Understanding the impact of large-scale radio astronomy projects on student engagement with physics in Ghana

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#A. INTRODUCTION

- The principles and applications of physics cut across the various spectrum of everyday life activities like walking, lifting objects, seeing and taking photographs (Ghana Education Service, 2019).
- Low students' engagement in Physics and decline in the studying of Physics: Students' engagement of this vital subject which largely defines the development status of any nation has been on the decline in Ghanaian Senior High Schools/Colleges/Universities over the years. (CoE, 2013-2015; WAEC, 2012; Anamuah-Mensah, Mireku and Ghartey-Ampiah [TIMSS], 2007).
- National and international investment in large radio astronomy projects, such as the Leeds-led DARA (Development in Africa with Radio Astronomy) HCD project, the African VLBI Network and the Square Kilometre Array, has the potential to inspire the next generation of scientists and engineers in the participating African countries.

- In recent years there have been scientific developments nationally in Ghana in radio astronomy. One such project (DARA) trained teachers in radio astronomy. Many of these teachers returned to the classroom.




#B. OBJECTIVES

To determine the difference between DARA teachers (teachers in various educational institutions in Ghana that participated in the DARA basic training programme) and non-DARA teachers (teachers in various educational institutions in Ghana that have not participated in the DARA basic training programme) on:

- Attitudes towards teaching Physics.
- Perceptions on the relevance of studying Physics.
- Knowledge of career routes in Physics.

#C. RESEARCH QUESTIONS (RQ)

What is the difference between DARA and non-DARA teachers on:

- Attitudes towards teaching Physics?
- Perceptions on the relevance of studying Physics?
- Knowledge of career routes in Physics?

#D. METHODOLOGY

- In this study, a mixed methods comparative study research design was used, specifically qualitative and quantitative research design. This design seeks to integrate both qualitative and quantitative data in a single project and therefore may result in a more comprehensive understanding of the phenomenon under investigation.
- The sample for the study was DARA-trained teachers and their students and Non-DARA-trained teachers and their students. The first phase of the research was conducted to get a wide survey/pilot study across the two different categories of teachers/students: DARA an non-DARA. The first phase of the sample for the study is shown in the table below:

ITEM	DARA	NON-DARA	TOTAL
Teachers	13	9	22
Students	667	240	907

- The sampling technique used for the study was purposive.
- Two main instruments was used in the study: questionnaire and interview. Questionnaire for the students and interview for the teachers. The questionnaire data collected so far will be edited, encoded and analysed through the help of Statistical Package for Social Sciences (SPSS) and the collected interview data was transcribed, coded and categorized into themes of the research, based on the research questions using NVivo.

#E. RESULTS / FINDINGS CONT'D

SOME EXTRACTS OF NON-DARA TEACHERS

Only nine non-DARA teachers were interviewed that was seven men and two women. Eight questions were asked on RQ1, one question was asked on both RQ2 and RQ3 for each teacher. All the questions asked were based on the RQs. With respect to RQ1, 56 responses of the teachers were positive (77.78%), 14 responses were negative (19.44%) and two responses were neutral (2.78%); in relation to RQ2, all the teachers responded positively (100%) and lastly the question asked based on RQ3 eight teachers gave a positive response (88.89%) and only one teacher gave a negative response (11.11%). This is seen in some of the extracts below:

RESEARCH QUESTIONS	POSITIVE	NEGATIVE	NEUTRAL
Attitudes towards teaching physics	''Yes, because of the methods I have been using to teach them.''	''There is always a stigma due to lack of resources that will help us to teach, there is a stigma on it. Pupils are afraid of learning Physics and even the sciences and so there is no change, with time and a lot of resources I think their interest will be developed.'' ''Basically No. because I have not heard of it.''	''I will say YES and say NO because some of the students are motivated to even learn more whiles some always lag behind. So I will say it is like 50/50 some of them have interest in the subject, others they don't have interest in the subject, and I think the main reason is that we don't have the equipment's so most times do improvisation and the rest.
Perceptions on relevance of studying physics	''They are positive, very positive because it may help one to acquire more knowledge and even how to get money, and everything.''	No	No
Knowledge of career routes in physics	''I think there are nice careers in Physics and if they are taken there are lot of skills one can get.''	In Ghana here pursuing Physics and having a career is very difficult in Ghana here as in the ready jobs.	No

#E. RESULTS / FINDINGS

SOME EXTRACTS OF DARA TEACHERS

Only 13 DARA teachers were interviewed that was 10 men and three women. Eight questions were asked on RQ1, one question was asked on both RQ2 and RQ3 for each teacher. All the questions asked were based on the RQs and all the teachers gave a positive response (100%). Hence, no negative response was made. This is seen in some of the extracts below:

RESEARCH QUESTIONS	POSITIVE	NEGATIVE
Attitudes towards teaching physics	''Attitude yes, in the sense that one right now they have a higher interest that is number one. Number two their attitude towards Physics or learning Physics is also on the rise and then in all it has also contributed to the general performance in the students' academic works in terms of Physics exams and other assessments.''	No
Perceptions on relevance of studying physics	''If you study physics you try to satisfy your own as I said somewhat is also a philosophy so you satisfy certain things troubling the mind blowing questions about the universe and certain things itself and apart from that you also increase your knowledge base for creativity and innovation wise and in terms of job prospects so are also on a high scale because it appears that most of the industries here in Ghana and outside Ghana employs the physics as background so I think on average you equip yourself with the basics in life.''	No
Knowledge of career routes in physics	''I think is a very good field. I have made my students to know that they don't have to think locally. Although we don't have a lot of institutions in Africa and Ghana that operate in physics or uses physics like Ghana Atomic Energy Commission (GAEC), Council for Scientific & Industrial Research (CSIR). There are also a lot of places that uses physics but I let them think that you are not just a human being to serve your country but here are a lot of place that your skills and knowledge will be needed. I make them know that the global way of doing things and that careers in physics are very important. They are always online looking at particle physics, CERN what is happening in particle physics, nanotechnology etc. my students are aware of a lot of careers in physics. The school gave me a platform to talk on science careers to all science students. A lot of the students know a lot of careers in physics.''	No

#F. CONCLUSION

The preliminary results from the teachers shown above reveals that there is a difference between DARA teachers and Non-DARA teachers on attitudes towards the teaching and learning of Physics, no difference in the perceptions on the relevance of studying Physics and lastly DARA teachers are more knowledgeable in career aspirations/knowledge of career routes in Physics than Non-DARA teachers based on the extracts from the interview for the teachers.

#G. FUTURE WORK

- Students' questionnaire will be edited, encoded and analysed through the help of Statistical Package for Social Sciences (SPSS).The teacher responses will be compared to the corresponding student group relating to that teacher. This is to see if there is a consistency between what the teacher reports and what the students have reported, in relation to the research questions. The approach is to consider whether the teacher's perception of their students correlates to the students' lived reality in relation to the research questions. Correlation between teachers' views and students' views in DARA and non-DARA cases will be done.
- Second phase of the project will be done if necessary to collect more data.

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