

Research Article

Secondary school students' attitudes towards Chemistry and Physics subjects in Tarime-Mara, Tanzania

Jeremia M. Seba¹, Patrick A. Ndunguru¹ and Stelyus L. Mkoma^{2*}

¹Department of Education, Faculty of Science, Sokoine University of Agriculture, P.O. Box 3038, Chuo Kikuu, Morogoro, Tanzania

²Department of Physical Sciences, Faculty of Science, Sokoine University of Agriculture, P.O. Box 3038, Chuo Kikuu, Morogoro, Tanzania

Received: 15 June 2013, Accepted: 8 July 2013

Published: 10 September 2013

ABSTRACT

This study examined students' attitudes towards physics and chemistry in selected secondary schools in Tarime-Mara, Tanzania. Three hundred (300) students in forms III and IV from six selected ordinary level secondary schools both private and government owned were involved in the study. Data were collected using validated reliable questionnaire and analyzed by simple descriptive statistics determining frequencies and percentages. It was found that female students had negative attitude toward physics and chemistry compared to males. Positive attitude of male students was associated with confidence, lack of anxiety, enjoyment, and good performance in physics and chemistry. It is recommended that physics and chemistry teachers should assist students, particularly female students develop positive attitude towards these subjects by addressing issues which affect students' confidence, enjoyment, achievement and anxiety.

KEYWORDS: Secondary students, Participation, Physics, Chemistry, Gender, Tanzania

INTRODUCTION

According to the science curriculum in Tanzania, four science subjects are taught in secondary schools namely, physics, chemistry, biology and mathematics. In form I and II all students have to take all science subjects while in forms III and form IV only some students go on studying all science subjects. Those who do not proceed with all science subjects are allowed to drop physics and chemistry subjects. But the response of the students towards physics and chemistry in secondary is seems to be very poor. In Mara region the number of students taking physics and chemistry is small and is smaller for female students.

Some studies have been conducted outside Tanzania to determine factors that affect students' participation in science subjects in secondary schools and found that, the factors could be grouped into two categories namely, external and internal factors. External factors include influences from outside such as family members, school and science teachers, peers group, mass media and the society. The second

* Corresponding author

Email: stelyusm@gmail.com

© 2013, St. John's University of Tanzania

<http://www.sjut.org/journals/ojs/index.php/tajonas>

category was internal factors such as students' attitude, perceptions and experiences of school science (Zhu, 2007). Internal factors seem to be reported more intensively in various studies, for example positive attitudes have been associated with interest in and enjoyment of science among secondary school students (Miller et al., 1999). Furthermore, students who enjoyed their learning experience in form I and II and achieved good results in science were found to be more confident in their abilities and more likely to enroll in physics and chemistry subjects.

Since many studies have revealed that students attitude toward science subjects determine participation in science in different parts of the world, this study aims at investigating secondary school students' attitudes towards physics and chemistry in Tarime District, Mara region, Tanzania. Since anxiety, confidence and enjoyment in subjects are associated with students' attitudes towards subjects; this study will specifically examine students' anxiety, enjoyment and confidence in physics and chemistry subjects.

METHODOLOGY

A quantitative approach was employed for this study carried out in Tarime district, Mara, a region located north east to Lake Victoria. The study sample consisted of three hundred (300) from six (6) secondary schools selected by a stratified random sampling frame. The secondary schools involved in the study were Mogabiri, Rebu, Nyamongo, Ingwe, Mvera vision and Kibasuka. Data were collected by means questionnaire which was pre-tested in one of the non-participating secondary school before use. The questionnaires were then administered to and completed by science students chosen from form III and form IV from the six schools.

RESULTS

Demographic characteristics

Table 1 represents the demographic characteristics of students according to their gender and comments on previous experience in mathematics. The number of students participated were 300, of which about 35% were females and 65% were males. Majority of students aged between 15-20 years old. A large number of students (91%) attended classes which were over 60 students in their ordinary level education. About 84% of the students were having different teachers for mathematics each year who were mostly females (84%)

TABLE 1: Demographic characteristics and comments on previous experience in science subjects (n= 300).

Characteristics	Frequency (n)	Percentage (%)
Gender		
Female	106	35.3
Male	194	64.7
Age (year)		
below 18	168	71.0
18-19	119	24.7
20 and above	13	4.3
Number of students when in Form II class		
< 40	8	2.7
40 and 60	19	6.3
> 60	273	91.0

Different subject teachers for physics and chemistry each year		
Yes	253	84.3
No	47	15.7
Physics and chemistry subjects teachers were		
Mostly male	253	84.3
Mostly female	14	4.7
Mostly equal female and male	33	11.0

Anxiety

In general the analysis of anxiety, the result showed that more female students felt anxious during physics and chemistry compared to male students (Table 2). Although the findings varied by schools, 52% of female students found anxious towards science subject compared to male students (30%). Being anxious to science subjects may contribute to negative attitude of students' participation in science subjects (physics/chemistry) in secondary schools. The anxiety difference between male and female students was more significant in some schools as observed in Kibasuka and Mwera where 100% of female students were anxious during physics and chemistry sessions. In Rebu secondary school no gender difference was found as far as anxiety is concerned as the percentages of male and female students who felt anxious was equal, that is 16.7%.

TABLE 2: Percentage of Secondary School Students who Felt Anxious in Physics and Chemistry by Gender.

School Name	Female		Male		Total	
	Anxious	Not Anxious	Anxious	Not Anxious	Anxious	Not Anxious
Mogabiri (n=87)	28.6	71.4	35.6	64.4	32.2	67.8
Mwera (n=17)	100.0	-	50.0	50.0	64.7	35.3
Rebu (n=48)	16.7	83.3	16.7	83.3	16.7	83.3
Kibasuka (n=33)	100.0	-	25.8	74.2	30.3	69.7
Nyamongo (n=57)	23.5	76.5	20.0	80.0	21.1	78.9
Ingwe (n=58)	42.9	57.1	33.3	66.7	37.9	62.1
Total (n=300)	12.3	23.0	18.0	46.7	30.3	69.7

Confidence

From the results obtained (Table 3) most of students in the studied schools showed to have confidence in physics and chemistry (76%, 82%, 92%, 94%, 88% and 76% in Mogabiri, Mwera, Rebu, Kibasuka, Nyamongo and Ingwe secondary schools, respectively). Generally, male students (88%) showed to have more confidence in physics and chemistry than female students (74%). Furthermore, the results show that about 72% of male students claimed to be very good and/or good in physics and chemistry as compared to 57.5% of females. The possible reasons reported by student as why boys being more confident than girls included boys performance good in most examinations, study hard, have more time for private study when at home than girls, and parent support boys to take science subjects, whereas girls fear science subjects. Adamuti-Trache (2007) reported similar findings suggesting that attitude toward science are in general highly favoured by good performance and achievement in science subjects. Also studies suggest that peers, parent's support and teacher's attitude make student to be confident and develop positive attitude toward science subjects (Panizzon and Levins, 1997; Adamuti-Trache, 2007).

TABLE 3: Students Confidence and Their Classification in Physics and Chemistry by Gender (in %)

School name	Mogabiri (n=87)	Mwera (n=17)	Rebu (n=48)	Kibasuka (n=33)	Nyamongo (n=57)	Ingwe (n=58)	Total (n=300)	
Attitude							Female (n=106)	Male (n=194)
Confidence in physics and chemistry								
Yes	75.9	82.4	91.7	93.9	87.7	75.9	73.6	88.1
No	24.1	17.6	8.3	6.1	12.3	24.1	26.4	11.9
Classification in physics and chemistry								
Very good/good	56.3	64.7	83.3	78.8	70.2	44.8	57.5	71.6
Average	39.1	35.3	16.7	21.2	29.8	41.4	33.0	26.8
Poor/Very poor	4.6	-	-	-	-	13.8	9.4	1.5
Males more confidence in physics and chemistry than females								
Yes	49.4	58.8	47.9	84.8	21.1	77.6	35.8	63.9
No	50.6	41.2	52.1	15.2	78.9	22.4	64.2	37.1

Enjoyment

Table 4 shows students who enjoyed physics and chemistry by school and gender. The results show that about 88% of male students enjoyed physics and chemistry compared to 81% female students. In studied schools students showed that male students enjoyed physics and chemistry more than female students except in one school (Nyamongo, 81%). It is interesting to note that most of female students who had opted for physics and chemistry responded that they enjoyed science lessons, although the result showed that about 59% males and 40% female students supported the statement that male students enjoyed physics and chemistry more than female students. Therefore, we suggest that enjoyment in physics and chemistry influences the attitude of student's participation in the subjects. According to George and Taylor (2001), students who enjoy their learning experiences in junior secondary school and achieve good results in science are found to be more confident in their abilities and likely to enroll in physics and chemistry. On the other hand, Miler et al. (1999) suggested that positive attitudes have been associated with enjoyment and interest in science among secondary school students.

TABLE 4: Students who Felt Physics and Chemistry were Enjoyable by School and Gender (in %)

Enjoyment in physics and chemistry	Mogabiri (n=87)	Mwera (n=17)	Rebu (n=48)	Kibasuka (n=33)	Nyamongo (n=57)	Ingwe (n=58)	Total (n=300)	
							Female (n=106)	Male (n=194)
Enjoyable	80.5	100	97.9	93.9	98.2	67.2	81.1	88.1
Non enjoyable	19.5	-	2.1	6.1	1.8	32.8	18.9	11.9
Do males enjoy more in physics and chemistry than females?								
Yes	55.2	47.1	43.8	84.8	19.3	70.7	39.6	58.8
No	44.8	52.9	56.3	15.2	80.7	29.3	60.4	41.2

DISCUSSION

The results from this study highlight that gender differences appear to be maximal in the face of attitude toward physics and chemistry in secondary schools. The findings show that male students have more

confidence, good performance and enjoyment in physics and chemistry than female students. All these factors are associated with positive attitude toward physics and chemistry. As a result male students participate more in physics and chemistry than female students. The difference in attitudes between male and female students suggests that there are social, cultural, and educational or other factors which affect negatively female students' attitudes towards physics and chemistry (El-Haj, 2003; Elwood, 2005).

Mushi (1996) conducted a study in 1995 which intended to give a careful description of gender difference in performance in science from the perspective of secondary school science teachers' views in Tanzania. The results suggested that teachers' perception stems from their pivotal influence the girls self-image, motivation and attitudes to science. For example between 1990–1995, about 25% of the total number of girls registered in secondary school in Tanzania took physics and chemistry, whereas for secondary schools located in the Lake Victoria zone there were 2–3 girls taking science subjects in classes of about 30 students (Mushi, 1996).

The student's negative attitude where girls dislike science subject was on the other hand due to teaching methods and the physics/chemistry teachers were mostly male. Also the parents influence and attitude that boys are able to study hard and do difficult thing like studying science subjects (Adamuti-Trache, 2007). These may fail to motivate and arouse girls' interest toward learning the science subjects. The illiteracy idea and needs of parents to encourage their children (boys and girls) to study science subjects can solve the problem of girls disliking physics and chemistry (Hoffmann, 2002).

Furthermore, our study revealed that the negative attitude of students is the functions of lack of anxious, confidence and enjoyment. Students have no interest in physics and chemistry, and believe that science subjects are difficult and need more time to study. It is therefore, suggested that students should be motivated and encouraged by providing them with conducive environment and teaching/learning materials. Cheung (2009) suggested that students should be motivated always to put in their best to the study of science subjects.

This study indicated that most boys' students developed positive attitude and interest toward science subjects due to the fact that they get support from their parents being given privilege for private study at home compared to girls and are encouragement from science teachers which mostly are males. These may influenced boys students non-anxious, confidence and enjoyment toward science subjects and increase their enrollment and choice to science (Barns et al., 2005; Cleaves, 2005). On the other hand, the significant difference in the attitude between boys and girls toward science subjects causes the minimal number of female profession in science compared to male. The problem has to be rooted out to girls in secondary schools where they developed negative attitude and misconception to the science subjects.

CONCLUSION

The study concerning the students' attitude toward physics and chemistry in Tarime-Mara has spelled out about four important findings. Feeling of anxiety was significantly observed among the females compared to males toward physics and chemistry. The study found that male students were more confident than their female counterparts and that in all of the schools males were more likely to rate their science ability as "very good and/or good". It is clear from the evidence provided in this study that male students enjoyed more the science subjects though the difference in the levels of enjoyment with that of female was not significantly large. Generally, these findings show that male students have positive attitude toward physics and chemistry compared to female students who showed negative attitude. It is thus recommended that physics and chemistry teachers in collaboration with school administrators, parents and community in general should assist students, particularly female students develop positive attitude towards these subjects by addressing issues which affect students' confidence, enjoyment, achievement and anxiety.

ACKNOWLEDGMENT

Authors gratefully acknowledge the cooperation of heads of schools and chemistry teachers, and to students who willingly took part in this study. We acknowledge special research funds granted to the first author from the Higher Education Students' Loans Board (HESLB) of Tanzania. Thanks to Sylevester Seba and Tabu Katengesya for help in logistics and in data collection.

REFERENCES

- Adamuti-Trache, M. (2007). Who likes science and why? Individual, family and teacher effects. Report for the Canadian Council on Learning (pp. 72), Ottawa: CCL. Available on <http://www.ccl-cca.ca/NR/rdonlyres/9458A577-2A56-486F-9F80-49DCCD8E05F3/0/WhoLikesScienceJan2007.pdf>
- Barnes, G., McInerney, D.M. and Marsh, H.M. (2005). Exploring sex differences in science enrolment intentions: An application of the General Model of Academic Choice. *The Australian Educational Researcher*, 32(2), 1-22.
- Cheung, A. (2009). Studies attitude toward chemistry lesson: The interaction effect between grade level and gender. *Research Science Education*, 39, 75-95.
- Cleaves, A. (2005). The formation of science choices in secondary school. *International Journal of Science Education*, 27(4), 471-486.
- El-Haj, T.R. 2003. Challenging the inevitability of difference: Young women and discourses about gender equity in the classroom. *The Curriculum Inquiry*, 33, 401-25.
- Elwood, J. 2005. Gender and achievement: What have exams got to do with it? *Oxford Review of Education*, 31, 373-93.
- George, L. and Taylor, P.C. (2001). Increasing physics enrolment in year 11. Paper presented at the annual meeting of the Australian science Teachers Association.
- Hoffmann, L. (2002). Promoting girls' interest and achievement in physics classes for beginners. *Learning and Instruction*, 12, 447-465.
- Miller, D., Parkhouse, P., Eagle, R. and Evans, T. (1999). Pupils and the core subjects. Paper presented at the British Educational Research Association Annual Meeting.
- Mushi, P.S.D. (1996). Tanzania secondary school teachers' perception and reaction to gender difference in performance in science. *UTAFITI (New series)*, 3(2), 91-130.
- Panizzon, D. and Levins, L. (1997). An analysis of the role of peers in supporting female students' choices in science subjects. *Research in Science Education*, 27(2), 251-270.
- Zhu, Z. (2007). Learning content, physics self-efficacy and female students' physics course- taking. *International Education Journal*, 8(2), 204-212.