PART II

DISSEMINATION AND PROMOTION OF SCIENCE
1. Meetings with students and parents

As part of the dissemination and promotional campaign, meetings were held in a number of girls’ state secondary schools before the students were requested to make their choice of subjects, that is at Form 2 or 3. The schools that were chosen and accepted to participate in this campaign were three Junior Lyceums and one Area Secondary School, as follows:

- Sir Adrian Dingli Girls’ Junior Lyceum (St. Andrews)
- Santa Theresa Girls’ Junior Lyceum (Mrieħel)
- Margaret Mortimer Girls’ Junior Lyceum (Santa Lucia)
- Sir Luigi Preziosi Girls’ Area Secondary School (St. Andrews)

Meetings with students

Since the choice of subjects in the Junior Lyceums is made at Form 2, the meetings were held with the girls at this level. On the other hand, in 2006, the Area Secondary Schools were shifting their choice of subjects from Form 3 to Form 2. Thus, the students in both Form 2 and Form 3 attending the area secondary schools had to make their choice of subjects in 2006, and meetings were held with students in both forms who attend Sir Luigi Preziosi Area Secondary School. A total of over 700 students were present at these meetings, coming from over 45 different localities throughout Malta.

For these meetings, a PowerPoint presentation was prepared to facilitate the communication process with the students, such that, apart from listening, they could also visualise what was being said (a copy of the slides used is presented in Appendix 1). During this presentation, the students were exposed to a number of facts about the significant and practical use of science in everyday life. The exposure to role models at such an early age is of great importance to encourage the uptake of science subjects among these students. For this reason, they were presented with examples of female personalities who earned a reputation in their respective area of scientific knowledge. These included famous people such as Florence Nightingale and Marie Curie, and not so famous ones such as Jeanne Villepreux-Power, Annie Jump Cannon and Rosalind Franklin. Apart from coming from different fields of science, the female role models chosen come from different eras dating back to the 18th century up to the 20th century. During the presentation, a brief outline of their life and their contribution to science was given.
To address the problem that all the role models presented were foreigners, it was decided to include local examples. Two local women were included as possible role models namely Ms Nadine Axisa, a graduate in Mathematics who works in the environmental agency and Ms Marisa Cassar, a pharmacy graduate who has her own biotech company. These were contacted beforehand and a short video clip was taken and included in the presentation. During their intervention, they both recounted their different personal experiences as science students and, later, as professionals in a science-related career. During their talk, they also encouraged those students who would like to take up science but are afraid to do so, because of negative assumptions from society and those close to them, to take courage and make the right choice which will fulfil their dream.

A list of possible careers in science was produced and presented. The careers were divided into four main categories, namely:

- Architecture and Engineering
- Computer and Mathematical sciences
- Life and Physical Sciences
- Healthcare

The presentation ended with another list of possible science-related courses one could follow at MCAST or at the University of Malta.

For all the presentations, a female guest speaker having a scientific background was also invited. In order for the audience to better relate to these speakers, many of them were students following a science-related degree. During their talk, they recounted their experience as science students and shared their future aspirations with the audience present.

At the end, the students had an opportunity to clarify any doubts they might have had and ask questions which were troubling them. The participation and involvement of the students in this session was very encouraging. The questions asked varied from personal ones to the more generic, such as the requirements to enter into particular careers and the opportunities present in the labour market for science-related professions. Before leaving, the students were also given a three-gate leaflet highlighting the important points covered during the presentation.
Meetings with parents

The important role that parents play in the life of their children cannot be and was not underestimated. The influence they exert, knowingly or unintentionally, on the decisions that their children have to take from time to time is considerable, important and justifiable. For this reason, apart from the four meetings with students, another three meetings were organised with their parents. These meetings were held with the parents of the Form 2 students attending Sir Adrian Dingli Girls’ Junior Lyceum, and the parents of Form 2 and Form 3 students at the Sir Luigi Preziosi Girls’ Secondary School. The parents’ attendance for these meetings was, in general, numerous and enthusiastic.

The meetings followed a similar format to the meetings with students, although they were shorter and more concise. The female guest speakers for these meetings included current science students as well as a female science professional whose daughter also works in a science-related area of study. The parents had the opportunity to ask questions and some also aired their reservations and fears on having their daughters entering a science-related career, and these were replied to by the female guest speakers.

A group of parents at Sir Adrian Dingli Girls’ J.L. during an information meeting with parents before their daughters made the choice of subjects.
**Ms Maria Ciappara**, Head of Carlo Diacono Girls’ J.I., attending a discussion session held with guest speakers and participants of the science club.

**Ms Nadine Avise, Ms Marisa Cassar and Ms Claudine Cassar** as science-oriented female role-models while sharing experiences with a group of students

**Ms Nadine Avise** addressing Form 2 and 3 students and teachers at Sir Luigi Preziosi Girls’ Sec. School.
2. **Pilot Project: “Science Club for Girls”**

Another initiative that was taken to promote science with female students was the launching of a pilot project named “Science Club for Girls”. This project consisted of weekly sessions whereby a group of female students (the ‘Club’) were involved in hands-on activities in science. This took place at the Carlo Diacono Girls’ Junior Lyceum in Zejtun between November 2006 and April 2007. To facilitate the smooth running of this project, a guidebook was prepared with all the necessary information on the aims and procedures of this project (a copy is included in Appendix 2).

The aims

The aims of this project can be summarised as follows:

1. **Creating opportunities** for girls to experiment with and discover for themselves scientific concepts while working with scientific models in a tangible way.

2. **Reinforcing** the concepts and knowledge learned during the normal school hours, by means of scientific exploration in a small group.

3. **Bridging the gender gap in science** by giving girls the opportunity to overcome the stereotyping still associated with science and science-related careers.

4. **Building inter-generational relationships between females interested in science subjects** through the interaction and communication developed between them during the practical sessions. These will, hopefully, provide a sound foundation for a professional network of women in science in the future.

The implementation

All the students attending the Carlo Diacono Girls’ Junior Lyceum were informed of this initiative in October 2006, some days after the start of the new scholastic year. They were given an application form, and those who were interested in participating, were asked to return the application form. A total of fifteen students chose to participate in this project, varying from 11 to 15 years of age.

Prior to starting the actual sessions, a meeting was held with the parents of the participants. These were presented with the main aims of the project, how it will work, and what benefits their children were expected to gain through this experience.
The science club sessions were scheduled for Fridays, during the one-hour mid-day break. The first session was held on the 24th of November 2006, and a total of ten sessions were held. These were carried out under the supervision of Mr. Horace Gauci, a science teacher in the same school. Various activities and scientific investigations took place during these sessions, mainly in the areas of chemistry and the physical sciences. These included experiments in density, convection currents, chemical reactions and pressure. All the participants had the opportunity to discuss the scientific problems at hand, develop a plan of action and, eventually, implement the plan through experiments to reach the desired conclusions. They were also asked to keep some sort of journal where they could record what they did and what the results of the investigations carried out were.

The lack of female role-models for the duration of this project could not remain unaccounted for. Seeing women who have been successful in a science-related subject and listening to their experiences in their respective careers, can surely encourage more girls to follow in their footsteps. With this in mind, a discussion session with female role models was organised during the last session. The guest speakers were Ms Nadine Axila, Ms Claudine Cassar and Ms Marisa Cassar, who all have a different scientific background varying from mathematical and environmental science, to computing and software development, and to pharmaceutical and genetics study. These guests shared their experiences in opting for this career, as well as the fears they had when they decided to enter a science-related field. Finally, they noted the satisfaction which their respective careers give them. The students then had the opportunity to ask questions and discuss issues related to what they heard which were of interest to them. The session ended with words of encouragement by the guest speakers who urged the students to take up science subjects if these interest them, and to challenge the traditional stereotypes and comments they may hear which assume that a career in science is not ideal for a woman.

The project came to a close by means of an exhibition of the girls' work carried out during the ten sessions. A short ceremony was held during the opening of this exhibition where the girls were presented with a 'Certificate of Participation'. This exhibition remained open for three days, and apart from the static display, included also an interactive section where some of the experiments carried out were set-up ready for use. Groups of girls from different schools around Malta (about 200 students from four different schools) visited this exhibition and had the opportunity to try out the experiments set up specifically for this purpose.
'The incredible can-crusher' – is it possible to crash an aluminium can without any effort?

'Rising water' – filling a container with water… while the container is upside down!

A group of visiting students from St. Theresa Girls' J.L. assisted by participants of the science club (right side) conducting an experiment during the interactive exhibition.
Conclusions

The research undertaken and the work carried out throughout the duration of this project was meant to address and fulfil the two main aims forming the foundations of this project. On one hand, there was the statistical component of the project, which included the collation of the results and statistics from various studies and previously published research that were conducted on women in science. On the other hand, there was the dissemination and promotion of science, in particular with secondary school female students.

Statistical Analysis

The analysis of the education statistics gave various interesting and remarkable results.

Starting with the number of students who studied biology and chemistry at secondary school level during the three scholastic years taken into consideration, a clear indication was found that the number of girls studying these two subjects is more than the number of boys. This is true for Biology in both Junior Lyceums and Area Secondary Schools, and also for Chemistry in Junior Lyceums. The actual figures are shown in Table C.1 below.

<table>
<thead>
<tr>
<th>Scholastic Year</th>
<th>Biology</th>
<th>Chemistry</th>
<th>Biology and Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td>2004-05</td>
<td>419</td>
<td>1,242</td>
<td>324</td>
</tr>
<tr>
<td>2005-06</td>
<td>558</td>
<td>1,329</td>
<td>384</td>
</tr>
<tr>
<td>2006-07</td>
<td>601</td>
<td>1,454</td>
<td>393</td>
</tr>
</tbody>
</table>

Table C.1: Number of students studying Biology and Chemistry in Junior Lyceums and Area Secondary Schools

An analysis of the applications submitted for the SEC level examinations revealed that the actual number of female registrations for science subjects was initially smaller than their male counterparts, but then, from 2003 onwards, the registrations submitted by females were greater than the male registrations. However, on calculating the proportion of the female candidates who chose science subjects out of the entire female group sitting for the respective examinations session, it is noted that, in all the sessions considered, this was smaller compared to the proportion of males. In spite of this, the percentage increase over the May 2001 of the female proportion in all the sessions was greater than that of the male proportion. These remarks are illustrated in the following table.
<table>
<thead>
<tr>
<th>SEC Level Exams</th>
<th>Science subjects registrations</th>
<th>Percentage of science subjects registrations out of total number of registrations</th>
<th>Increase over May 2001 of proportion of science subjects registrations out of total registrations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td><strong>May 2001</strong></td>
<td>6673</td>
<td>6584</td>
<td>32.11%</td>
</tr>
<tr>
<td><strong>May 2002</strong></td>
<td>7322</td>
<td>6831</td>
<td>32.24%</td>
</tr>
<tr>
<td><strong>May 2003</strong></td>
<td>7382</td>
<td>7407</td>
<td>33.50%</td>
</tr>
<tr>
<td><strong>May 2004</strong></td>
<td>7299</td>
<td>7470</td>
<td>32.81%</td>
</tr>
<tr>
<td><strong>May 2005</strong></td>
<td>7348</td>
<td>7495</td>
<td>32.32%</td>
</tr>
</tbody>
</table>

*Table C.2: Science registrations at SEC Level*

Focusing on the situation in the Intermediate Level examinations, it is noted that the number of female applicants was always greater than the number of male applicants, although the same cannot be said when analysing the proportion of those applying for science subjects out of the total number of registrations. However, the increase over May 2001 in the proportion of registrations for science subjects out of the total registrations was generally (excluding the May 2005 session) greater for females than for males. Table C.3 illustrates the respective figures and calculations.

<table>
<thead>
<tr>
<th>Intermediate Level Exams</th>
<th>Science subjects registrations</th>
<th>Percentage of science subjects registrations out of total number of registrations</th>
<th>Increase of proportion of science subjects registrations out of total registrations compared to May 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td><strong>May 2001</strong></td>
<td>942</td>
<td>1239</td>
<td>37.29%</td>
</tr>
<tr>
<td><strong>May 2002</strong></td>
<td>971</td>
<td>1282</td>
<td>37.25%</td>
</tr>
<tr>
<td><strong>May 2003</strong></td>
<td>999</td>
<td>1352</td>
<td>37.93%</td>
</tr>
<tr>
<td><strong>May 2004</strong></td>
<td>1060</td>
<td>1409</td>
<td>36.20%</td>
</tr>
<tr>
<td><strong>May 2005</strong></td>
<td>1122</td>
<td>1508</td>
<td>36.38%</td>
</tr>
</tbody>
</table>

*Table C.3: Science registrations at Intermediate Level*
In examining the applications made for the Advanced Level examinations, both the actual number of registrations for science subjects and the proportion of science subjects’ registrations out of the total number of registrations were higher for males than for females in all the examination sessions considered. However, the increase over the May 2001 session of the female proportion of registrations in science was greater than that of the male counterpart in all the sessions. The corresponding amounts and percentages are shown in Table C.4 below.

<table>
<thead>
<tr>
<th>Advanced Level Exams</th>
<th>Science subjects registrations</th>
<th>Percentage of science subjects registrations out of total number of registrations</th>
<th>Increase of proportion of science subjects registrations out of total registrations compared to May 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td>May 2001</td>
<td>1131</td>
<td>757</td>
<td>44.76%</td>
</tr>
<tr>
<td>May 2002</td>
<td>1157</td>
<td>828</td>
<td>46.50%</td>
</tr>
<tr>
<td>May 2003</td>
<td>1047</td>
<td>816</td>
<td>43.09%</td>
</tr>
<tr>
<td>May 2004</td>
<td>1264</td>
<td>849</td>
<td>49.45%</td>
</tr>
<tr>
<td>May 2005</td>
<td>1508</td>
<td>1135</td>
<td>46.30%</td>
</tr>
</tbody>
</table>

Table C.4: Science registrations at Advanced Level

In almost all the sessions, the performance of females in the science subjects at all the three levels was better than that of males. This is reflected in the percentage of females who passed their examinations out of the total number of registrations, which is higher than the percentage of male passes. In fact, Table C.5 below shows that, with the exception of three instances in the SEC Level examinations sessions (2001, 2004, 2005), the percentages for females were always greater than the corresponding percentages for males.
<table>
<thead>
<tr>
<th></th>
<th>SEC Level</th>
<th>Intermediate Level</th>
<th>Advanced Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td>May 2001</td>
<td>57.8%</td>
<td>56.9%</td>
<td>78.0%</td>
</tr>
<tr>
<td>May 2002</td>
<td>58.7%</td>
<td>61.9%</td>
<td>79.0%</td>
</tr>
<tr>
<td>May 2003</td>
<td>60.6%</td>
<td>62.1%</td>
<td>78.8%</td>
</tr>
<tr>
<td>May 2004</td>
<td>61.4%</td>
<td>60.7%</td>
<td>78.1%</td>
</tr>
<tr>
<td>May 2005</td>
<td>63.0%</td>
<td>60.1%</td>
<td>77.9%</td>
</tr>
</tbody>
</table>

Table C.5: Percentage passes out of the total number of candidates in the science subjects at all levels

It could be noted also that there are still subjects attracting many more applications from one particular sex than from the opposite sex. However, in these cases it seems that, as a general rule, the performance of the candidates in the minority group was better than that of the candidates in the dominant group. One possible reason for this is that the few who go against the current and choose a subject which is traditionally associated with the opposite sex, are more interested in the particular subject and, thus, are more committed to perform better than the rest. Also, they are more willing to go through personal sacrifices to prove themselves with the people around them.

In the case of students attending MCAST, it was observed that the male students following a science-related course of study were in a pronounced majority. In the reference period considered (that is between 2001 and 2005) there were on average 17.2% of the female students at MCAST following a science-related course, compared to the 60.4% of the male students who were involved in science. It, thus, comes to no surprise that the number of female graduates in science from MCAST was by far less than the number of male graduates. An issue of concern is that the rate at which the number of male graduates increased between 2002 and 2005, was also faster than the rate of increase of female graduates. This may be due to many reasons, including the greater number of male students, or perhaps, a greater drop-out rate of female students from science-related courses. However, the latter is only a hypothesis which needs further testing and more detailed investigations.

The percentage number of female applicants to science related courses vis-à-vis the total number of applicants at the University of Malta was also less than the corresponding figure for males. Furthermore, a large proportion of the female applicants was concentrated in the Institute of Health Care, which runs traditionally female-dominated health care courses. The resulting situation when these applicants were removed was, obviously, more biased in favour of males. Also, although the
number of female graduates in science increased over the reference period considered, it did not increase proportionally with the number of female graduates from all the courses. In fact, although the actual numbers of graduates in science were almost equally shared out among male and females, when the number of science graduates was expressed as a percentage of the whole group of graduates, the results showed a difference of almost 10% in favour of male students. The reasons behind this also need further investigation, and it could be that, even here, the drop-out rate for females following science courses is bigger than the drop-out rate of males following the same courses or, possibly, bigger than the drop-out rate of females following non-scientific courses. Further research is needed to establish the exact causes.

The employment statistics were more complex and intricate to analyse, and there is room for more analysis on these figures by, possibly, involving other variables. One immediate conclusion that could be reached is that females were more ready to take part-time employment in a science-related career than full-time employment. In fact, the gap between males and females, although still present, was less marked in the case of part-timers. Also, in the reference period considered, certain professions still attracted a particular sex more than the other. For instance, nursing and midwifery was more dominated by females, while mechanical and electrical engineering was the domain of male employees.

The majority of full-time females in a science-related career were single, while, on the other hand, married women were the majority of part-time female employees. This may be due to the fact that female employees leave their full-time career when they decide to start a family. Although many of them may return to the labour market after some time, they might prefer to do this on a part-time basis. In the case of male employees, married men were the main group in both full-time and part-time employment. The average median age of the full-time male employees in science over the reference period was of 37.0 years, while the corresponding figure for female employees was of only 35.5 years. The situation was reversed in the case of part-time employment. The average median age of female was marginally higher than that of males, namely 38.2 years for females against 38.0 years for males. This reinforces the argument made before that females tend to switch to part-time employment once they get married. The mean duration time in the current employment at the end of each year of the reference period was calculated for both full-time and part-time employees. While, male and female part-time employees both spent on average 6.0 years in their current employment, female full-timers spent 10.2 years in their current employment compared to the slightly less 9.6 years of male full-timers.
Dissemination and Promotion of Science

The two promotion and dissemination campaigns that were embarked upon during this project were aimed at motivating and encouraging those girls who were in doubt on whether to choose science subjects due to pressure from their immediate environment, be it parents, peers, relatives or teachers. The giving out of information about science and science-related careers, the opportunity to engage in scientific activity through hands-on experience and the exposure to female role models were the three pillars on which the campaign was built. Both initiatives proved to be achievable and practical, and it is now up to others to copy and ameliorate the examples and models designed and tested in this project.

Final comment

Through the analysis made, conclusions reached and possible courses of action suggested throughout this project, it is hoped that awareness was created on the gender gap existing in science and technology in Malta and on possible remedies to this situation. The benefits of having a shared participation between males and females in science are clear, understood and unquestioned by many. It is desired that the work done in this project and the initiatives taken do not stop with the publication of this document, but this project should serve as an instrument to set the ball rolling for future efforts to translate the dream of equal opportunities for all into a reality.
APPENDICES
Meetings with students and parents –

Powerpoint slides
Choosing Science

Why is Science important?
- Science explains the world.
- Science helps improve our lives.

How understanding science helps you understand the world?
Science:
- Links your practical experience of the world to ideas that explain them.
- Satisfies curiosity about phenomena with explanations.
- Initiates critical and creative thought.
- Shows you how scientific ideas contribute to technological changes.
- Helps you to question and discuss science-based issues.

How will taking Science help you?
- Throughout your life you will meet with the products of science and technology:
  - You'll use mobile phones, take advice from doctors, and see articles in the media.

What can I do next with Science?
- Study an A level in Biology, Chemistry, Mathematics, Technical Design, Computer Studies or Physics.
- Study science in a vocational context: For example a Diploma in Applied Science, a Higher National Diploma in Electrical Engineering.
- There are also science based tertiary courses in, for example, animal nursing, dental technology or engineering.
- Many jobs and careers start with a Secondary Science qualification - all areas of science as well as medicine, pharmacy, environmental studies, engineering and computing.

Women in Science
- Along the years, the contribution of women to science was vital, and it still is.
- Some of these women scientists are:
  - Jeanne Villepreux-Power
  - Florence Nightingale
  - Annie Jump Cannon
  - Marie Curie
  - Rosalind Franklin
  - Maria Gissar
  - Nadine Aissa
Jeanne Villepreux-Power (1794-1871)
- She studied fossil shells and the humble molluscs, as well as Aragonite shells.
- She was the first to create and use aquaria for experimentation in aquatic environments.
- She invented three kinds of glass, one of glass, another of glass surrounded by a cage submerged in the sea, and a third kind of cage which could be sunk and ascended at a given depth in the sea.

Florence Nightingale (1820-1910)
- She studied nursing in Paris and became the superintendent of a women's hospital in London.
- She was in charge of the hospitals in Colne where British troops were fighting a war in 1854.
- She saved many lives and made many changes in the nursing and health profession.
- She became the first woman to win the British Order of Merit.

Annie Jump Cannon (1863-1941)
- She pursued her studies on physics at Wellesley College.
- Her interests were in stars, photography and light spectrums.
- She photographed the solar eclipse in Spain in 1882.
- In 1897, she joined the staff of the Harvard College Observatory where she for over 40 years.
- She named and catalogued over 300,000 stars and developed a classifying system that is still in use today.

Marie Curie (1867-1934)
- She graduated from Paris University and Sorbonne in science.
- She found two very radioactive elements, which she named polonium and radium.
- She calculated the radiation leaving uranium.
- Together with her husband Pierre Curie and with Henri Becquerel, she received the Nobel Prize in Physics in 1903, becoming the first woman ever to receive this award.
- She received another Nobel Prize in Chemistry in 1911.

Rosalind Franklin (1920-1958)
- She is best known for her crucial contributions to the solution of the structure of the DNA and for her insight into what the X-ray diffraction photographs implied.
- Due to her early death, she was not awarded the Nobel Prize for Physiology but her contribution to the discovery was comparable to those who did receive the award.
- She carried research on the tobacco mosaic virus and enzyme.

Who is the scientist?
- People who do science
- People who study science

Careers in Science
- Architecture and Engineering
- Computer and Mathematical
- Life and Physical Scientists
- Healthcare Practitioners
Architecture and Engineering
- Aerospace Engineers
- Architects
- Engineering Technicians
- Computer Hardware Engineers
- Electrical and Electronic Engineering Technicians
- Electrical Engineers
- Industrial Engineers
- Mechanical Engineers

Computer and Mathematical
- Computer Programmers
- Computer Software Engineers
- Computer Systems Analysts
- Mathematicians
- Operations Research Analysts
- Statisticians

Life and Physical Scientists
- Archaeologists
- Astronomers
- Biochemists
- Biologists and Microbiologists
- Chemical Technicians and Chemists
- Forensic Science Technicians
- Physicists
- Plant Scientists
- Agricultural and Food Science Technicians
- Anthropologists

Healthcare Practitioners
- Dentists and Dental Hygienists
- Chiropractors
- Optometrists
- Pharmacists
- Physicians and Surgeons
- Surgeons
- Veterinarians
- Emergency Medical Technicians and Paramedics
- Farmers and General Practitioners
- Occupational Health and Safety Specialists
- Obstetricians and Gynecologists

Where do I study Science?
MCAST
- Institute of Agribusiness
- Institute of Building and Construction Engineering
- Institute of Electrical and Electronics Engineering
- Institute of Information and Communication Technology
- Institute of Mechanical Engineering
- Institute of Community Services
- Institute of Business and Commerce - Diploma in Applied Science

University of Malta
- Faculty of Architecture and Civil Engineering
- Faculty of Dental Surgery
- Faculty of Engineering
- Faculty of Medicine and Surgery
- Faculty of Science
- Institute of Agriculture
- Institute of Conservation and Restoration Studies
- Board of Studies for Information Technology
- Institute of Health Care

Appendix 1: Meetings with students and parents – Powerpoint slides
“Science Clubs for Girls” –

a guidebook
Science Clubs for Girls

A guidebook

"The gender gap in Science and Technology in Malta: evaluating the problem and tackling the issues."
Table of Contents

Preface

Why?

How?

Where and When?

Who?
   The Participants
   The Parents
   The School Science Teachers
   The Group-leaders
   The Science Clubs Coordinator
   The Female Guest Speakers

Follow-up

The Funding
Preface

Many in our society still view Science as a male area and feel that it is not an entirely appropriate field for women to enter. Overcoming this gender stereotype can take a lot of work, although a lot of progress has been made.

A major area causing problems is that the lifestyle science demands in many cases conflicts with the women's family desires and needs, since it is hard to have kids and work the long hours a science career brings with it. The lack of women scientists is not providing an appropriate population of role models for young and not-so-young girls.

The traditional upbringing of girls is also creating another barrier since girls are not encouraged to develop certain skills. They play with dolls, learn to cook, and are rewarded for showing certain personality traits such as empathy, cooperation and kindness. On the other hand, most boys learn to use tools, to build models with blocks, learn about cars, and are rewarded for displaying traits like aggressiveness and competition. Since science historically develops as a masculine activity, the qualities that are rewarded professionally are the traditional male ones. Women who had no hands-on experience when they were younger have a disadvantage in the lab initially, and instead of gaining confidence to pursue a career in science, they lose it.

The experience in the science or computer lab at school increases and strengthens more the confidence in a boy showing an interest for a science-related career. However, many a time, this same experience in labs serves as a deterrent in girls who have an interest in science and other related areas. Even at an older age, women still find the experience in a lab a frightening one, and are afraid that they might press a wrong button and burn down the entire building.

The aim of the "Science Clubs for Girls" is precisely to instill this confidence in our girls. Through their hands-on experience, the experiments they will conduct, the opportunity to construct models and the exposure to female role-models in science, the participants are helped and encouraged to overcome the hurdles that society placed, and is still placing, in front of them in their race towards a science-related career.

John Baptist Gamill
UNESCO Project Coordinator
Why?
The objectives behind the Science Clubs for Girls project are as follows:

Creating opportunities:
The creation of new opportunities for girls to experiment with and discover for themselves scientific concepts is the main objective of these science clubs. The experience which these clubs offer is intended to ignite the creativity of the girls and provoke their thinking skills and capabilities in science and mathematics. These traits, blended with the enthusiasm and energy that the girls radiate, provides an ideal learning environment for the participants to interact with the world around them and learn from their firsthand encounters. Having the participants working with scientific concepts in a tangible way helps them build up confidence in mathematics and science, leading them to continue developing their exploration capabilities in the journey of science and mathematics.

Reinforcement:
The Science Clubs also serve as a reinforcement of the concepts and knowledge learned during the normal school hours. These clubs provide a safe environment for scientific exploration guided by responsible group-leaders. Having small groups of girls working under the supervision of an experienced group-leader gives an opportunity which is sometimes absent from our schools due to the large number of students in class.

Bridging the gender gap in science:
Another objective of the Science Clubs for Girls is to give girls the opportunity to overcome the stereotyping still associated with science and science-related careers. The historical and cultural contexts have throughout the years associated science more with males. These clubs are meant to help in overcoming this gender-related frontier. Consequently, more girls will be likely to pursue a career in science and mathematics, without having these stereotype limitations to their future choices.

Building inter-generational relationship between women scientists:
The relationships which will build up through these science clubs provide a sound foundation for a professional network of women in science. The interaction of young girls, group-leaders and female scientists throughout the experience of this venture offer an inter-generational bond between all the parties involved, which in time will lead to a community of female scientists for future young girls to rely on.
How?

The Science Clubs for Girls consist of a number of small groups for adolescent girls under the supervision of responsible group-leaders. Each group is composed of between 10 and 12 girls having between 11 and 15 years. A female group-leader will be assigned to each group and they will be led by a Science Clubs Coordinator. The role of the group-leaders is of facilitating the learning experience in an informal learning environment. Through the clubs, the girls engage in a wide range of hands-on, project-based activities in the physical sciences (e.g. chemistry, biology, physics) and in engineering. They are presented the opportunity to make connections between science and its real-life applications. The girls are also encouraged to use tools and improve their manual skills and capabilities. The activities they will engage in vary from building small wooden technological projects to experiments in chemistry and biology. Under the guidance of their respective group-leaders, they discuss scientific problems, develop a plan of action, solve the problem at hand, and develop new queries, and at the same time, build the confidence they need to explore new possibilities.

Each girl will keep a scientific diary in which to write about, draw pictures of, and stick photos of her experiences. These are meant to encourage reflection and also as a means for them to communicate with their group-leader. Discussion about scientific notions and about gender issues associated with them is facilitated by means of this journal. For communication to be effective, it cannot be one-way but must be two-way, and, hence, the group-leaders are encouraged to write back to the girls on these journals.

Where and When?

The Science Clubs for Girls will take place at the Carlo Diacono Girls' Junior Lyceum in Żejtun. The school provides the physical space required for these clubs, such as classrooms, open grounds, science and computer laboratories, and workshops, depending on the activities. These are held once a week on Saturday mornings between 10am and 11.30am, for a 10-week period during the scholastic year starting from the first week of November 2006.
Who?

The Participants
The participants in these clubs are girls of age between 11 and 15 years. The girls attending the Carlo Diacono Girls’ Junior Lyceum are initially approached and invited to join these clubs, and they are encouraged to bring along other fellow girls in the mentioned age-group. This is done through meetings with the girls in Forms 1 to 4 which will be held during the first two weeks of October 2006. The initial target is to have three groups each made up of 10 to 12 girls of different ages. The interaction of these girls among themselves and with the group-leader, the sharing of experiences and ideas, and the building of fruitful relationships between all those involved are the key factors for the success of these clubs.

The Parents
Rationale
There is strong evidence that parents’ influence upon their children is a very powerful motivating agent and contributes to a great extent towards the success or failure of projects such as this one. The creation of a successful partnership with the parents from the start of the project is crucial.

Down to practice
An information meeting about these clubs is held with the parents in the first week of October 2006. The parents are given all the information in relation to this initiative, including:
- details of how these science clubs will be run;
- the advantages which the girls participating in these clubs will benefit from; and
- possible contribution they might give by reinforcing their daughters’ interest in science, such as by doing some of the experiments with them, and, thus, showing that they (the parents) themselves are interested in learning too.

One of the main aims is to have the parents encouraging their girls to participate in this project and giving them their support throughout the whole duration of the clubs. During this meeting the parents are encouraged to air their reservations and fears, and ask any questions they might have. At the end, the parents are given related flyers and registration forms to fill in and send them to the Science Clubs Coordinator.
The School Science Teachers

Rationale

Clear and open communication with the school science teachers is fundamental to the success of the project. Teachers lend credibility to the project for both the girls and their parents. Also, some of these teachers might be interested in taking the role of Group-leaders in the science clubs.

Down to practice

A meeting is held with the school science teachers during the first week of October 2006. The aim of this project is explained to them, and they are asked to encourage the girls to participate in these science clubs, especially those who they think could most benefit from this project. They are also given details of the activity-areas that the science clubs will focus on, including examples of the activities that will be taking place. They will be consulted on the experiments done during the normal school hours and ensured that the experiments done in the clubs are different from those done in school-hours. The teachers need to be convinced that the science clubs are aimed to be supplement activities to those activities done in class, and by no means a substitute for them.

The Group-leaders

Rationale

Professional women scientists, female school/college teachers and undergraduate science students bring their enthusiasm for science, knowledge about science and success as scientists or students of science to the project. In so doing, they serve as positive female role models for the girls participating in the clubs. The girls can see directly that female can be successful in science and that the contribution of women in the world of science has been and still is important.

Down to practice

The role of the group-leaders is to facilitate the learning of the participants in these clubs. Thus, the value group-leaders have in this project is of paramount importance. The group-leaders have a sound background in science, and can come from the following different spheres of the society:

1. Science school/college female teachers who are dynamic and practical in their approach to science;
2. University science female undergraduates having a responsible attitude and showing the ability to monitor, guide and provide assistance to the girls during the activities;
3. Professional women scientists having technical expertise and an inclination to mentor and assist the girls in their experiments.
Each group of girls has one group leader assigned to it at any one time. However, during the duration of the entire project, any group can have different group leaders—ideally not more than three. This depends on the number of people showing interest in becoming group leaders, on the number of hours they are willing to volunteer, and on other unforeseen circumstances that may arise during the duration of the project.

**The Science Clubs Coordinator**

Rationale

The retention of the volunteer group leaders in the project requires a commitment from the Science Clubs Coordinator to provide the necessary positive environment throughout the whole project. The Coordinator is responsible for the organization, management and entire functioning of the project. She coordinates resources necessary for the activities and experiments, maintains the budget, supports the group leaders and makes contact with Female Guest Speakers.

Down to practice

The women scientist and undergraduate students are highly motivated, but often lack any teaching experience. The most difficult task for these group leaders is often how to manage the classroom in an efficient and effective way. To ensure the success of the project, the Science Clubs Coordinator should offer all the necessary support to these people. At the beginning of the project, it is crucial for the Coordinator to:

- provide an orientation visit for the group leaders of the school premises;
- set some ground rules for how the project will be run;
- give some tips on how to keep the girls engaged, set limits, build positive expectations, and manage challenging behaviours; and
- distribute a set of activities and experiments that will be taking place during the entire project, together with a time-table for each group’s activity schedule.

**The Female Guest Speakers**

Rationale

All women having a background in science and who are pursuing a science-related career have an important potential role to play in this project. Just seeing a woman who has been successful in science can go a long way. The sharing of experiences of these women with the participants of the science clubs encourages and gives confidence to the girls. These women are all
possible role models for the girls. However, not all of these women can take
the role of group leaders due to various circumstances and commitments they
might already have. To waste such an important resource is too high a price to
pay. Thus, the role of female guest speakers in this project.

Down to practice

Various female scientists renowned in their field of study are invited to share
their experience with the participants of this project. Each session starts off
with a fifteen-minute discussion led by a guest speaker. During this short
period, the guest speaker will have the opportunity to share her experience as
a scientist, recounting her memories from the days when she was still a
secondary school student, going through the times when she decided to choose
science for her future, and finishing off with her current role in society. The
girls will then have the opportunity to ask questions and discuss any concerns
they might have with the speaker.
Follow-up

At the end of the 10-week project, an exhibition of the work done by the girls is organised in the main hall of the school. The parents in particular, and the public in general, is invited to visit this exhibition which. The opening of this exhibition will take place during a short ceremony where some of the girls (about three) participating in these science clubs will be invited to address those present and narrate their experience of the clubs. Together with these girls, women representing the group-leaders and the female guest speakers will also address the audience.

Girls going to different schools around Malta are invited to visit the exhibition which will be open for one week. Interested groups of girls and their teachers are asked to contact the Science Clubs Coordinator for an appointment.

The Funding

While it is possible to run the Science Clubs for Girls as a purely free-of-charge endeavour, the project is most effective if the participants pay a nominal fee of Lm2 each. This fee acts as a discriminating factor between those girls who really want to learn from this experience and those who would participate without any commitment, and, thus, taking the place of other girls that might be really interested in science. The sum collected from these fees will go towards the buying of materials and equipment needed for the project. Other finances (up to a maximum of Lm500) are available through the UNIBECO Programme “The Gender Gap in Science and Technology in Malta: evaluating the problem and tackling the issues”, coordinated jointly by the NCPE, the University of Malta and the ETC.