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Parental and society influence on Physics students' enrolment decisions in the University of Education, Winneba, Ghana.

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Abstract

The research explored the enrolment decisions of science students in the University of Education, Winneba to enroll in science courses particularly. The study used a modified 'multiple worlds' model to investigate how the various worlds of the students influenced their science subject choice. All science students of UEW constituted the population from which a sample of two hundred and sixteen students was drawn. Two equivalent forms of questionnaire designated as PSQ, responded to by Physics students and BSQ , responded to by Biology students were used to collect biographical data. A reliability coefficient of 0.72 was obtained on the questionnaires while construct validity and triangulation were used to establish their validity. The study found that students do not perceive their parents as influencing them to choose physics, and also did not perceive any influence within society to have swayed their subject choice either.

Keywords: University of Education, Winneba; socio-economic status; construct validity; science and technology education; societal influence; students' enrollment decision; multiple worlds model; causal-comparative research; structural characteristics;

1.0 Introduction to the Study

The research was prompted by the increasing reluctance of students to enroll in science courses, particularly physics since the inception of the University in 1992. While the study in context investigated influence on students' deliberations about taking science courses, the report was confined to decisions about enrolling in physics as a course and as University major. It is important to note that science students in the University (UEW) either opt for biology (biological science) or physics (physical science) with chemistry being a common denominator to both subjects.

Physics is widely recognized to be the most fundamental of all the sciences and has also been recognized as the foundation of our society (Pravica 2005) and indispensable in many professions and for economic development (Stokking 2000). Of all the sciences, physics is at the heart of the technology driving our economy (National Research Council 2001) and is present in almost every facet of modern life.

Attempts to identify the underlying causes of low interest in Physics have for the most part involved quantitative analysis of students' enrolment rationales and their attitudes to science (Woolnough 1994). Other studies have analysed the background factors associated with enrolment decisions (Fullarton & Ainley 2000). These approaches however were unable to clarify enough, just how students' decisions about Physical science study are influenced by attitudes or backgrounds (Lyons 2003). This may be due to the fact that statistical research is not able to take full account of the many interaction effects that take place in social settings as suggested by Cronbach (1975), because it is difficult to precisely access, quantify and

analyse these social variables quantitatively. This study largely adopted qualitative approach but where applicable quantitative methodology was used, to bridge the limitations associated with the sole use of either methodology (qualitative or quantitative).

The University of Education, Winneba was established with the mandate of solely training teachers for all levels of education in the country. Therefore any problem that has a bearing on the number and quality of teacher production brings it (UEW) into focus and any attempt at addressing such a problem without factoring UEW into the scheme of things will be a mere cosmetic approach at solving the problem. This is the reason why enrolment of students in Physical science in the University which obviously affects the number of physics teacher turn-out and especially in the face of the current massive short fall of such teachers in our schools, is being put under the microscope as it were.

1.1 Statement of the Problem

Student enrolment in physics in the University of Education (UEW) has consistently been comparatively low and there is the need to investigate how students make their science subject enrolment decision. Among all the main departments in UEW, the Science Department makes one of the least, if not the least student admissions every year. This consequently affects the number of students opting for either biological science or the physical science (comprising of Chemistry and Physics) with the latter having a relatively awful patronage. What is more, a number of the physical science students major in chemistry, leaving a small percentage to graduate with Physics major. This is vividly seen in Table 1 below (Table 1).

A review of a number of research endeavours on students' physics choice, and students' attitudes towards physics, by Angell, Guttersrud, Henriksen, & Isnes (2004) confirmed this under-representation of students in physics education. In addition, Millar &Toscano (2006), through an Institute of Physics (lOP) commissioned report, found that during the previous decade, there has been a decline in recruitment in A-level physics, which had resulted in the closure of several university physics departments. Thus, unless something is done to attract and train more physics teachers (without compromising standards or quality anyway) other professional areas which require people with Physics background could be significantly affected.

The shortfall in the number of physics teachers could have serious consequences for the nation because the development of every nation is driven by the advancement in science and technology education, and Physical science is a central pillar around which such advancement strives. Unfortunately, it seems almost all the available research done on marking out the cause of low enrolment of students in physics were carried out in socio-cultural settings which might not necessary apply to the Ghanaian context and for that matter the current study. For example, Fullerton & Ainley (2000) in a study carried out in Australia, singled out factors such as: identifying with particular ethnic cultures, attending particular type of schools (Private, Public), high educational level of parents, high socio-economic status of parents among others as factors which affect students decision for physical science. Secondly, all the respondents involved in these studies were young students whose course and subject choices could be heavily influenced by their parents because they were still under the care and control of their parents. However, most of the respondents (students) in the present study are relatively mature and in most cases independent individuals who may not be necessarily influenced in their choices of subject by their parents and family. Therefore, there is the need to establish the factors affecting the interest of students in physical science in the current context, hence the need for this study.

1.2 Research Questions

The following two research questions guided the study:

1. How does parental influence account for students' physics enrolment decision?
2. In what way, if any, does society contribute to students' physics choice?

2.0 Socioeconomic Status and Education of Parents

Perhaps one of the most comprehensive of recent investigations into subject choice has been the Australian Center for Educational Research (ACER) longitudinal reports on subject choice (Fullarton & Ainley 2000). Analysis of the Australian data collected in 1993 and 2001 provided comprehensive statistical profiles of subject choice by senior high school students. The studies report that enrolments in science course are strongly associated with a number of background factors, including gender, peer influence, socioeconomic status, parents' education levels and ethnic identity. These factors constitute external influence on students' enrollment decision at all levels (Abouchedid & Nasser 2000). They were also considered background factors that were strongly implicated in students' physical science enrollment decision (Hodkinson & Sparkes 1997). For that matter they formed part of the influential variables on students' physical science being studied.

According to the ACER studies and research in the USA (Leshie, McClure & Oaxaca 1998) and UK (Woolnough 1994), the choice of physical science is more closely associated with high socioeconomic status (based on parental occupation) than any other subject area. This is not the case, however, among biology and other science students in Australia, as enrolments tend to be fairly consistent across socioeconomic levels. In Ghana and most African countries, socioeconomic levels are generally low, most settlements are rural with very high level of illiteracy reportedly about 60% in Ghana. Aside the general socioeconomic factors across the country, disparity also exists in terms of provision of both material (educational infrastructure) and human educational resources and opportunities between rural and urban centres. This affects quality teaching and learning (Fredua-Kwarteng & Ahia 2005), which could eventually affect students' interest in education especially science (as a practical subject) among students from rural schools in particular.

Fortunately, Ghana has a culture of communal living or extended family system, so a child of a poor and/or illiterate parent might still receive help from an educated and/or wealthy relative. Thus, a casual scrutiny of the circumstantial differences for Ghana compared to the countries where these studies were carried out, suggests the correlation between parents' socioeconomic and educational level and physical science enrolment might not be feasible or at least not easily determined.

2.1 Societal influence

Inherent in the meaning of society is the fact that it is constituted by people who live in a geographical area defined as a nation, made of social institution such as religious bodies, political parties among others and whose members share some mutual concern or interest, a common objective or common characteristics (Jenkins 2002). This is the perspective in which society is viewed in the scope of this study. According to Lipps (1999), interest in science could be influenced by the recognition and value placed on knowledge of science and its application, scientist, and science related professions by society. When science professions are highly rewarded, people would consider it a worthwhile profession to engage in. With enrolment in physics, studies have shown that the influence of society is more pronounced in girls' decision than boys due to socio-cultural traditions. Society perceives physics and physics - related professions as masculine and difficult (Jones, Howe & Rua 2000; Anamuah-Mensah 1995).

3.0 Methodology

The study adapted the modified 'multiple worlds' theoretical model by Lyons (2003), originally developed by Phelan, Davidson & Cao (1991) to investigate influences within the student family, peer and school worlds. The usefulness of this model in the domain of science education was demonstrated by Costa

(1995), who reported that the ease or difficulty students experience in crossing borders between school science and their family and peer worlds affected their engagement with the science curriculum.

The adapted model used in the present study is a 'hybrid model' from the original model developed by Phelan *et al.* (1991) and the modified version by Lyons (2003). Two modifications were made to the Lyons (2003) model, while retaining the core idea of the original model in order to make it suitable for the context of this study.

First, society was introduced to absorb and replace the 'mass-media' world included by Lyons (2003) (see Fig 1.0), being aware of the influence that recognition and value placed on knowledge of science and its application, scientist, and science related professions by society, could have on students' interest as suggested by other researchers such as Lipps (1999). That is, the mass-media is only a tool used by society to express some of its values, belief, attitudes, etc and therefore very much represents just part of the characteristics of the society.

Secondly, some of the structural characteristics of the worlds were redefined to include variables that were considered relevant to the study but not used in the previous studies due to circumstantial differences. For example, the school world was perceived to be structured on the basis of curriculum guidelines related to the content, pedagogy of Physics, and subject prerequisites only, because the hindrance to the choice of physics due to the other variables included in Lyons's (2003) model such as timetable restrictions, are not applicable.

Again, the Science Department of UEW does not have any restriction that compulsorily restrains students from enrolling into physical science. All students who are admitted into the department make their own enrolment decisions perhaps based on perception of their own abilities. Therefore, subject prerequisite as defined in the context of this study is more of a perceptional phenomenon related to individual students' rating of themselves rather than a tangible variable that it was considered to be in the Lyons (2003) model.

3.1 Justification for the use of 'Multiple Worlds Model'

The 'multiple worlds' model as indicated, is concerned with how the different worlds of the student affect his/her engagement with the school, in this case their enrolment decision. Therefore justifying the use of the model is to demonstrate how feasible these worlds of the student (school, society, peer and family) could be implicated in the choice of physical science in the Ghanaian situation and within the institutional environment of the university.

A key factor in understanding Ghana's culture, both past and present, lies in the people's sense of community. There is an Akan (a major ethnic group in Ghana) proverb that says, *"If a tree gets all the wind, it will break."* It is this idea that led the people of Ghana, especially before the arrival of the Europeans, to view themselves not as individuals, but as part of a greater whole. A Ghanaian is part of his immediate family, part of his extended family, part of his village, and finally part of his tribe. Living in such a community, there is a fierce loyalty among the Ghanaian people (Krampah 1976).

3.2 Research Design

The research design is a case study 'borrowed' heavily from data analysis technique employed in causal-comparative study which attempts to determine reasons, or causes, for the current status of the phenomena under study, through statistical analysis. In effect, the study fundamentally compared the perception of two different independent groups, which were students enrolled in physics and those enrolled in biology to understand the overall influence on students' enrollment decision.

3.3 Population and Sample

The accessible group was mainly continuing level 100-300 students.

3.4 Sample and Sampling Procedure

Purposive sampling technique using intact group (because every member of the accessible population was

given the chance to be part of the sample) was used in selecting students who responded to the questionnaire. This was considered necessary because the science department has a relatively small number of students at the various levels compared to other departments in the University. A total of 436 students (see Table 2 below) constituting 84% of total student population, n=521 was sampled. These were the total number of students who were present at lectures at the various times when the questionnaires were distributed.

3.5 Research Instrument

Two equivalent or parallel forms of questionnaire designated as Physical Science Students' Questionnaire (PSQ), responded to by Physics students and Biological Science Students' Questionnaire (BSQ), responded to by biology students. The questionnaires, which generally sort students' perception of influence from their school, family, peer, and societal worlds which impact on their choice of subject, were informed by studies of the Victorian Middle Years Research and Development (MYRAD) Project (2003) of Australia and several others such as Zahra, Tai & Sadler (2006); Osborne & Collins (2001); Turmo (2003); Lyons (2003) and Schreiner & Sjøberg (2004). The items on the PSQ and BSQ consisted of both unstructured items with spaces for 'free response', and structured items with fixed a range of alternate responses to which students responded on five-point Likert scale (see Appendices A).

3.6 Data Analysis

Both quantitative and qualitative methods of analysis were used in analyzing the data of this study, because of the nature of the research approach (largely qualitative).

4.0 Analysis of Results

4.1 Demographic Data

For the 2005/06 (Level 300) cohort of students, 72 completed questionnaires were received from a total of 147 distributed, a response rate of 49%; the 2006/07 (Level 200) group of 123 students returned 56 questionnaires, which represented a 45% response rate while the 2007/08 (Level 100) cohort returned 88 making up 53% of 166 distributed. The overall returned rate was 50%, n = 436. Analysis of variance (ANOVA) and *t-test*, used to compare the demographic data on students at the various levels, as well as, on the basis of their course of study (physical science and biological science) , indicated that the demographic profiles of each set of respondents were representative of their respective cohorts and that the 2005/06 year group was not different from the 2006/07 and 2007/08 year groups and the 2006/07 year group was not different from the 2007/08 year group. Therefore, the data can be considered representative of the group as a whole, and where applicable the data collected from all the students have been combined to give a larger cohort for analysis.

4.2 Research question 1

'How does parental influence account for students' physical science enrolment decision'?

Until recently, UEW where the research subjects of the current study were drawn, admitted mainly post secondary teacher' certificate 'A' holders who in most cases were independent adults. However for the past few years there has been increasing direct Senior High School students' admissions involving students who are most likely still under the care and control of their parents, and who could influence them one way or the. It is therefore important for this study to investigate whether there is any such influence directed at students' subject choice, particularly physical science, thus the question.

The transcribed responses to the close and open ended items requesting students to specify if they considered the opinion of their parents/family members in making their choice of subject, rate their parents' attitude to formal education, science, and indicate if their parents directly or indirectly advocated for any aspect of the science, were presented to reflect students' perception of family influence as being favourable, neutral or unfavourable to physical science enrolment as shown in Table 3 below.

Table 3 shows that the family/parents exert very marginal influence on students' physical science choice favourably or unfavourably. Most students do not perceive their parents as influencing them to choose or

avoid physics. Even if parents / family did, most of them did not yield to the influence one way or the other. Though this influence correlated with enrolment, it was not statistically significant ($p > 0.05$).

4.3 Research question 2

'In what way, if any, does society contribute to students' physical science choice?

Society as an institution 'consumes' the products of the school. When society perceives products of the school or aspects of it in the form of human and material resources as meeting its needs and aspirations, it places a certain value on them which in turn shapes the perceptions of the elements of the school. Research has shown that the value and recognition society placed on the knowledge of science and its application, scientist, and science related professions influences interest in science. When science professions are highly rewarded people would consider it a worthwhile profession to engage in (Lipps 1999) and the media is considered a powerful tool for shaping society's mind set about science (Sagan 1996).

The question which bothers the mind then is, 'should society be scientifically literate or at least literate to value science'. If this is so, considering the reported high level of illiteracy in most developing countries, including Ghana, and the paradox that even physics students think physics is an abstract subject (from the earlier analysis of this study), how does the Ghanaian society facilitate the choice of physical science?

The open – worded items under this variable generally invited students first to disclose reliance on influences within the society in their choice of subject and to point out practices in the Ghanaian society, which they thought promotes science or aspects of science, as well as, indicate how often they see science related material in the media which in any way related to their subject area of choice, giving examples. The transcribed responses indicating potential positive, negative or no influence was compared to actual student enrolment figures and recorded in three facets of influence; 'favourable', 'neutral' and 'unfavourable' as illustrated in Table 4.

Most students did not perceive any influence within society to have swayed their subject choice. The table shows just a little above 1% of students referred to societal influence in making decision for their choice of subject. Though the numbers were too small for any meaning analysis to be made on them, physics seems to be the less favoured by society. Society generally though did not seem to contribute favourably or unfavourably to physical science choice by students. This concurred to a no significant relationship found between the influence of society and enrolment ($p > 0.05$).

5.0 Discussion

5.1 Family and Societal Worlds

Despite the family and societal world did not show significant correlation with enrolment, qualitative data was collected from students to understand why family and societal influence did not seem to matter significantly in the current students' subject choice contrary to several other research findings implicating them. These inferences from the pieces of information gathered could help one appreciate the reasons why there was so little influence within the family and the society on enrolment in this study. The reason was that the professional orientation of the students has already been determined. All things being equal all students would graduate as science teachers who will be recruited to teach in basic and second cycle schools. Research shows students willingly enroll in physics when parents and the students themselves consider physical science as having strategic importance for the career path or future aspiration of the students (Lyons 2003, 2006). In this case, students apparently were left with no other strategic value for enrolling in physical science than physical science taking them from the villages and towns to urban and cosmopolitan areas for economic and other social reasons mentioned earlier in this report because of the high demand for them even in the urban secondary schools. To most of them this strategic value was not compelling enough for them to risk the stress and perceived low grades and class being handed deliberately to students in general and science and physics students in particular.

5.2 Other Findings

There were some other findings which did not form part of the original objectives of the study but discovered during the qualitative data collection and worth mentioning because students' narration showed they do also influence students' decision for or against enrolling in physical science. These were:

i. Influence of students' informal contact with lecturers - some students reported they were encouraged by lecturers to enroll in one subject area or the other but the one which students happened to value more as far as this study is concerned was encouragement from physics lecturers because it helped them to increase their self-concept, which research has shown to be vital for students' decision to enroll in physical science.

ii. Also, when they visited the Departmental notice board, the information they gathered indicated a relatively small number of students enrolled in physical science compared to biological science which gave them the idea that biological science was the preferred choice of most students in the University. With their previous experience with physics, most of them took irrevocable decisions there and then to enroll in biological science (Craft 1980; Hossler & Bean 1990).

5.3 Conclusion

The study found that majority of the students do not perceive their parents as influencing them to choose or avoid physics, and also did not perceive any influence within society to have swayed their subject choice either. Students also reported building enough self-confidence to enrol in physical science by the encouragement they received through informal contact with physics lecturers.

With the above findings, one can safely conclude that the factors affecting the choice of physical science in UEW are students' perception of physics as a subject, the way it is presented to them and the influence of peers. It appeared physics as a subject has inherent difficulties for students which are not being helped by the teaching strategies of teachers. It is however important to note that majority of the students do not choose Physics as a Level 100 course, therefore the reasons for avoiding physics might be more related to their experience with the subject at the pre-tertiary level than the university. The fact that most schools could have qualified biology teachers, but inadequate or no qualified physics teachers could have two consequences, first, teachers may tend to teach to their strengths and at the junior level this could reinforce biology and the predominance of Biology classes could encourage students to take biology. With the reported abstract, content focused and difficult nature of Physics to students, one cannot but agree with Fletcher (1997) that there should be a systematic study into where motivational obstacles in learning Physics may lie and enlightened the process of internalization as an important model to explain it and how students can make Physics content their own through their own free will.

5.4 Recommendations

It very much looks like the low interest of students in physical science at the university is more related to their unpleasant experience with the subject at the lower level of education than anything else. Osborne, Simon & Collins (2003), said that as physics in junior school level is often taught by teachers who lack expert knowledge and who have little enthusiasm for the subject, the quality of teaching and learning is deprived. In such situations, teachers who lack confidence and familiarity fall back on didactic. Without lively teachers, with the time and inclination to teach physics in a stimulating manner, few students will become 'switched on' to physics. In the light of the findings in this study, there should be partial decentralization of orientation for fresh students to allow more senior science faculty members to interact more with fresh science students to disabuse their minds of some of the 'misconceptions' they acquired from peers.

References

Abouchedid, K. & Nasser, R. (2000). External and Internal Social Barriers in Stereotyping University Majors. *Current Research in Social Psychology*. Vol 5 No.3.

Anamuah-Mensah, J. (1995). Science and Technology Clinics for Girls in Ghana. In UNESCO (1996). *Towards Scientific and Technological Literacy for all in Africa*. Dakar.

Angell, C. Guttersrud, 0., Henriksen, E. K. & Isnes, A. (2004). physics: Frightful but

Fun - pupils' and teachers' views of physics and physics teaching. *Science Education,*

88, 683-706.

Bean, J.P. (1990).'Why students leave: insights from research', in Hossler, D. and Bean, J.P. and Associates (ed.), *The Strategic Management of Enrollment*. San Francisco: Jossey-Bass.

Costa, V. (1995) "When Science is "Another World": A Relationships between Worlds of Family, Friends, School and Science', *Science Education*, 79 (3): 313 – 333.

Craft, C.O. (1980). *Recruitment of industrial arts education majors: A professional obligation of all industrial arts educators*. Man/Society/Technology, pp. 21-22.

Cronbach, L. J. (1975, February). Beyond the two disciplines of scientific psychology. *American Psychologist, 30*(2), 116-127.

Fredua-Kwarteng, Y. & Ahia F. (2005, February, 23). *Ghana flunks mathematics and science: Analysis (2)*.RetrievedJuly18, 2005, from: http://www.ghanaweb.com/GhanaHomePage/NewsArchive/artikel.php?ID=75 906.

Fullarton, S. & Ainley, J. (2000). Subject Choice by Students in Year 12 in Australian Secondary Schools, *LSAT Research Report Number 15, ACER*, Camberwell.

Hipkins, R. (1998). Changing school subjects for changing times. Apapaer presented at the PPTA conference: Charting the future. The way forward for Secondary Education, Wellington.

Hodkinson, P. & Sparkes, A. (1997). 'Careership: A Sociological Theory of Career Decision Making; *British Journal of Sociology of Education*, 18 (1): 29 – 44.

Hossler, D. & Bean, J.P. (1990). *The Strategic Management of College Enrollments*. San Francisco: Jossey-Bass.

Hossler, D. & Gallagher, K.S. (1989). 'Studying student college choice: A three-phase model and the implications for policymakers', *College and University* 62(3), 207-221.

Jenkins, R. (2002). Social Influence Foundations of Sociology**.** London: Palgrave MacMillan.

Jones, M. G., Howe, A. & Rua, M. J. (2000). Gender differences in students' experiences, interests, and attitudes towards science and scientists. *Science Education*, 84: 180-192.

Kao, G. (2001). In Douglas S. Massey, Camille Z. Charles, Garvey F. Lundy, & Mary J., (2002): The Source of the River: The Social Origins of Freshmen at America's Selective Colleges and Universities. Princeton University press. Available at: "http://pressnceton.edu.titles /7351.

Krampah, D. E. K. (1976). "Life in Ghana. Commonwealth Topic No. 10". In *Social Development in Ghana: Finding a Development Path*. London: Commonwealth Institute.

Leshie, M., McClure, G., & Oaxaca, R (1998). Women and minorities in science and engineering. A life sequence analysis. *Journal of Higher Education*, 69(3), 239- 278.

Lipps, J.H. (1999). Beyond Reason: Science in the Media. *Evolution! Facts & Fallacies. Academic Press, San Diego. Chapter 4, pp. 71-90.*

Lyons, T. (2003). Decisions by science proficient Year 10 students about post-compulsory high school science: A sociocultural exploration. Unpublished PhD thesis. University of New England. Annidale, NSW.

Lyons, T. (2006). The puzzle of falling enrolments in physics and Chemistry courses:

putting some pieces together. *Research in Science Education*, 36(3), 285-311.

Millar, V. & Toscano, M. (2006). Girls in physics. *Australian School Innovation in Science, Technology and Mathematics (ASISTM) Project.* [Online] Available: http://www.vicphysics.org/documents/events/ stav2006/A2.ppt [2006, April 7].

Osborne, J. & Collins, S. (2001). 'Pupils' Views of the Role and Value of Science Curriculum: a Focus Group Study', *International Journal of Science Education*, 23 (50): 441 – 467.

Paulsen, M.B. (1990). *College Choice: Understanding Student Enrollment Behavior.* ASHE-ERIC Higher Education Report No. 6. Washington, D.C.: School of Education and Human Development. George Washington University.

Phelan, P., Davidson, A. & Cao, H. (1991), 'Students' Multiple Works: Negotiating the Boundaries Of Family, Peer and School Cultures', *Anthropology and Education Quarterly*, 22, pp. 224 – 250.

Pravica, M. (2005). The importance of physics: breakthroughs drive economy, quality of life. [Online] Available: http://www.reviewjournal.com/lvrj home/2005/Mar-06-Sun 2005/opinion/682710.html [2007, May 2].

Sagan, C. (1996). *The Demon-Haunted World. Science as a Candle in the Dark.* (New York, NY: Random House).

Schreiner, C., and Sjøberg, S. (2004). *Sowing the seeds of ROSE. Background, Rationale, Questionnaire Development and Data Collection for ROSE (The Relevance of Science Education) - a comparative study of students' views of science and science education.* Acta Didactica.- (4/2004) (ISBN 82-90904-79- 7): Dept. of Teacher Education and School Development. University of Oslo, Norway.

Stokking, K. M. (2000). Predicting the choice of physics In secondary education *International Journal of Science Education,* 22(12), 1261-1283.

Turmo, A. (2003). *Science education and international studies. Large international studies as a frame for research in science education: A discussion with examples on how data from PISA 2000 can enlighten facets of the construct scientific literacy*. Doctoral thesis, University of Oslo, Oslo.

Waelkens, C., (2005). How do and how should scientist communicate? A paper presented at the EU Science in Society Forum 2005.

Woolnough, B. (1994). 'Factors Affecting Students' Choice of Science and Engineering', *International Journal of Science Education*, 16 (6): 659 – 676.

Zahra, E.,Tai, Q. & Sadler, O. (2006), The Situation of Girls' Education in Anglophone Africa Report [Online] Available: http://www.fawe.org/publications/Working%20Papers/SitGEAngloAfr.pdf.

Notes

Fig. 1.0: Modified 'multiple worlds' theoretical model by Lyons (2003).

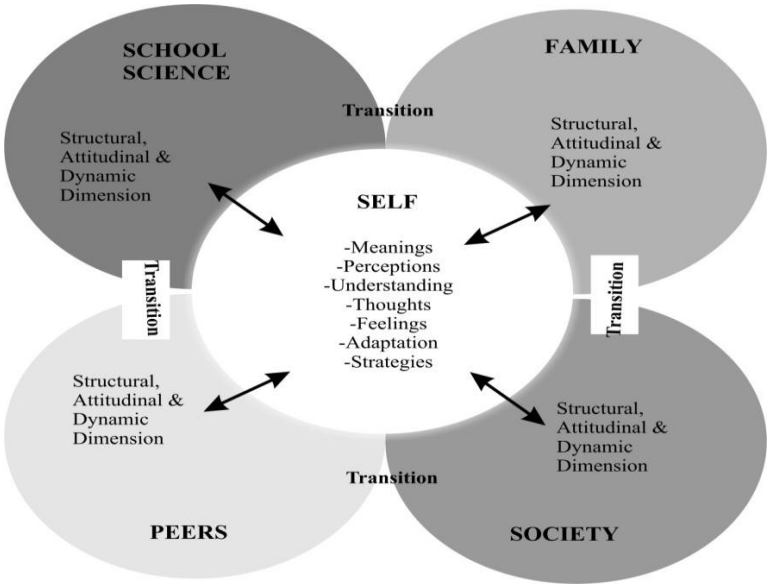

Fig.1.0: The 'hybrid theoretical model' of students' multiple worlds (Source: Phelan, Davidson & Cao, 1991 and Lyons, 2003). This model was originally developed to investigate influences within the student family, peer and school worlds. That is, the model conceptualises students' day to day activities as involving transition between these worlds, wherein they negotiate the different cultural knowledge and modes of behaviours.

Table 1: Enrolment statistics of Science students in UEW.

Academic Year	Total student enrollment	Number of students opting for Physics	Percentage (%) Physics enrollment
2006/2007	151	42	27.8
2007/2008	195	21	10.8
2008/2009	166	18	10.8
2009/2010	74	13	17.6
2010/2011	76	13	17.1

Table 1: Enrolment statistics of Science Students in the Department of Science Education from 2006 -2010.

Table 2: Detailed Sample Statistics

	Planned					Actual				
Level of Students	**Male**	**% of Male**	**Female**	**% of Female**	**Total**	**Male**	**% of Male**	**Female**	**% of Female**	**Total**
100	159	74	55	26	214	121	73	45	27	166
200	113	75	38	25	151	90	73	33	27	123
300	108	69	48	31	156	102	69	45	31	147
Total	**380**		**141**		**521**	**313**		**123**		**436**

Table 2: Detailed Sample Statistics. This table shows the number of students, constituting 84% of total student population, n=521, who were present at lectures at the various times when the questionnaires were distributed.

Table 3: Family influence on students' physical science enrolment

Family Influence	Number of cases		Total	Total percentage (%) of Students
	Male	Female		
Favourable	0	1	1	0.5

Neutral	145	66	211	97.6
Unfavourable	2	2	4	1.9
Total	147	69	216	100

Table 3: Family influence on students' physical science enrolment. The table shows that most students do not perceive their parents as influencing them to choose or avoid physics.

Table 4: Societal influence on students' physical science enrolment.

Societal influence	Number of cases		Total	Percentage of students (%)
	Male	Female		
Favourable	1	1	2	0.93
Neutral	145	67	212	98.15
Unfavourable	1	1	2	0.93
Total	**147**	**69**	**216**	**100**

Table 4: Societal influence on students' physical science enrolment. The table shows that just a little above 1% of students referred to the role societal influence has informed them in taking a decision about their choice of subject.

Appendix A

University of Education, Winneba

Faculty of Science Education

Physics students' questionnaire (PSQ)

This questionnaire is part of a study to investigate the cause(s) of low enrolment of students in physical science in the University (U. E. W). Please provide *truthful answers* to these items. Every piece of information provided will be treated as *confidential*

Thank you.

Instruction

Please in each case, tick [√] in the appropriate bracket(s) and/or provide short precise answers.

1.0 Biographical Data

1.1 Gender Male [ ] Female [ ]

1.2 Age …….....

1.3 Academic Achievement: ……..

2.0 Influences(s) within Students' Family.

2.1 How is the relationship between you and your parent(s)/guardian?

[ ] Very Close [ ] Close [ ] Normal [ ] Not Close [ ] Apathetic

2.2 How would you rate your parents' attitudes towards formal education?

[ ] Strongly Approve [ ] Disapprove

[ ] Approve [ ] Strongly Disapprove

[ ] Neutral

2.3 (i) Do your parents/guardian advocate for the choice of science subject / science related profession?

Yes [ ] No [ ]

(ii) If yes which science subject area (physics science or biological science) do they either directly or indirectly advocate for. ……

2.4 What in your view influence such desire by your parent(s)/guardian for science subject choice?
…….....

2.5 In what ways do you parents/guardian demonstrate their favour for such subject choice?
.....

2.6 Did this influence your decision for biological science? Yes [ ] No [ ]

2.7 Are your parent(s) in science related professions? If yes state the profession
……..

2.8 Indicate your parents/guardian's level of education.

[ ] Post – Graduate Qualification

[ ] 1st Degree/Diploma and HND

[ ] Pre – Tertiary Qualification (Cert 'A', GCE 'O' and 'A' Level, SSCE)

[ ] MSLC Basic Education and below

[ ] Illiterate

2.9 Influence(s) within society.

2.10 (i) Are there practices in the Ghanaian society that promotes the value of science/science related professions? Yes [ ] No [ ]

(ii) Identify some or of these practices …….

2.11 How often do you see items on science or science related material(s)/profession etc, in the media?

[ ] Very Often [ ] Often [ ] rarely [ ] Not at all

2.11.1 State example(s) of such news item ……

2.11.2 How has this influenced your choice for biological science and not physical science?
……

3.0 General Information

3.1 If you were given a chance to re-select your subject area of study, would you this time round opt for physical science? Yes [ ] No [ ]

3.2 If yes, why? ……..

3.3 What suggestion(s) would you make towards attracting and motivating more students to read science in general and physical science in particular? ……

3.4 State other factor(s) (if any), that should be considered in this study to establish the cause(s) of low enrolment of students in physics. ……

Tel:

Email

[*NB: The same questionnaire was answered by PSQ (responded to by Physics students) and BSQ (responded to by Biology students)]