literate science teachers)

\$18,000 makes it possible to convert our award-winning STEM teacher training from in-person delivery to online modules (3)

\$43,000 publishes our popular hands-on resource manual as an e-book/paperback for global distribution

**Go to  
The Practical Education Network US Fund  
to give now:**

<http://bit.ly/pen-kbfus>

or

scan





# Special Acknowledgements

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Dr. Prince Armah, Cosmos Eminah  
National Teaching Council (NTC): Bishop Lawrence Sarpong  
GES National Science Education Unit: Andrews Quaning, Olivia Opare  
GES Girls' Education Unit  
UNICEF  
Ghana Association of Science Teachers (GAST)  
Ashesi University  
Michigan Technological University  
MIT-Africa  
Peace Corps Ghana  
Tei Abbey Mensah, Chief, Osudoku  
Ashesi Education Collaborative  
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