

Practical
Education
Network

Hands - on, Minds up

IMPACT STUDY REPORT

The Impact of Practical Education Network's
Approach of Hands-on, Practical Learning, on
Students and Teachers in the Ghanaian JHS
Science Classroom



**Michigan
Technological**
University

Research Findings from Michigan
Technological University.

BACKGROUND

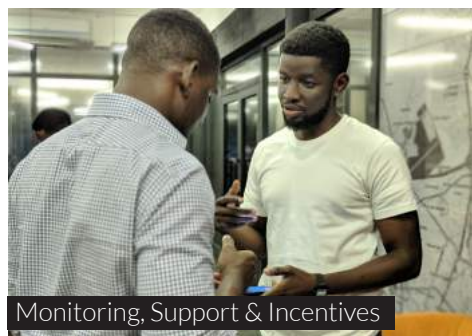
The Ghanaian education system often exhibits a pervasive teacher-centered pedagogy, lack or absence of laboratory materials, poor-quality teacher training, and minimal support systems for teachers. Practical Education Network, PEN, is an organization which addresses these problems by training science teachers through workshops about how to utilize locally-available, affordable materials in order to teach topics in the national curriculum in a hands-on, inquiry-based manner, according to best practices in science.



Low-cost materials



Teacher Training



Monitoring, Support & Incentives

PEN is proud to have collaborated with the Ghana Education Service (GES) and Ghana Association of Science Teachers (GAST) in order to host workshops for JHS teachers around the country for nearly four years. Recently, PEN was invited to provide content expertise to the National Council for Curriculum and Assessment (NaCCA) during the revision process of Ghana's new basic school science curriculum.

PEN also understands the importance of evidence-based policy making in the education sector worldwide. This is why PEN designed and implemented a year-long, quasi-experimental impact study in Ghana, in order to rigorously test the effectiveness of a hands-on science teaching approach in the Ghanaian classroom.

WHAT HAPPENED?

Over the course of the 2017-2018 academic year, six Form 3 JHS Science classrooms in the Greater Accra Region of Ghana were involved in the Practical Education Network (PEN) Impact Study. The effect of PEN's approach of hands-on learning using local materials was measured in relation to students and teachers in the science classroom. Three of the schools were 'comparison' schools, who conducted their classrooms as usual, using mostly the traditional lecture-driven pedagogy. The other three schools were 'experimental' schools, who had PEN-trained teachers conducting practical lessons. They used locally available materials to demonstrate science concepts in the national curriculum. The comparison and experimental groups were compared at the beginning and end of the school year to elicit any difference in a PEN classroom, and a 'business as usual' classroom.

Meet The PEN Master Trainers



Emmanuel Ocquaye
Ga East Science Coordinator



Simon Dzamenu
JHS Science Teacher
Kofi-Kwei M/A



Rejoyce Akoto
JHS Science Teacher
Asofan M/A '1'

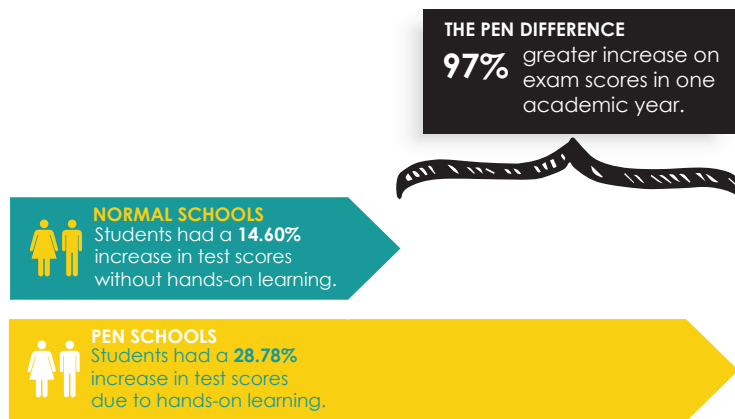
In the beginning of the school year, every student (n=324) was given the student pre-survey which measured their classroom environment, critical thinking skills, and attitudes towards science. Additionally, students were also given the science content pre-test using past Basic Education Certification Examination (BECE) questions. **During the school year**, PEN Master Trainers and teachers in the experimental groups met on a weekly basis so that teachers could be trained in how to teach the topic of the week in a more practical, hands-on way using activities from the PEN Manual. During the lessons, PEN Master Trainers documented experimental teachers' performance using the Teacher Monitoring Sheet, measuring their ability to Prepare & Setup Materials, Facilitation of Student Learning, and Delivery of the Objective. **At the end of the school year**, every student (n=309) took the student post-survey and took the science content post-test. At this time, students also wrote their culminating BECE, which was additionally used as a measurement tool for this study.

During data analysis, potential differences in the comparison and experimental groups were studied using descriptive statistics, difference in pre/post means, an unpaired T-test for unpaired means at a 5% significance level, and a test for effect size, specifically the Hedge's g.

RESULTS

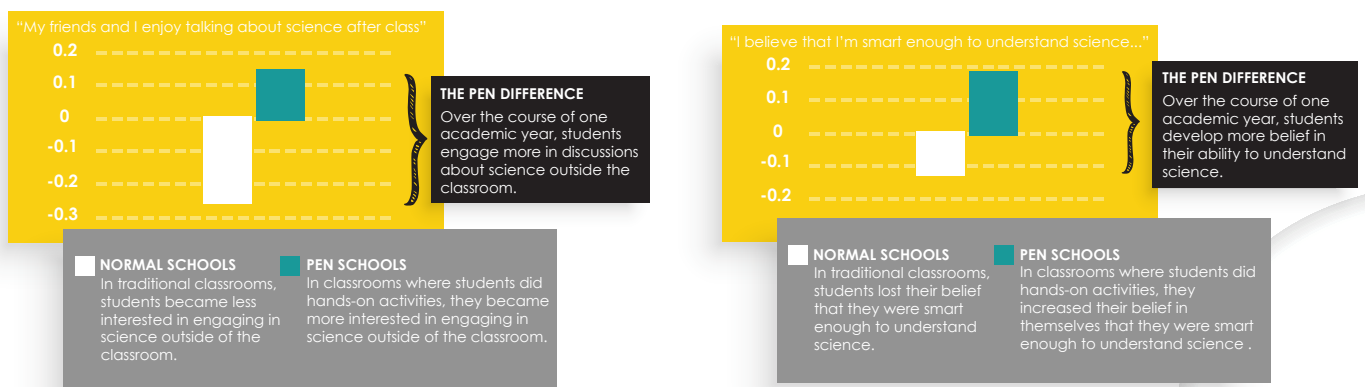
Differences between the experimental and comparison groups were observed along several dimensions, all of which can be explored in the full report. Highlights include changes in student test scores and student attitudes towards science over the course of the study.

STUDENTS' TEST SCORES



ATTITUDES TOWARDS SCIENCE

Nearly all students in normal schools showed a decrease in positive attitudes / interests in science over the course of the year. The PEN approach was able to reverse this trend and keep students interested in the wonders of science.



In addition to the two indicators detailed in the above graphs, additional indicators measured through the student surveys showed similar trends. The prompts used for these indicators include:

- Science is my favorite subject...
- I enjoy being in science class...
- I think it is useful to know about science for my everyday life...
- I will choose to study science when going to senior high school...
- I am amazed about things I learn in science class...

THE WAY FORWARD

After nearly 2 years of rigorous experimental design, implementation, and analysis, PEN is proud to present these key findings from the 2017-2018 Impact Study in six Ghanaian JHS Science classrooms. While this report provides a concise summary of the most significant findings, the full 86-page report with a more detailed description of the study and additional findings can be provided to interested parties upon request.

The vast majority of the general public, teachers, students, school administration, and government officials agree that STEM education in Ghana should be more practical. However, the reality in most Ghanaian schools continues to be one where students 'chew and pour' facts rather than use their hands to conduct experiments and fully understand concepts in the curriculum. Therefore, PEN encourages all educational stakeholders and policy makers to use this evidence on the benefits of practical education, during decision-making, in order to swiftly make the systemic change that will surely transform Ghanaian STEM classroom. PEN welcomes strategic partnerships with all relevant stakeholders that share the same vision for a brighter future of STEM in Ghana and beyond. PEN sees the following as possible steps of action:

- Training every STEM teacher in the nation how to teach students in a more hands-on, inquiry-based way using affordable, locally-available materials.
- Integrating these trainings into the Teacher Training Colleges and Universities, in order to maintain the practically-minded teacher workforce.
- Mandating teacher implementation of hands-on pedagogies, and providing coaching and support to improve quality of delivery.
- Making practical science measurable, making it a requirement for students to successfully complete science practicals in order to progress through the education system.
- Creating a pipeline of highly-performing science students from the SHS to Tertiary education by providing incentives such as scholarships or internships in order to increase the pace of innovation.

REACH OUT TO US!



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