After the presentation of the best-practice projects we will discuss their approaches and results. There are possibly contributions and experiences from other countries working with the mentioned age groups. We are interested in getting information about their proceedings and previous results.

Last but not least, we would like to set up criteria for improving teaching methods with regards to gender aspects.

Keywords. Gender, Hands-on Science.

Gender Preferences and Science Career Choice

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Abstract. Statistics show that the percentage number of females in science courses at the University of Malta is low when compared to other undergraduate courses. The ratio of males to females varies according to the science undergraduate course. This paper aims to identify reasons for gender differences in science undergraduate courses, lecturing staff and employees in science related professions. A questionnaire was addressed to two hundred and twenty three (223) undergraduate students following science related courses at the University of Malta. They were asked about their experience of science at Primary, Secondary and Post Secondary levels and about their choice of course/career. Personal interest in science was found to be the key factor that determines the decision in whether to pursue a science career or not. No gender difference was found to be statistically significant in this regard. Based on these findings, suggestions are made about how to improve science education with a view of increasing the number of students, both male and female, following a science career.

Keywords. Gender Preferences, Science Career.

1. Introduction

The choice of an occupation or career is an important decision for every school leaver. At the end of compulsory schooling, students decide whether they want to start working or further their education. Vocational choice is the outcome of a synthesis of factors. This study focuses on the role of science education in influencing the choice of a science career.

The total number of students at the University of Malta and the number of undergraduate students following science courses have increased by 34% from 1995 to 2003. According to the Labour Force survey, (March 2001), graduate employees in science related professions make up 12% of the total number of professional employees in Malta. Moreover, compared to other countries, (Science and Engineering Indicators, 2002), Malta ranks among the countries which produce the smallest percentage of science graduates. The faculty with the largest student population at the University of Malta during the academic year 2002/03 was the Faculty of Economics, Management and Accounts (FEMA), with 24.6% of the total student population. During the same academic year, undergraduates in science-related courses made up only 17.6% (1,569 out of 8,920 University students, 57% males and 43% females). This is a low percentage compared to other countries (except for Norway and New Zealand), Table 1, with Malta ranking among those countries producing the least number of science professionals.

Table 1
First university degrees & ratio of first university degrees & Science & Engineering (S&E) degrees to 24-year-old population, in selected regions and locations : 1999 or most recent year

Region/location	All first university degree awarded	Total number of S&E degree awarded	% total of S&E students of University degrees
Austria	[illegible]	[illegible]	29
Belgium	[illegible]	[illegible]	[illegible]
Czech Republic	[illegible]	[illegible]	[illegible]
Denmark	[illegible]	[illegible]	42
Germany	[illegible]	[illegible]	[illegible]
Hungary	[illegible]	[illegible]	24
Ireland	[illegible]	[illegible]	[illegible]
Italy	[illegible]	[illegible]	[illegible]
Malta **	8,920	1,569	18
The Netherlands	[illegible]	[illegible]	27
Norway	[illegible]	[illegible]	[illegible]
Spain	[illegible]	[illegible]	[illegible]
Sweden	[illegible]	[illegible]	[illegible]
Switzerland	[illegible]	[illegible]	28
Turkey	[illegible]	[illegible]	[illegible]
United Kingdom	[illegible]	[illegible]	33

Data Source: * Science and Engineering Indicators 2002
** University Admissions Office (Malta 2003)

The Labour Force Survey, March 2002 reveals that at the end of September 2001, the labour supply totalled 144,692 of which 1969 i.e. 1.4 %, were found to be graduate employees in science related professions. This is also considerably low when compared to the proportion of students for the 12 European Member States in 1992/93 (Key data on Education in the European Union, 1996), *Table 2*. These statistics show that there is need for more science graduates in Malta.

Table 2. Percentage Number of Students in Higher Education by Science-related field & by Member State, 1992/93

	DK	D	GR	E	IRL	I	NL	AT	P	FI	SE	UK
Natural Sciences	4	7	5	8	14	8	4	6	4	5	4	7
Mathematics	4	5	4	4	5	3	2	5	1	7	[illegible]	5
Medical Sciences, Health	13	20	12	9	4	11	11	8	6	18	15	15
Engineering, Architecture, Transport	14	31	27	16	18	17	13	13	18	24	17	14

The December 2004 labour force figures published by the National Office of Statistics through the labour force survey indicate that the females who are working or willing to work within the economy as a percentage of the total females of working age is still 30.6% compared to the 60% by 2010 target set in the Lisbon Convention of the European Union.

Progress in education depends on government's investment. In 2001, the Maltese government invested 7.3 million of its capital expenditure and 46.6 million of its recurrent expenditure in education. (Consolidated fund account for 2001). With respect to science education, the Prime Minister stated that "unless the country continues to invest heavily in this sector, it will not only lose the momentum it has established in a variety of economic and social fields, but will undergo a systematic process of deterioration, leading to economic dependence", Fenech Adami (1996). The shadow minister, Bartolo (2001), reinforces this initiative by saying that if Maltese citizens leave school without an adequate scientific literacy, Malta runs the risk of falling behind in the 21^{st} century.

Overall, there is a demand for science professionals in Malta. The Employment Barometer Survey 2002, indicates a shortage of mechanical engineers. The statistic is based on the unemployment figures for April 2002 and on the demand of employers during the same period. In addition to graduate professionals, our society also needs employees in the industrial, technical and health related areas which support professionals and who also call for a certain amount of publicity, promotion and exposure to science in order to engage in such a job.

The aim of this paper is to identify gender differences in science-related courses at the University of Malta. It also reports results of a survey conducted among science undergraduates about their interest in a science career. In view of these findings, actions that need to be taken in order to attract more students, particularly females, to science are proposed.

2. Theoretical background.

The under representation of women in science, sex differences in interests and achievements have been the springboard to a wide range of research in gender and science education. Sex differentiation holds its roots to school, the 'hidden' and overt curriculum apart from social interactions in the wider context of society.

Science is perceived as a male domain in schools. Harding (1996) argues that school science becomes masculinised through: the predominance of males working in science; the way science is 'packaged' for teaching and learning; classroom interactions which reinforce stereotyped expectations and the way science itself is conceived and practised. Another disadvantage to females, documented in the AAUW report (1992) states that, in America's schools, girls receive an inferior education to boys in terms of the amount of attention given in the classroom. Thus teachers should be responsible to eradicate any issues which might reserve the association of particular subjects to one sex only. Instead they should provide opportunities for girls "to participate in science as women, rather than substitute men", (Gilbert, 2001).

Vlaeminke et al. (1997) mention the contextual, cooperative and student-centred curriculum as being more compatible with femininity. Females attune more to science in a social context. According to Head (1985) and Harding (1996), they seek humanisation aspects and applications.

The responsibility for the limited number of girls choosing science should not only be attributed to the curriculum. Kelly (1981) proves that boys liked science more than girls. In addition to this, both sexes differ in their preferences within science subjects. In a Maltese study Ventura (1992) reveals that "girls avoid

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careers in engineering and technology for which mathematics is compulsory, and prefer careers in medicine and related subjects instead."(p.12). These findings, in no way imply that females are inferior to males or are incompetent in science. In fact, Ventura found that at secondary level, girls, perform better than boys in science examinations. As Kelly (1981) claims that despite getting good grades, girls are not accepting the physical and mathematical sciences.

The gender gap due to performance in science and mathematics becomes wider as age increases. Various research works suggest that sex differences in scholastic attainment tend to emerge clearly and consistently after the age of eleven. Gafni and Beller (1996) assessed the performance of 3,300 pupils (aged 9 – 13) from 110 different schools and, found that boys' performance was on average better than girls across all participating countries. In Malta, Gatt (2002) found that although no gender differences were obtained for the overall grade, girls outperformed boys significantly in the coursework aspect of the national certification system.

Boys and girls differ in their interest for science and the confidence and relevance they attribute to the subject. Though a lot of research has been carried out in the attempt to find gender differences in children's performances, researchers like Robertson (1987) express the opinion that "there are more similarities than differences between the performances of girls and boys". In his research, this was particularly so in the case of practical laboratory tasks.

Camilleri (2002) found that in the case of 16 year olds, there are no significant gender differences in the performance of Matriculation Secondary Education (SEC) examinations (held in May 2001) except in Maltese and Physics. Girls perform significantly better in Maltese whereas boys outperform girls in Physics. Camilleri further argues that the effect of gender on school attainment is almost insignificant since out of 4 examinable subjects, one of which was Mathematics, only Maltese and Physics revealed gender differences. A similar foreign study about the performance of 16-year olds by Bell (2001) specifies the cognitive areas in which both sexes differ.

> *"Gender differences exist in question parts that only involve the retrieval of declarative knowledge and not the use of procedural knowledge. These differences are in favour of boys for physics contexts such as mechanics and earth and space, and in favour of females for human biology. A consideration of the processes used would suggest that it is the depth of processing of information that is the critical factor".*
>
> (Bell, 2001, p. 484)

Education and gender do not progress in a vacuum but in the context of society at large and in smaller nuclei such as the family. Bell (2001) considers activities out of school accountable for different performances. He attributes the gender differences mentioned above to the activities in which boys and girls prefer to engage and the environments made available to them by parents and by peers.

Various researchers claim that single-sex schools and classrooms create less gender-related stumbling blocks than in the case of co-education. However, others debate that when elements of good education are present, girls and boys succeed, irrespective of whether they are in single or mixed schooling. The AAUW (2000) comments that "while we can draw lessons from single-sex educational experiments, we must continue to improve co-education so that all students benefit".

Although small in numbers and many drops out from pursuing a career in science, women have shown to be competent in this area of science. Etzkowiz et al. (2000) compare the decreasing number of women in science to a pipeline.

> *"Women pass along a pipe that leaks at every joint along its span, a pipe that begins with a high pressure surge of young women at the source ...and ends at the spigot with a trickle of women prominent enough to be deans or department heads..."*
>
> *Etzkowiz et al. (2000)*

3. Aims and objectives

The main aim of this study was to look at the numbers of female scientists and female students in science-related undergraduate level courses and to identify those factors that share a contribution in the decision to pursue a science career at Tertiary level.

The specific objectives of the study included:

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1. Reviewing statistics on number of female students attending science-related courses at the University of Malta;
2. Identifying the factors, among probed influences (personal, family, school) which promote the choice of a science course / career and whether boys and girls are affected differently;
3. Studying the degree of influence of the educational system on the choice of a science career and if there are gender differences with respect to school influence; and
4. Identifying the point at which boys and girls decide to take up a science career.

4. Method of research

The method of research was divided in two parts. The first included an analysis of the statistics of students and staff at the University of Malta. This data was supplied by the University of Malta administration. The second part of the research was based on a questionnaire with university students following an honours science course. A sample size of 223 respondents, stratified to represent the actual ratio of students in the different science courses, was obtained. This made up approximately 17% of the total number of students in each of the following science related honours degree courses: Bachelor in Science, Education, Engineering, Architecture, Nursing, Environmental Health, Dentistry, Pharmacy and Medicine. Ninety-five percent (95%) responded to the questionnaire of which 47% were females and 53% males.

5. Analysis and discussion of results

5.1. Analysis of University Statistics

Table 3: Undergraduate students in science-related courses classified by Course, Gender and Academic year.

COURSE	2001			2002			2003				
	M	F	T	M	F	T	M	F	T	*MT*	*FT*
B.E.&A.	61	39	28	77	23	26	64	36	36	*67*	*33*
B.Eng.	85	15	48	81	19	64	81	19	48	*83*	*17*
B.Pharm	29	71	28	42	58	36	29	71	24	*33*	*67*
M.D.	59	41	61	58	42	38	65	35	37	*61*	*39*
B.Ch.D.	73	27	15	[illegible]	[illegible]	6	54	46	13	*64*	*36*
B.Sc	57	43	30	52	48	29	55	45	44	*54*	*46*
IHC	47	53	36	39	61	83	31	69	52	*39*	*61*
Total	59	41	246	58	42	112	54	46	254	57	43

Note: M = % number of Males; F = % number of Females; T = Total; IHC = Institute of Health Care

Data Source: Education Statistics 2001

Analysis of student statistics show that, overall, the number of females following science courses at tertiary level has increased by 5% between 2001 and 2003. However, males and females differ in their preferences. From statistics, females predominate in Health Care courses, mainly Pharmacy, Nursing, Environmental Health, Physiotherapy and Radiography courses. Engineering and Architecture courses remain a male domain. With regards to the other science related courses, the presence of females is noticeable, (Table 3).

For the academic year 2002/3, the total student population at the University of Malta had a predominance of males over females in Engineering and Architecture courses. Females predominated in the Pharmacy, Education and Health courses. The number of males and females found Medicine, Science and Dentistry courses was approximately the same.

Females predominate in Pharmacy and Health courses because they are more interested in biological sciences than in the physical sciences (Peltz, 1990). In addition, convenient working hours are perceived to be more appropriate for potential working mothers and thus have an influence on the number of females in the Education course.

The number of female science graduates has increased these last few years, however when compared to other countries, Malta still produces the lowest number of female scientists per capita: Approximately 70 female science graduates / 100,000 persons in the labour force aged between 25 to 34 years, as opposed to 460 male science graduates / 100,000 persons, (OECD, 1996). Thus, the government has the responsibility of providing initiatives aimed at attracting women to science, engineering and technology and providing an environment that retains them.

Table 4. Lecturing staff classified by Faculty and Gender, 1999-2000.

Faculty	% Male	% Female	Total
Architecture	100%	0%	15
Engineering	97%	3%	33
Medicine & Surgery	80%	20%	120
Dental Surgery	90%	10%	10
Science	91%	9%	55
Institute of Health Care	41%	59%	73

Data Source: Education Statistics, Malta 2001

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The problem lies with the quantity of graduate women who for some reason do not make it to high academic posts. An under-representation of female scientists at senior level is a proof. In the case of University staff, it was found that at present, there are only two Maltese female professors at the University of Malta, and they are both in science-related faculties. The number of female lecturers is highly inferior to that of males except for the Institute of Health Care where females outweigh males by 18% (Table 4)

5.2. Questionnaire responses

Based on the responses obtained, this part of the study showed that there are no gender differences in the enjoyment of science, the time at which students make their decision to follow a science career and the degree of influence that Primary and Secondary science have on the choice of a career. χ^2 tests of variables conducted across gender were found to be statistically insignificant. Therefore, factors which students consider influential on their science career choice tend to be the same for males as for females. This means that there are no gender differences between those who choose science. This does not rule out the existence of gender differences between the number of boys attracted to science to that of girls. As the statistics in the first part show, significantly fewer females are attracted to particular science courses. The following sections outline those aspects of science that have attracted boys and girls in the same way.

5.3. Type of school attended

Most of the respondents came from church schools at Primary and Secondary levels followed by state education at Sixth form. The schools which produce most science professionals in Malta are church schools. When considering that church schools cater for the education of only 30% of children in Malta, their contribution to promoting science-related career is significant. This may be the result of fewer subject options available in these schools; the effort of guidance teachers to channel clever students to science; or the fact that church schools in Malta are single-sex schools.

Gatt (2003), reveals that 97% of students attending a church postsecondary school come from church secondary schools. This study showed that a relatively greater number of students attended church rather than independent schools. These results suggest that parents tend to perceive church schools as providers of a selective, motivating, social group to their children at an affordable expense when compared to private schools. One should also keep in mind that whereas entry into boys' Church school is through a competitive entrance examination, this is not the case for girls. This shows that it is not only the case of Church schools having better achievers, but for the possibility that these schools tend to promote the science option in both boys' and girls' schools. In addition, Church schools tend to favour females' choice of science as they are single-sex schools. Ormerod (1975) demonstrated that fewer girls opt for science in coeducational schools than in girls' schools.

Post-Secondary state education in Malta known as the Junior College, hosts most of the students because of the limited number of private and church sixth forms available in Malta. Nonetheless, the number of respondents from church sixth forms was quite high. Selectivity in the admission of students to church and state sixth forms plays an important role in the results obtained. Selecting best achievers contributes to have a large percentage furthering their education at tertiary level. Gatt (2004) also reveals that the majority of students from Church Primary and Secondary schools tend to follow general Post-Secondary education rather than the vocational stream.

Considering the limited number of places in church Sixth forms compared to the state Junior college, Higher Secondary and Prevocational school, the number of University students from church sixth forms is quite high. This is not necessarily because Church schools provide better instruction but because the best students are admitted. Places are few whereas the demand is high.

5.4. Science as an enjoyable experience

Respondents, boys and girls, enjoyed science lessons at all levels of schooling. They enjoyed science lessons mostly at primary level. However, for both genders, this decreased as students proceeded from Primary, to Secondary, to Sixth form. The perception of science being a subject to one's liking at Primary level turns out to be less enjoyable as it is studied more formally. Camilleri (1999) reveals that positive attitudes towards science decline from Primary to Secondary. The decline in interest is found to be sharper in science than in other subjects (Gardner 1985). Students who claimed that they enjoyed science less from Primary to Postsecondary are those students who in fact chose a science career and therefore those who are expected to be interested in the subject more than others. This is particularly worrying as one need to look at those students who were turned off science and did not opt for it, particularly in the case of girls.

There is a relationship between the degree of enjoyment of science at Sixth form and the undergraduate course followed. Most students expressed a high level of enjoyment of science at post-secondary level. However, differences did not emerge between the different genders but between the different courses frequented. Science at Sixth form appears to be significantly enjoyed mostly by Education, Science, Engineering, Medicine, Pharmacy and slightly less by Architecture and Health Care students. Dentistry students enjoyed science least at Sixth form level. Education and Science students specialising in science subjects, are the students who showed the greatest degree of enjoyment. On the other hand, Dentistry students might have perceived science as just a stepping stone to the career they aspired for. Therefore students who mostly enjoy science at Post Secondary level tend to choose courses which provide the opportunity to study the pure science (B.Sc. and B.Ed.). With the slight decrease in enjoyment, students opt for applied science University courses such as Engineering, Medicine and Pharmacy, which are vocational courses. Students following Science and Dentistry courses would probably have aimed at a different course such as medicine.

5.5. Decision point to follow a science career

All respondents, that is, for both genders, expressed that they remember their first interest in science mainly at Secondary level. However, they decided which particular science undergraduate course to pursue mainly at the point of entry to University, on receiving their results. Students decide upon the course they would like to follow, by considering those courses they are eligible for, based on their exam results. Most science-related courses for the academic year 2002/2003 required an Advanced level pass at Grade C or better in one or two science subjects, (Special course requirements, 2002). On the other hand, Medicine was the most demanding. To be eligible, students have to obtain passes at Grade B or better in Biology and Chemistry.

A very small number of students decided upon their career before first fostering an interest in science related careers. These were mainly respondents that stated a first interest in science at primary level. Career decisions taken at Primary level are weak and tend to be irrelevant to career decision making. There is consistency in the results obtained, i.e. that first interest in science mainly takes place at secondary school level, while the actual decision, to follow a particular course/career, is made just before admission to University. Ginzberg (1972) shows that realistic career decisions are often made between the age of 18 and 25, when individuals dissociate themselves from their fantasies about careers and make more pragmatic decisions. This depicts subject choice, at Secondary level (age 13/14) as being too early.

5.6. Factors determining science-career choice

When students were asked to identify factors influencing their decision to follow their particular course/career, the predominantly influencing factors mentioned were:

a) personal interest in science (58%);

b) feeling good at science subjects (47%); and

c) examination grades obtained in the order stated (40%).

Personal interest in science was regarded as the most influential factor in career choice. Factors related to science education do not predominate. However science education can act as a secondary factor contributing to the increase of science professions. Fostering interest in the subject, providing experiences of success in science and making students feel they are good at these subjects indirectly influence the choice of a science career.

The second factor considered to be influential was 'being good at science subjects'. Lau et al. (2002) have found that psychological aspects derive from motivational variables which prove to be the strongest predictors of engagement, choice of science subjects and careers among

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high school students. All the students ticked more than one factor that influenced their decision to follow the science course / career. This confirms Woolnough's (1997) conclusions, that students' career choice in science is the result of "the variety of social, school and personal influences interacting upon the student to form his or her career choice". 'Personal interest in science subjects' is the factor mostly considered when choosing subjects both at Secondary and Post-Secondary levels. Parental influence is considered the least influential of all. 'Status of the future occupation' and 'Requirements for the degree course' are considered to be more influential at Post Secondary than at Secondary level.

6. Discussion

Research in science education (Kelly, 1981; Head, 1985; Whyte, 1986; Darmanin, 1991; AAUW, 1992) shows that there are gender differences, in the performance and achievements of males and females at various levels of education. This was not found to be the case overall in Malta with girls performing as well as boys at school leaving level. However, a disparity in the number of females in particular undergraduate courses was identified. This was accentuated in engineering courses. Whyte (1986) attributes the choice of a career by males and females to the choice of subjects at school. Science subjects are often stereotyped. The label certain subjects are given can narrow the vision of students, who are led into certain paths, to conform to the male/female identity with which they have been brought up from a young age.

> "The 'gender spectrum' of school subjects – arts, languages, domestic subjects for girls, mathematics, physics and technical subjects for boys – not only reflects labour market divisions, it reconstructs them, fitting boys into their future, corresponding positions in the male or female labour market"
>
> (Whyte, 1986, p. 16)

This study shows that those who were attracted to science were influenced by the same factors, irrelevant of their gender. However, the numbers show that the way science is being presented today is pushing away many girls. This means that a percentage of potential scientists, particularly females have been driven away as a result of the way that science and scientific careers are presented.

There are various initiatives that can be taken in order to make science more attractive to a larger number of students. One particular aspect is that girls are more attracted to the social aspect of science. Science is currently often presented as an objective and detached practice which removes any sense of feeling or caring. This has to change if one wants more females to take up science as their career choice. As Harding (1983) argues, we have to take action at all levels of education: national; school; and teacher level.

At national level, Harding (1983) argues the presence of choice options at secondary level limits the students' access to opportunities. However, Ditchfield and Scott (1987) put a counterargument stating that making science compulsory is not the solution. They argue that teachers should cater for all students, giving them the chance to choose whether they would like to study or not certain areas of science. What is important is that students are provided with meaningful experiences. Harding also argues that more attention should be given to those areas such as physical sciences in which girls tend to be weakest. This requires the provision of professionally trained teachers. Teachers should be made aware of gender differences. Spear (1987) recommends that teachers start considering the value of doing science to students, both boys and girls, and to introduce project work on the range of occupations that require or prefer qualifications in science subjects.

Education officers and subject coordinators should be aware of the problem and offer adequate information and effective training schemes for girls to follow at school. Efforts should also be made at primary level such that girls can have the opportunity to overcome the feeling of strangeness that is usually experienced at secondary level. Links should also be set up between schools and women at work at 16+ and 18+ levels.

At school level teachers should be made aware of the different feedback that is generally given to boys and girls and how this may result in setting stereotypes that science is for boys. Within guidance and counselling, girls should be presented with possible employment opportunities, including those involving science. Links with industry should also be kept and personnel at various levels of employment invited to talk to students about their work. Extra help should be made available to girls who experience difficulty with science subjects as it is the case with other subjects. From the GIST (Girls in Science) experience, 'tinkering' activities which were introduced during science lessons or in special girl clubs, were found to give positive results: like enhancing the spatial ability; familiarising girls with topics such as electricity, energy etc.; and building their self-confidence and competence in the subject (Whyte, 1986).

Curricular changes should also change, moving away from more abstract, conceptual, mathematical, less practical and divorced from everyday life approach which tends to put off girls. Instead, science that is more relevant to the environment should be included. Versy (1990) also makes a number of useful additional suggestions in what she calls 'staff development strategies'. These suggestions include: gender issues to be central focus in INSET courses at any level, be it course development, department management, special needs, active learning, school community links etc.; gender issues should be discussed in a friendly atmosphere which can be achieved through small group discussion; development plan concerned with gender should be drawn up and submitted by subject coordinators and education officers; a person in the school should be given the responsibility to keep gender awareness among staff attitudes and teaching material prepared; setting up a monitoring group concerned with gender to foster and suggest teaching approaches better suited to girls and boys; and finally people having responsibility should use their influence on publishers, teachers, examination boards etc..

Many initiatives can be taken at teacher level. The first step is to recognise the existence of the problem and that girls tend to be at a disadvantage due to the low self-esteem that they often have with respect to science. Teachers should push girls to do their best by having similar expectations from girls as from boys. They should give girls more opportunities to handle apparatus and carry out experiments. Examples related to science should also be of interest to girls. This is mainly achieved through considering social issues. Subject specialist teachers seem to oppose possible changes in teaching techniques more than non-subject specialist ones. In addition, to those already mentioned, one finds the need to use non-gender illustrations showing girls and women performing less conventional tasks; experiments to which pupils can relate personally; role-playing exercise; proposing solutions to open-ended problems; and the inclusion of design experiments. Both boys and girls should be considered as equal learners with individual needs, interests and objectives from which benefits are to be derived from the scientific activities.

7. Conclusions

Unless the recruitment of female scientists is promoted, the Maltese economy will be deprived of the talent of a fraction of half the population. Thus it is important to make it easier for women to take a stand in the scientific male-dominated terrain. An effective way of starting to eliminate differentials amongst both sexes is by reforming science education. Instead of trying to make girls fit into the existing science curriculum, the science curriculum must become more inviting for girls.

Students should be encouraged to choose not only on the basis of their liking of the subjects but also to keep in mind their future career. Students should be guided professionally to choose the subjects which will make them fulfil their vocation. In particular, females should have more exposure not only to health sciences. Given the proper career guidance at all levels of education, students would be more prepared to face challenges and make more informed decisions. It is recommended that subject choice at Secondary level is postponed. Students can study Physics, Chemistry and Biology in the form of co-ordinated science. This eliminates studying Physics as the only compulsory science subject at Secondary level. The choice of science subjects can be made at Advanced level, prior to Post-Secondary education. Consequently, all students would have experienced three science subjects and would be more informed when choosing to take up science.

It is hoped that the number of science careers in Malta will increase and match the average number of students in other countries. Increase in the number and proficiency of students, of both sexes, following science courses will help meet the ever changing demands of the Maltese economy.

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Inviting Women to Physics and Engineering

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Abstract. It is a well known fact that women tend to prefer other fields then Physics and Engineering when they choose a career. This is also the case in Portugal.

At our University, female undergraduate students in Engineering are less then twenty percent while in Biology they largely exceed male students. According to research, this gender bias is enforced by an ordinary discourse, shared by secondary school teachers, which tend to ignore female scientists and female engineers accomplishments and adopt a male dominant stance regarding the profile of the profession.

In order to help change in secondary teachers attitudes and discourse, we planned an in-service course, twenty five hours long, focusing in three case studies of high succeeding female in the fields of applied Physics and Engineering. Not only we used biography to highlight the obstacles which confront women when they enter traditionally male dominated fields but we debated the advantage of adopting a feminine shaped style to better solve several kinds of technical or scientific problems. We hope that, after following the course, teachers would be convinced that both, men and women, are equally fitted by nature to succeed in every field of science and technology, regardless particular styles of thought and action associated with gender, and that better performance will be achieved through team work.

Keywords. Women in Science, History.

Women are not just technical operators. It is self-evident that, across the centuries, women have always been in close contact with the technology of everyday home production and, at the least as operators of industrial high-technology devices and tools.

A quick survey of the history of engineering and technology might lead one to believe that technology is the dominion of men. After all,