The Role of Biology Fieldwork in Postsecondary Institutions in Malta

Dissertation Presented to the Faculty of Education in Part Fulfillment of the Requirements for the Degree of Bachelor in Education (Honours) at the University of Malta

May 2010

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Bachelor of Education (Hons.)
2006-2010
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ABSTRACT

VALENTINA AQUILINA

THE ROLE OF BIOLOGY FIELDWORK IN POSTSECONDARY INSTITUTIONS IN MALTA

This study aimed to evaluate the importance which is being given to biology fieldwork at post-secondary level and to compare the benefits of performing fieldwork with its cost in time and resources. Fieldwork practices in Malta were compared to those of a comparable institution in Sweden in order to test the hypothesis that the scope of such activities in Malta is limited by geography and resourcing. The study was conducted through questionnaires which were distributed to post-secondary institutions in Malta and one post-secondary institution in Sweden. All teachers and the majority of students maintained that fieldwork is an indispensable part of the Advanced Level study of Biology. The results showed that all institutions in Malta carry out fieldwork and the differences between institutions lie in quantity, quality, length and location of fieldwork. Half of the students experienced fieldwork within school grounds during a two-hour session. Other institutions travelled to a site specifically for the sake of fieldwork and spent between half a day and a whole day on fieldwork. Most fieldwork activities were combined with statistics and quantitative treatments of results. The results from Sweden were very different from those recorded in Malta due to differences in both geography and resourcing. Although both teachers and students appreciated the value of fieldwork, the amount of fieldwork experienced by students was relatively low. This is attributable to organisational problems, lack of resources and inadequate emphasis in the syllabus.

Dr. S. Lanfranco (Supervisor) B.Ed (HONS.) May 2010

FIELDWORK BIOLOGY POSTSECONDARY
Statement of Authenticity

I, the undersigned declare that this dissertation is my own work carried out under the supervision of Dr. S. Lanfranco.

Valentina Aquilina
To Andrew and my Parents,

For all their help and support
Acknowledgments

I would like to thank all the people who helped me in completion of this work. I would firstly like to express my gratitude to Dr. S. Lanfranco who was always there to find a solution to any of the difficulties I may have experienced and who always offered words of advice which both helped me and guided me.

I would also like to thank all the Head Teachers of the Post-Secondary institution who participated in this study. To all the educators and students who sacrificed their time to respond to the questionnaires, without which this study could not have been conducted.

A special thanks also goes out to my family and close friends who were always there for me to offer their constant support and encouragement. They were deeply appreciated especially during the final months of the completion of this work.
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Chapter 1

Introduction
Chapter 1: Introduction

1.1. Definition of fieldwork

In the context of this thesis, fieldwork may be defined as:

The term ‘fieldwork’, can be split into ‘field’ and ‘work’, showing that this is work which is done out of the classroom and ‘out in the field’. Fieldwork can be defined as any activity that takes place out of the classroom; this can be practical work in an outdoor location or even a visit to a place of biological interest such as a visit to a biological museum or hands on centre, a visit to an industrial site or a botanical garden. Fieldwork may be defined as “the direct observation of the environment and practical scientific enquiry outside the classroom” (Howarth & Slingsby, 2006 p.99). Students get to experience the work of a biologist, for example the work of a person who works in a fish farm or a sewage treatment plant.

When referring to biological fieldwork in Malta at secondary and post-secondary levels of education, more emphasis is being placed upon hands-on practical scientific activities outdoors. This fieldwork is generally associated with the chapter concerning Ecology and normally includes activities such as sampling, observing and quantifying organisms. These activities are normally spread over a few hours or a whole day. The location for these activities is either within school grounds or on a site of biological interest such as woodland, for example Buskett.
1.2. Teaching and Learning Science outside the Classroom

Most subjects can benefit from outdoor learning, yet this is particularly so for the sciences, this is because science can be directly observed from the environment.

1.2.1. A brief history of outdoor science learning.

The concept of outdoor learning is not a novel idea in education. In fact significant figures in educational history such as Johann Comenius (1592-1670) and Jean-Jacques Rousseau (1712-1778) both used direct outdoor experiences.

In their book ‘Learning Science Outside the Classroom’, Braund and Reiss (2004), described Johann Comenius as being a man who believed in a “universal education”, this being an education which not only focused on schooling but also on the family and social life of the child. His view of what he referred to as an “authentic curriculum” includes many references to outdoor learning. This is still important for teachers in this day and age.

In his classic book Emile, Jean-Jacques Rousseau as cited by Braund and Reiss (2004) wrote about the practical and experimental method of teaching and learning, he wrote of its imperative effect upon the development of the child. He based his teaching in natural and outdoor locations.

According to Anning, as cited by Braund and Reiss (2004) in the early twentieth century, Maria Montessori and the Macmillan sisters gave importance to outdoor learning in the education of younger children. This gave rise to a change in British primary education and in the design of schools. These women encouraged outdoor learning experiences such as: sleeping outdoors, gardening and eating. These were considered an important part of schooling for younger children. Their influence in this sector is still seen nowadays in some English
primary schools which were built in the 1930s. Later on after the Second World War, the practice of fieldwork flourished into the use of residential centres due to the increasing interest in conservation and environmental education.

1.2.2. The Benefits of Outdoor Learning

Outdoor education is beneficial for students in various ways. Studies by Rickinson et al. as cited by Dyment (2005 p. 28) show that outdoor learning has various effects upon the “(...) particular cognitive, affective, interpersonal/social, and physical/behavioural impacts of outdoor learning that are occurring through three kinds of outdoor learning activities: (1) fieldwork and outdoor visits; (2) outdoor adventure education; and (3) school grounds and community projects.”

According to Dyment (2005), there are various benefits of outdoor learning for students, teachers and the community. Students who have studied in the outdoors have shown an improved ability of creative and critical thinking, they have also shown an improvement in achievement in standardized tests. Teachers benefit from outdoor learning since students are much more enthusiastic towards learning. The community also benefits since students become better citizens who are more interested in the community.

Evidence from various studies (SEER 2000 and Eaton 2000) on secondary school students showed that students achieved better results at school in various subjects such as science and mathematics after being subjected to outdoor learning. Eaton (2000) as cited by Dillon et al. (2006) found that students’ experience of learning outdoors was more successful in the development of cognitive skills than classroom based learning.
1.3. A Brief History of Fieldwork in Malta

The author could not trace any literature about the history of fieldwork in Malta, so this section was compiled through interviews with people who have significant experience in the area.

1.3.1 Interview with Guido and Edwin Lanfranco: History of Fieldwork in Malta

The study of biology in the Maltese Islands is a relatively recent phenomenon. In the 1930s and 1940s people studied Natural History (at the University of Malta) which was a science based subject which was not considered to be very important. Later on in the 1950s the Departments of Biology, Chemistry and Physics were established. The subject of biology was mainly focused on the topics of classification and anatomy.

During the period 1980-1994, the largest post-secondary institution changed its name a number of times from being the New Lyceum to the Upper Lyceum to the Junior College as it is today (it was called the 'Upper Secondary' in the 1970s). At first no fieldwork used to take place at this post-secondary institution; but with the introduction of foreign examinations such as the Associated Examination Board (AEB) and the London University Examinations, fieldwork started to be given importance since it was considered as a component of the exam. In fact in the AEB exam, fieldwork was a project which could be submitted to the examination board, this project if done properly could elevate the candidates mark by a grade. For this reason one can say that the AEB gave a lot of importance to the fieldwork component of the exam. On the other hand the University of London examination was made up of two parts: the written examination and a practical examination. Part of the mark for the practical examination was contributed by the students’ record of practical work, including fieldwork, carried out during their two year course.
Where and when did fieldwork take place?

For administrative reasons, sites for fieldwork were found close to a school. During the 1980s this normally used to be at Wied il-Ghasel in Mosta which is very close to the Lily of the Valley school. Fieldwork took place in March and was held during school hours instead of a practical session.

What health and safety precautions were taken prior to and during fieldwork?

Prior to the fieldwork Mr. Guido Lanfranco used to inform the local police that they would be conducting fieldwork in the valley and he used to visit the site with someone else to ensure that it is safe since they used to go there in Spring time when hunting was at its peak. Fieldwork took place within walking distance from the Lily of the Valley school where they could take refuge if there was a sudden change in weather.

What type of fieldwork took place?

A site chosen for fieldwork normally contained various habitats such as a freshwater pool or garigue. Before the students arrived, gridlines were drawn; these were important since they gave students boundaries concerning where they were supposed to work. Students who were working individually or in pairs were assigned to a particular part of the grid, therefore everyone was working on a different part of the grid making each student’s work unique.

During fieldwork students used to do various activities such as:

- Use of quadrats to estimate population density and species distribution.
- Estimate distribution of one or two species within the area
- Take note of variation of a particular species within the area; students observed particular features such as: species height, soil within which the species grew and number of flower heads.
• Temperature of the environment
• Soil analysis: to associate particular plants with particular soil types
• Placement of sticks of varying heights in the soil with a test-tube (which was previously covered with petroleum jelly) attached at the top. This was used to study different insects at different heights above the soil.

Since students were assigned a particular spot on the grid, everyone’s result was different and then all the results were pooled in together to have a complete analysis of the area studied.

1. 4. Biology Fieldwork

1.4.1 Advantages for both students and educators

Why is fieldwork so important?

Biology as one of the sciences is truly understood through the observation of the natural environment. In fact according to Professor Anthony Campbell as cited by Howarth and Slingsby (2006), the greatest ideas in science were inspired by the observation of the natural environment. Fieldwork can help biology ‘come alive’ by allowing the students and teachers to get out of the classroom.

According to Ausubel (1968) during fieldwork there is a need for concrete experiences as a shift between primary concepts and secondary concepts. Piaget (1970) also claimed the need for “hands-on experience” being an important experience which helps students transit from a concrete to a more abstract level of cognition. Therefore in fieldwork two types of concepts could be taught: (1) primary concepts which are obtained from sensorimotor
experiences and (2) experience related concepts which, as concrete knowledge which can be built upon in the classroom.

The first hand experience of fieldwork not only helps students understand the subject much more but they also remember what they learnt, since this learning experience was so vivid because it was not something they read about and studied word for word. Fieldwork can be seen as the link between various parts of the biology syllabus for example, pollution, animal and plant anatomy and ecology. Fieldwork according to the British Ecological Society and Field Studies Centre (2002), is a unique opportunity for the participants to “generate data and practice original research.” Through fieldwork, students also develop better interpersonal skills with their classmates and their teacher.

Activity takes place outside of the classroom providing a novel learning environment

According to Tilling (1993 p. 76), “fieldwork does have the capacity to inspire – to instil a sense of awe and wonderment.” He also claims that there is evidence that shows that when students learn in a new setting, their learning is improved, they are also less distracted than if they had to be in class.

Orion (1993 p.325) claims that the main function of a fieldtrip is the “direct experience with concrete phenomena and materials.” Concrete experiences are an important part of fieldwork but these can also be given inside a classroom through photographs; and soil samples could be viewed in a laboratory. The things that make fieldwork so unique are the sensorimotor and the experiential activities related to it. For example if a student was studying a sand dune during fieldwork and he/she had to climb the back of the dune and slide down the front of the dune, this experience could help the students to learn about the dune and its structure.
Through experiential activities students can construct concepts which are abstract and enhance meaningful learning. This provides them with a framework upon which they can memorize episodes in the long term. Therefore it is important when conducting fieldwork to allow our students to experience the environment in a way which would not be possible inside the classroom.

**Fieldwork encourages students to appreciate and care for the environment.**

Environmental education and education for sustainable development are very important to make our students more environmentally aware. Fieldwork is a very good opportunity to make our students more aware of their environment. Clarke (1967) claimed that through fieldwork students appreciated nature and natural resources much more than if they were taught in class. Through fieldwork, students have first-hand experience about the natural environment. Fieldwork can be used to motivate students to appreciate, feel a sense of commitment to the environment and its conservation by understanding the structure of ecosystems and the relationship between the social, economic and political aspects of the world.

**Experiment takes place in an uncontrolled environment different from that of the lab: practicing ‘real science’**

Through fieldwork students are given the opportunity to observe situations that show how biology is used in everyday life. According to Barker, Slingsby & Tilling (2002), fieldwork gives students the chance to practice ‘original research’ that is not controlled or guided, as it would be in the laboratory where they normally conduct experiments. After having experienced fieldwork students learn that science does not always go according to plan, real results are often unpredictable and unexpected. After experiencing fieldwork, students could learn how to apply what they learnt to future experiences that may be on a larger scale and in a different location.
Through fieldwork students learn that the books and information which are presented to them in class do not provide them with all the answers to real life situations. Students are given the opportunity to investigate and study organisms and plants in their original habitat; something that cannot be done in the laboratory. Students learn that animals/plants which they may see in their text books are different from the ones which they see in real life.

1.4.2. Problems encountered by educators

Health and safety of issues

According to Barker, Slingsby and Tilling (2002) due to a number of accidents that involved students on out of classroom activities, various health and safety procedures have come into play. For this reason outdoor activities are now viewed as being hazardous and schools often need to insure their students before taking them out on fieldwork. This may leave many teachers feeling disheartened and may cause them to feel that “the risk is not worth it”. In fact they claim that “Teachers who organise out-of-classroom activities enrich the education of young people immeasurably and yet their contribution often goes unnoticed until something goes wrong.” (Barker, Slingsby and Tilling, 2002, p.10)

Time Constraints

Fisher (2001) claims that few teachers are ready to give up free periods to be involved in ‘out of contract’ activities. Fieldwork as an activity is very dependent on the goodwill of teachers who are willing to take their students out for fieldwork. Another problem with fieldwork is that time needs to be taken from other subject departments which are also under pressure to keep up with course requirements. Therefore biology fieldwork can be carried out within the school grounds such as a ‘redundant greenhouse and an overgrown garden
plot’, moving away from the notion that fieldwork should be carried out in a remote and ‘prestigious location’.

When fieldwork is not an obligate requirement of the assessment system such as is the case in post-secondary Biology Malta, teachers claim that they need all their teaching time to cover the prescribed syllabus. According to Fisher (2001) a lot of lesson time is spent on routine tasks which could be used for more important activities such as fieldwork. Very often the syllabus does not state that a particular topic for example ‘living things in their environment’ should be studied through an investigation. If a topic like ‘living things in their environment’ is not taught through an investigation, it is taught through hypothetical worksheets or perhaps through a video that does not compare with the real thing.

Teacher expertise and training

Barker, Slingsby and Tilling (2002) claimed that teacher enthusiasm is a very important factor related to the amount of fieldwork which is carried out by an institution. Since there is a decline in the amount of fieldwork which is being carried out, trainee teachers are experiencing less fieldwork themselves and are therefore less likely to carry out fieldwork with their students.

As fewer teachers have outdoor experience and training themselves, they are less likely to venture outside and so the cycle continues. (Barker, Slingsby and Tilling, 2002, p.11)

According to Orion (1993 p.325) most teachers think of the outdoors as an unknown learning environment. For this reason they often try not to venture outdoors since they are “unfamiliar with the philosophy, organization and didactics of field trips.”

In their report Barker, Slingsby, and Tilling (2002) claimed that teachers who are well experienced in fieldwork are decreasing in number. New teachers have less experience of fieldwork; many of them only being experienced in the
laboratory or the classroom. For this reason these teachers need more help and support when it comes to the planning of fieldwork. Since teachers do not feel confident or capable in the teaching of ecology through fieldwork, other problems such as health and safety, cost and time constraints only aggravate the problem of the decline in biology fieldwork.

1.5. Diminishing importance given to fieldwork in the MATSEC syllabus

After interviewing Professor Frank Ventura (Appendix 6), chairman of the University of Malta Matriculation and Secondary Education Board (MATSEC), the following points were drawn with regards to the importance given to fieldwork at post-secondary level.

According to Prof. Ventura, the syllabus is written and then it is implemented by different institutions in different ways. There are various factors which limit the amount of fieldwork which is carried out by the school such as time restrictions, parental consent and fieldwork planning among others.

Science, particularly biology, is not just learnt from books but also from experimentation and observation. Fieldwork is one activity which gives the feel of the scientific method and it is therefore not something which can be omitted. This normally entails finding a question that needs to be answered, creating a method to answer this question, finding material with which to experiment, thinking of practical problems which you might encounter, obtaining data required by carrying out the experiment and then analyzing the results.

As can be seen from the Biology ‘A’ Level syllabus and the Biology SEC syllabus, there is a clear decrease in importance being given to fieldwork. Whereas at
Ordinary Level between one to three fieldwork sessions are obligatory; at Advanced Level, fieldwork is not a stipulated and obligatory part of the practical experience. Table 1 contains extracts from the above mentioned syllabi.

**Table 1 - Syllabus Quotations from MATSEC**

<table>
<thead>
<tr>
<th>Level of studies</th>
<th>Syllabus quotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology Ordinary level syllabus 2010</td>
<td><strong>Section 2: Visits and Fieldwork</strong> – compiling the reports from:</td>
</tr>
<tr>
<td></td>
<td>1-3 visits to sites of biological significance, and</td>
</tr>
<tr>
<td></td>
<td>1-3 fieldwork investigations.</td>
</tr>
<tr>
<td>Biology Advanced level syllabus 2010</td>
<td>&quot;10 marks: Good Practical book(s), a record completely covering all sections of the syllabus but with a considerable amount of additional material, i.e. critical appreciation of physiological exercises is expected and fieldwork, if carried out, must be more than just an account of a field course.</td>
</tr>
<tr>
<td></td>
<td>8 marks: Above average practical book(s), a record completely covering all sections of the syllabus but showing evidence of additional effort extra notes, drawings, experiments or fieldwork.</td>
</tr>
<tr>
<td></td>
<td>Marks below 8 did not mention fieldwork at all.</td>
</tr>
</tbody>
</table>
1.6. The purpose of this study

There is very little specific research into the role of science fieldwork in Malta. This research area was initially studied by Cuschieri (1997) whose focus was on the role of all types of fieldwork (both in science, environmental science and in geography) in the secondary sector. The present research investigates the post-secondary sector with regards to fieldwork in biology.

This dissertation will fill a knowledge gap with regards to biology fieldwork in Malta since this area, particularly at post-secondary level has never been researched before. The study is based on data which was obtained through survey.

This dissertation evaluates the importance which is given to biology fieldwork at post-secondary level and examines whether the frequency and quality of fieldwork actually reflects its diminishing importance in the transition from SEC biology to Advanced Matriculation level biology.

This dissertation also investigates the different approaches to fieldwork in post-secondary institutions in Malta and Gozo and compares the benefits of performing fieldwork with its cost in time and resources.

Another objective of this dissertation is to examine the perceptions of educators and students regarding fieldwork since choices regarding the frequency of fieldwork may depend on these subjective factors. The final objective is the comparison of the nature and importance of biology fieldwork in Malta with its role in Sweden, this was done to test the assumption that such activities in Malta are intrinsically limited by its geography and resourcing.
Chapter 2

Methodology
Chapter 2: Methodology

2.1 Area of Study

2.1.1 An account of the post-secondary Educational System in the Maltese Islands.

After students attend primary level and secondary level education from the ages of 5-16 years, which are obligatory for all students, students then sit for their Secondary Education Certificate (SEC) exams. The results obtained in these exams influence whether they will continue studying or not. Students who obtain a pass in their SEC exams can choose to attend one of the various post-secondary institutions.

Post-secondary institutions can be either in the State or Private Sector. The state institutions currently are: Sir Mikelang Refalo Centre for Further Studies post-secondary complex in Victoria, Gozo; Giovanni Curmi Higher Secondary School in Naxxar; Malta College of Arts, Science and Technology (MCAST) and the University of Malta Junior College in Msida. The Private institutions can either be Church schools or Independent schools. There are two main Church schools: Saint Aloysius College Sixth Form and De La Salle Sixth Form. The Independent schools are St. Martin’s College and St. Edward’s College.

Students who fail to obtain the required grades either start a course at MCAST, study at home or attend Giovanni Curmi Higher Secondary School in Naxxar, where they are given an opportunity to continue studying to obtain the necessary grades. Students who have at least a grade 5 in Mathematics, English, Maltese, a Science subject, and any other two subjects are given the opportunity
to attend a post-secondary institution where they can then further their studies to obtain their advanced level certification. This can be done by attending one of the post-secondary institutions mentioned above.

The institution a student attends depends upon the grades which were obtained in the SEC exams. Since the places in church institutions are limited therefore, students are admitted according to merit. On the other hand private institutions accept students against a fee. The governmental institutions are free and open to all students who have the necessary qualifications.

2.1.2. Post-secondary Education in Sweden

The education system in Sweden is different from that in Malta. Students attend compulsory comprehensive school between the ages of 7 to 16 (this school is divided into three stages). At age 16 students can choose whether to continue studying or not; therefore from here on this can be referred to as ‘post-secondary education’. Between the ages of 16-19, students attend a ‘gymnasium’ or an upper-secondary school. At this point students choose particular ‘programmes’ according to the subject which they may wish to specialize in, for example: Natural Science. The programme a student chooses is made up of four types of subjects: core subjects, programme-specific subjects, orientation subjects and individually selected subjects. These programmes give the necessary qualifications for acceptance into a university. Therefore this level of education can be compared to the post-secondary education system in Malta, since both lead to the qualifications required to attend university.

2.1.3. Why did I choose Sweden?

In 2005, while studying for my Advanced level Biology at G.F. Abela Junior College, I was offered an opportunity of a lifetime, the chance to go to Stockholm in Sweden for ten days on a Biology- Environmental Science exchange with another post-secondary institution in Stockholm called: Thorildsplans
Gymnasium. I was so enthused by the opportunity to do fieldwork in a place like Sweden which is so different from Malta in many ways. Prior to this visit I had had very little experience of fieldwork whilst at school; yet the idea of going abroad just for the sake of fieldwork sounded very exciting to me.

Sweden lived up to all of my then expectations, we were given chances to try out various techniques and visit various habitats which are not found in Malta. While I was there we were taken out on ‘fieldwork’ almost every day; we practised traditional fieldwork in a lake, went on a nature walk around a forest, visited a sewage treatment plant, we also visited places of scientific interest such as the Nobel Museum, the Linnaeus Garden and the Vasa Museum.

The person who organized the exchange was Dr. Sandro Lanfranco, who also supervised my dissertation. Since I had contacts in Sweden after my exchange, I thought it was be very interesting to compare the type of fieldwork done in Malta with that which is done in Sweden. This was done by corresponding with one school in Stockholm, Sweden. Since only one post-secondary institution was studied, this is not representative of all post-secondary institutions. Yet the institution which I chose is a typical post-secondary institution within Stockholm and can be said to be representative of that city within Sweden.

The comparative study was done using a questionnaire (Appendix 3, Appendix 4) which was very similar to that which was distributed in the post-secondary institutions in Malta. I also decided to carry out a case study with one Swedish student, who had come to Malta during the exchange and with a Maltese student who had come with me on the exchange. Unfortunately the Swedish students who had come to Malta on the above mentioned exchange did not follow through with their promise to aid me in my studies. For this reason the case study with these students had to be omitted from my research (Appendix 8). On the other hand, eight Maltese students who had gone to Sweden on the exchange agreed to complete an open-ended questionnaire
(Appendix 5); thus allowing me to give a broader view on the fieldwork experiences of Maltese students in Sweden. These will be discussed in the coming chapter.

2.2. Design of the study

Since there is very little information about fieldwork in Malta, I felt that the best way to obtain information about what happened in the past was to ask people who have experience in this field, and this was done by interviewing Edwin and Guido Lanfranco (Appendix 7). Another aspect which was important to this research was the role of MATSEC and the biology syllabus in Advanced level biology studies. Information with regards to MATSEC was obtained through an interview with Professor Frank Ventura (Appendix 6).

The survey was done through two questionnaires which were distributed in various post-secondary institutions. One questionnaire was distributed to the biology teachers (Appendix 2) and the other questionnaire was distributed to biology Advanced level students (Appendix 1). The questionnaire was designed to obtain information about the frequency, quality and type of fieldwork which was being done. Another aim of the questionnaire was to obtain information about the attitudes of the teachers and pupils. The questionnaire was designed for all teachers who taught biology at a post-secondary level and for a sample of the students who took biology at Advanced level. The questionnaire was distributed in the scholastic year 2009-2010. The survey was preceded by a pilot study.

An ulterior objective of this dissertation was to investigate and compare the nature and importance of biology fieldwork in Malta with its role in Sweden in order to test the assumption that such activities in Malta are inherently
limited by geography and resourcing. This was done through questionnaires (Appendix 4, Appendix 5) similar to the ones distributed in Maltese post-secondary school. Since the questionnaires were very similar in nature, they could be compared easily.

A case study with a group of Maltese students, who had gone to Sweden in 2005 on a fieldwork related exchange, was achieved through a questionnaire (Appendix 5) made up of open ended questions which allowed the respondents to elaborate upon their experiences of fieldwork both in Malta and also in Sweden. The purpose of this case study was to investigate the different views on fieldwork as it was done in Malta and also as it was done in Sweden.

2.3. Pilot study

Prior to the actual survey, a pilot study was conducted through the distribution of 10 questionnaires to current student teachers. According to Wellington (2000) the pilot study is an “essential stage” when constructing a good questionnaire. Wellington (2000) also claims that “Testing it on colleagues, friends and family at every stage is one good way to ensure comprehensibility.” The purpose of the pilot study was to test the comprehensibility of the questionnaire, detect deficiencies and make the necessary amendments before distributing the final version of the questionnaire.
2.4. Purpose and design of the final questionnaire

The questionnaire was designed to be short and to the point. This was important since it was meant to take up only a short period of time for the person who was filling it in. This would increase the number of questionnaires which were answered completely and decrease the number of incomplete questionnaires. The questions in the questionnaire were of two main types: questions which were closed ended (where the respondent had to choose the appropriate option) and questions which were open ended to reflect the way the respondent felt about certain issues.

2.5. Sub-divisions of the questionnaire

The questionnaires which were used in this survey were made up of different sections. The questionnaire follows a particular pattern: “closed, matter-of-fact questions to begin, followed by the open-ended questions requiring opinions, feeling and value judgements at the end.” (Wellington, 2000, p. 106).

The questionnaire for teachers was made up of three sections:

(i) The first section dealt with general information about the frequency, location and type of fieldwork being done in the institutions.

(ii) The second section dealt with the resources required for the fieldwork activity to take place.

(iii) The last section dealt with the teacher’s feelings and opinions towards fieldwork.
The questionnaire for students followed a similar pattern but was only made up of two sections.

(i) The first section dealt with general information about the frequency, location and type of fieldwork being done in the institutions.
(ii) The last section dealt with the student's feelings and opinions towards fieldwork.

The first section of both questionnaires was mostly composed of closed ended questions which dealt with factual information about the frequency, location and type of fieldwork which is being conducted in the institutions. The closed-ended questions were presented in such a way as to present all possible answers. Where necessary some questions were left open ended to allow the respondent to fill in.

The second section in the teacher's questionnaire dealt with the resources required for fieldwork. This section was made up of open-ended questions which allowed the teachers to express their opinions and feelings with regards to possession or lack of resources when conducting fieldwork.

The last section in both questionnaires deals with the way both educators and students feel towards fieldwork. This section was very subjective and therefore open-ended questions were more favourable, especially since the questionnaire was anonymous. Since according to Wellington (2000) respondents would be more at ease when answering a survey anonymously and therefore they would be more honest and articulate in their response.
2.6. Target group of the Questionnaire

After obtaining permission from the Education Division and the Archbishop's Curia, the institutions were contacted and when permission was granted, the questionnaires were distributed to the institutions and collected in person. The head of the Biology sector or the Head Teacher of the school was asked to distribute the questionnaires to the relevant teachers of the subject. These were then left at the institution until they were completed; the institution then contacted me when they were completed.

The questionnaires were distributed towards mid-September and collected by the beginning of October. Since there are few post-secondary institutions, the target group consisted of all the institutions; this enabled my study to have a broad view of the situation with regards to fieldwork around all of Malta.

2.7. Setting of the study

All the post-secondary institutions mentioned above were approached and asked to participate in this research. The post-secondary institutions which gave their consent were Sir Mikelang Refalo Centre for Further Studies post-secondary complex in Victoria, Gozo; Giovanni Curmi Higher Secondary School in Naxxar, and University of Malta Junior College in Msida. The Church Schools which gave their consent were Saint Aloysius College Sixth Form and De La Salle Sixth College Form. The Independent Schools did not give their consent for this research.
2.8. Management and Analysis of Data

2.8.1 Quantification of Responses

The results obtained from the questionnaires were then transferred to a Microsoft Excel 2007 spreadsheet. All the responses were coded and then all the questionnaires were quantified. The answers of the respondents were coded using the presence/absence (1/0) method. These results were then used to plot graphs to illustrate the results obtained. Trends in the data were explored using non-metric multidimensional scaling (NMDS) using the software package PAST created by Hammer O., Harper, D. A. T & Ryan, P.D. (2001).

NMDS is a way of reducing and interpreting large multivariate data sets such as the one from this survey. “The algorithm then attempts to place the data points within a two- or three-dimensional coordinate system such that the ranked differences are preserved.” (Hammer O., Harper, D. A. T & Ryan, P.D., 2001).
Chapter 3

Results
Chapter 3: Results

3.1 Questionnaire distribution and response

Of the 180 questionnaires which were distributed to students in the five post-secondary institutions around Malta and Gozo, 156 questionnaires were returned, which is a response rate of 87%. The graph below illustrates the number of students from each post-secondary institution who took the survey.

![Number of students who took the survey](chart.png)

Figure 1: Number of students who took the survey

In all the post-secondary institutions visited, a questionnaire was distributed for each teacher who teaches biology at Advanced level. Of the 25 questionnaires which were distributed to teachers in the post-secondary institutions, 22 questionnaires were returned giving a response rate of 88%. The graph below illustrates the number of teachers from each post-secondary institution who answered the survey.
Since the Swedish questionnaire was placed online through a website which supported questionnaires, the number of students who responded was dependent on the efforts of Swedish teachers (Mr. Lars Bjorklund and Mrs. Cecilia Rehnstrom) who kindly aided me in my studies.
3.2. Evidence illustrating the number of students who are sitting for the Advanced level biology exam has increased rapidly over the years.

Table 2 shows the number of candidates who are sitting for the Advanced Level Biology exam between the year 1998 and 2009 (S. Lanfranco, personal communication). One can note that there has been a steady increase in the number of students sitting for this exam. In fact by looking at Table 2 one can note that in 11 years the number of candidates has approximately tripled. The graphs illustrate the increases and decreases in the number of students sitting for the exam.

Table 2: Number of candidates sitting for the MATSEC examination in Advanced Level Biology during the period 1998-2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>230</td>
</tr>
<tr>
<td>1999</td>
<td>286</td>
</tr>
<tr>
<td>2000</td>
<td>315</td>
</tr>
<tr>
<td>2001</td>
<td>354</td>
</tr>
<tr>
<td>2002</td>
<td>387</td>
</tr>
<tr>
<td>2003</td>
<td>357</td>
</tr>
<tr>
<td>2004</td>
<td>398</td>
</tr>
<tr>
<td>2005</td>
<td>504</td>
</tr>
<tr>
<td>2006</td>
<td>583</td>
</tr>
<tr>
<td>2007</td>
<td>631</td>
</tr>
<tr>
<td>2008</td>
<td>586</td>
</tr>
<tr>
<td>2009</td>
<td>678</td>
</tr>
</tbody>
</table>
Figure 3: Number of candidates sitting for the Advanced level biology exam during the period 1998-2009
3.3. Frequency of fieldwork done in Post-Secondary institutions.

When asked about the frequency of fieldwork which is experienced by students in post-secondary institutions, most teachers claimed that their students experience only one fieldwork session whilst studying Advanced level biology. Only one teacher from Gozo claimed that students experience between two to three fieldwork sessions. On the other hand the Swedish teachers claimed that their students experience two fieldwork sessions whilst studying biology at post-secondary level.

![Figure 4: The quantity of fieldwork taking place in post-secondary institutions](image-url)
3.4. Topics which fieldwork is associated with

When the teachers were asked about which topics were related to the fieldwork activities being done in the post-secondary institution, the following results, as seen in Figure 5 were obtained.

![Bar chart showing the percentage of teachers in Malta and Sweden for different topics related to fieldwork.](image)

**Figure 5: The topics which are related to fieldwork activities by teachers**

As can be seen in the graph, most fieldwork which is done in post-secondary institutions is related to the topic of 'Ecology', then 'Plant Structure and Function' and as can be seen very little fieldwork is done related to the topic of 'Biotechnology'.
3.5. What is the nature of the fieldwork being done in post-secondary institutions?

3.5.1. Where does fieldwork take place?

From the teachers’ questionnaire, the following results were obtained: fieldwork within school grounds (50%) being the most popular choice for fieldwork activities, the second most popular site for fieldwork being Mosta (18%), then Buskett (14%), Bahrija (9%) and Dwejra (5%) in Gozo. On the other hand the sites used for fieldwork by the Swedish teachers were a woodland area and a freshwater lake.

![Figure 6: Location of fieldwork in Malta and Sweden](image-url)
### Table 3: The Location of fieldwork for different Post-Secondary Institutions

<table>
<thead>
<tr>
<th>Name of Post-Secondary Institution</th>
<th>Where fieldwork takes place for students from this institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>De La Salle College Sixth Form</td>
<td>Bahrija (approx. 20km away from school)</td>
</tr>
<tr>
<td>Saint Aloysius College Sixth Form</td>
<td>Buskett (approx. 9km away from school)</td>
</tr>
<tr>
<td>Giovanni Curmi Higher Secondary</td>
<td>Mosta (approx. 3.5 km away from school) and Within School Grounds (within walking distance)</td>
</tr>
<tr>
<td>University of Malta Junior College</td>
<td>Within School Grounds (within walking distance)</td>
</tr>
<tr>
<td>Sir. Mikelang Refalo Centre for Further Studies Post-Secondary Complex</td>
<td>Dwejra, Gozo (approx. 5.5 km away from school)</td>
</tr>
<tr>
<td>Thorildsplans Gymnasium (Sweden)</td>
<td>Woodland and a Freshwater Lake</td>
</tr>
</tbody>
</table>
3.5.2. Length of a fieldwork activity

![Bar chart showing the length of fieldwork activities]

From the results obtained, there is clear evidence that most fieldwork (45%), which is being done, is being restricted to a double lesson. Other teachers claimed that they spent half a day on fieldwork (41%). Very few teachers (9%) spent a whole day on fieldwork. In Sweden the situation is very different since teachers spend a weekend on fieldwork with their students.
3.5.3. Activities which took place during fieldwork

When teachers were asked which activities took place during the fieldwork session, they were given a chance to tick any activities from the ones listed above. They could tick one or more of the activities and could also include any other activity which they may carry out during fieldwork.

As can be seen in pie chart Figure 8, the five most popular activities which take place during fieldwork in Malta, in order of preference:

- Using quadrats and line transects to record statistically fauna and flora in particular areas.
- Comparative study of plants in different habitats.
- Relationship between structure and function (support, xerophytes, hydrophytes).
- Variation between and within species (quantitative analysis—no. of leaves, height of trees, thickness of trunks).
- Construction of a simple food chains and food webs.
- Use of keys to identify trees, insects, pond water animals, flora, soil and litter animals.
- Study of garigue, maquis, woodland, valley and grassland communities.
- Study of rocky and sandy beaches.
- Population studies. Use of markers to record gastropod (snails) mobility.
1. Using quadrats and line transects to record statistically fauna and flora in particular areas.

2. Comparative study of plants in different habitats

3. Variation between and within species (quantitative analysis - no. of leaves, height of trees, thickness of trunks)

4. Relationship between structure and function (support, xerophytes, hydrophytes)

5. Study of garigue, maquis, woodland, valley and grassland communities.

Figure 9: Activities which take place during fieldwork in Sweden
As can be seen from the pie chart Figure 9, the Swedish teachers give equal importance to most of the activities which were mentioned in the survey.

3.5.4. Are fieldwork activities being done by groups or individuals?

From the results in the case of both Malta and Sweden there is a clear inclination for group work during fieldwork. This was clear since in both cases 100% of the group studied claimed that they worked in groups during fieldwork. Yet students in Sweden are also given individual activities as can be seen from the results obtained.

![Bar chart showing percentage of students doing individual and group work during fieldwork in Malta and Sweden]

<table>
<thead>
<tr>
<th></th>
<th>Individual work</th>
<th>Group work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malta</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Sweden</td>
<td>19%</td>
<td>97%</td>
</tr>
</tbody>
</table>

Figure 10: Whether individual or group work activities took place during fieldwork
3.6. Resources required for the fieldwork activities.

3.6.1. Were any fees paid for the fieldwork activities?

From the teachers’ response to this question, any fees which were paid by the students were related to transport for fieldwork. Since most students experience fieldwork within school grounds, no transport was required and therefore they did not need to pay for any fees. In Sweden any fees required for fieldwork are paid by the school.

![Figure 11: Whether or not a fee was paid for any fieldwork activities](image)

3.6.2. Means of travelling during fieldwork

The most common mode of transport in Malta that is used to reach the fieldwork site is by bus (55%) the second most popular mode of transport is on foot (45%). On the other hand in Sweden students reach their site of fieldwork by train (50%) and also on foot (50%).
3.6.3. **Is insurance required for taking students out on fieldwork?**

There was a low response rate to this question since only 60% of the teachers who took the questionnaire answered it. From the results obtained, Maltese students are not insured whilst out on fieldwork. This was because the fieldwork activity took place on school grounds. If the activity did not take place on school grounds, students’ guardians/parents were asked to sign a consent form giving the students permission to go out on fieldwork. On the other hand in Sweden, students are always insured during school time.
3.6.4. Are students being excused from their lessons to go out on fieldwork?

Teachers were asked whether their students were excused from other lessons to be able to go out on fieldwork. As can be seen from Figure 14, more than half the number of teachers claimed that their students are not excused from their other lectures (50%), all other teachers including the Swedish teachers, stated that their students are excused from their other lessons for the purpose of fieldwork.
3.6.5. *Would teachers perform more fieldwork if given the resources (time, apparatus, funding etc.)*

Teachers were asked whether they would incorporate more fieldwork if they were given the resources to do so. 100% of the teachers who responded to the question (22 out of 24 teachers giving a response rate of 92%), claimed that if given the resources they would perform fieldwork. The reasons they gave as to why they would do so are listed in Table 4.
Table 4: shows reasons why teachers would incorporate more fieldwork if given the resources

<table>
<thead>
<tr>
<th>Why would teachers perform more fieldwork if given the resources?</th>
<th>No. of teachers</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Enhanced learning</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>2. Through numerous fieldwork experiences, students grasp the concepts better</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>3. Students enjoy fieldwork</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>4. Students are given more opportunities to practice quantitative research</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>5. Students would be more motivated and involved in the subj.</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>6. More resources mean more opportunities to be explored</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>7. Would perform fieldwork in marine conditions</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>8. Would perform fieldwork in different local habitats</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>11. Students put theory into practice</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>12. Teacher’s time is also a limiting factor</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>

3.6.6. *Does the syllabus influence how much fieldwork students experience?*

Teachers were asked whether the syllabus influences the amount of fieldwork which the students experience. Out of the 24 teachers who took the questionnaire only 15 answered this question, giving a response rate of 63%. Of the 15 teachers who answered this question, 14 (93%) claimed that the syllabus does influence how much fieldwork students experience, only one teacher (7%) said that the syllabus does not influence the amount of fieldwork. The pie chart Figure 15 reflects the responses obtained.
Figure 15: Shows whether the syllabus influences amount of fieldwork experienced by students

Table 5 reflects the reasons why the syllabus influences the amount of fieldwork experienced by students.

Table 5: Reasons why the syllabus influences the amount of fieldwork experienced by students

<table>
<thead>
<tr>
<th>Reason why the syllabus influences the amount of fieldwork students experience</th>
<th>No. of Teachers</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited time to cover remaining topics</td>
<td>11</td>
<td>73</td>
</tr>
<tr>
<td>It is very difficult to organize fieldwork for a lot of students</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>One fieldwork session has to be included in the practical work record</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Fieldwork is tailored to meet syllabus requirements</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Since fieldwork is not obligatory in the syllabus</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>
3.7. Students’ and Teachers’ feelings and attitudes towards fieldwork

3.7.1. Do students enjoy fieldwork?

Most of the students who answered this question said that they did enjoy fieldwork. From the 187 students who took the survey, 185 (99%) students answered this question, 165 (88%) enjoyed fieldwork and 20 (11%) of the students did not enjoy the fieldwork activity.

![Figure 16: Whether or not the students enjoyed the fieldwork activity]

<table>
<thead>
<tr>
<th>Percentage of Students</th>
<th>Malta</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>86%</td>
<td>100%</td>
</tr>
<tr>
<td>No</td>
<td>13%</td>
<td>0%</td>
</tr>
</tbody>
</table>
When asked why they liked or disliked fieldwork the students gave the answers shown in Table 6.

Table 6: Reasons why students liked/disliked fieldwork

<table>
<thead>
<tr>
<th>Reasons why students liked/disliked fieldwork</th>
<th>No. of students</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoy working with friends/groups</td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td>Learn new techniques and info related to the topic</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Learn about new species of plants and animals</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>Enjoyed being outdoors</td>
<td>43</td>
<td>23</td>
</tr>
<tr>
<td>Something interesting/ different/ unique</td>
<td>81</td>
<td>44</td>
</tr>
<tr>
<td>Hands on activity</td>
<td>52</td>
<td>28</td>
</tr>
<tr>
<td>The activity was not interesting</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>The activity was very time consuming</td>
<td>5</td>
<td>2.7</td>
</tr>
<tr>
<td>Involved a lot of work</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Uncomfortable experience</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>A confusing experience</td>
<td>3</td>
<td>1.6</td>
</tr>
<tr>
<td>The activity was not sufficient since took place in a school grounds</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Fieldwork was done just to complete the practical sheets</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>
3.7.2. *Do students think that fieldwork gives them a better understanding of the topic?*

Most of the students who answered this question said that fieldwork helped them to better understand the topic which was related to fieldwork. From the 187 students who took the survey, 185 (99%) students answered this question; 165 (88%) found the fieldwork helped them understand the topic better and 20 (11%) of the students did not find the fieldwork session relevant or interesting to their area of studies. The reasons why students feel that fieldwork gives them a better understanding of the topic are listed in Table 7.

![Figure 17: Whether or not fieldwork gives students a better understanding of the topic being studied](image)

<table>
<thead>
<tr>
<th>Country</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malta</td>
<td>81%</td>
<td>17%</td>
</tr>
<tr>
<td>Sweden</td>
<td>90%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Table 7: How fieldwork gave/did not give students a better understanding of the topic being studied

<table>
<thead>
<tr>
<th>How did fieldwork give/not give students a better understanding of the topic being studied?</th>
<th>No. of students</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn by doing something yourself instead of just reading about it</td>
<td>102</td>
<td>55</td>
</tr>
<tr>
<td>Greater chance to learn the subject in more detail</td>
<td>52</td>
<td>28</td>
</tr>
<tr>
<td>Learn about new/ endemic species of plants and animals</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Learn about new environments</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Gave students an opportunity to practice different techniques not done in class</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Topic was already covered in class</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Did not see the link between fieldwork and the topics being covered in class</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>The area which was studied was limited</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>Did not understand what took place during the activity</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
3.7.3. **Do students think that fieldwork is an important part of their ‘A’ level biology studies? Why?**

Students were asked whether they think that fieldwork is an important part of their advanced level biology studies. From the 187 students who took the survey, 185 answered the questionnaire, 155 (84%) claimed that fieldwork is an important part of their studies, 30 students (16%) said that it is not an important part of their studies. These results can be seen in Table 8.

![Bar chart showing percentage of students who think fieldwork is an important part of their studies](image)

**Figure 18: Whether or not students think fieldwork is an important part of their studies**

Students were then asked why they think that fieldwork is/ is not such an important part of their studies; the following answers in Table 8 were given.
Table 8: Reasons given as to why students think fieldwork is an important part of their studies/is not an important part of their studies.

<table>
<thead>
<tr>
<th>Reasons given as to why students think fieldwork is an important part of their studies/is not an important part of their studies.</th>
<th>Number of students</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To become more aware of animal and plant diversity</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Understand the topic better</td>
<td>49</td>
<td>26</td>
</tr>
<tr>
<td>Allows students to practice what they learnt in lessons</td>
<td>47</td>
<td>25</td>
</tr>
<tr>
<td>Gives them an opportunity to experience real science</td>
<td>47</td>
<td>25</td>
</tr>
<tr>
<td>Prepares them for a job they may have in the future</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>Allows them to sit for and do well in the Advanced level exam</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Makes the subject more interesting</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Would like more fieldwork to take place</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>It involves different aspects of biology</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Gives the students opportunities to practice different skills</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Enhances the relationship between students and also students and teachers</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fieldwork does not need to be done in detail</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>It has a low weighting in the MATSEC exam</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>There is no relation between biology and fieldwork</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

3.7.4. Do teachers feel they have enough ‘teacher training’ with regards to conducting fieldwork?

Teachers were asked to rate their expertise in the area (On a scale of 1-5, 1 being the lowest and 5 being the highest rating.) They were also asked to give a reason why they have chosen this level of expertise. The results can be seen in Figure 19.
Teachers were then asked to write about why they chose this level of expertise. Out of the 23 teachers who took the survey, 20 answered this question. The reasons why teachers chose this level of competence are listed in Table 9.

Table 9: Reasons given by teachers for their self-proclaimed level of proficiency

<table>
<thead>
<tr>
<th>Reasons why teachers chose their level of expertise in fieldwork</th>
<th>No. of teachers</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited experience of fieldwork at university</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Was never given the opportunity to organize a fieldwork trip</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Gained experience by attending courses which included fieldwork</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Experience was gained with time</td>
<td>9</td>
<td>45</td>
</tr>
<tr>
<td>Has a lot of experience and use to conduct residential fieldwork in the past</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Suggests that more teacher training should take place</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Had the opportunity to organize fieldwork during Teaching practice</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Worked on an ecological field-site and built experience this way</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>
3.7.5. Why do teachers think that students benefit from fieldwork?

All the teachers who took this survey claimed that fieldwork is beneficial for students. The reasons why they think that fieldwork is important for students are listed in Table 10.

**Table 10: Reasons why teachers feel that students benefit from fieldwork**

<table>
<thead>
<tr>
<th>Reasons why students benefit from fieldwork</th>
<th>No. of Teachers</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makes the subject more interesting</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Students understand techniques better</td>
<td>8</td>
<td>35</td>
</tr>
<tr>
<td>If students fully understood the content of the topic then fieldwork would reinforce what they have already learnt.</td>
<td>8</td>
<td>35</td>
</tr>
<tr>
<td>Learn how to handle apparatus related to fieldwork</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Students are outdoors</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Learn how to observe different species</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>It is important for students to be in contact with habitats and to experience wildlife instead of being indoors all the time</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Hands on experience</td>
<td>7</td>
<td>30</td>
</tr>
<tr>
<td>Learn how to apply theory to practice especially in an exam</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>Students work together and help each other</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Gives teachers a chance to get to know students better</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Improves students attitude towards the subject</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Fieldwork helps students connect different subjects: all the sciences and also the languages which they use in the report</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
3.7.6. Do teachers think that fieldwork should be a compulsory requirement within the practical section of the biology ‘A’ level exam and why?

All the teachers who answered the survey agreed that fieldwork should be a compulsory part of the biology ‘A’ level exam. The reasons why they think so are listed in Table 11.

Table 11: Reasons why teachers feel fieldwork should/should not be compulsory within the biology ‘A’ level examination

<table>
<thead>
<tr>
<th>Reasons why teachers feel fieldwork should/should not be a compulsory requirement within the practical section of the biology ‘A’ level examination</th>
<th>No. of teachers</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students would appreciate fieldwork more if it was compulsory</td>
<td>8</td>
<td>35</td>
</tr>
<tr>
<td>Accentuates aspects of Ecology</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Fieldwork should be compulsory and central to students Advanced level course</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>Fieldwork should be done in greater detail and depth</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Fieldwork would eventually be eliminated in some schools if it is not made compulsory</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Students need to learn how to apply theory to practice</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Through fieldwork students learn new skills</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Fieldwork is very important since it links various topics</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Students enjoy fieldwork</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>In Sweden fieldwork is a part of the compulsory curriculum.</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
3.8. Ordination Plots of data derived from Non-Metric MDS

The ordination method that we used (NMDS) organises samples in such a way that the distance between the sample points in the ordination diagram corresponds to the dissimilarity distance between samples (that was calculated mathematically by the program). However, the main issue is that a multidimensional data set has to be reduced to a two-dimensional diagram, leading to distortion of the distances between sample points relative to their real mathematical dissimilarities.

NMDS analyses the matrix of dissimilarities in order to find a configuration of the samples in ordination space so that the distances in the ordination diagram correspond to the calculated dissimilarities. The 'stress' of the diagram is a term that is used to quantify the 'lack of fit' between distances in ordination space and the calculated dissimilarities. In other words, it is a measure of how well the ordination diagram reflects the real dissimilarity matrix. The program reshuffles the samples in ordination space in order to obtain a configuration where stress is minimized. The process is iterative, and is carried out several times until the stress values can no longer be reduced further.

The ordination plots obtained through NMDS were clarified by connecting data points representing a particular institution into a convex hull that was colour coded as was listed in Table 12.
Table 12: Colour coded key for ordinate graphs

<table>
<thead>
<tr>
<th>Post-Secondary Institution</th>
<th>Code</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Malta Junior College</td>
<td>JC</td>
<td>RED</td>
</tr>
<tr>
<td>De La Salle College Sixth Form</td>
<td>DLS</td>
<td>YELLOW</td>
</tr>
<tr>
<td>Giovanni Curmi Higher Secondary School</td>
<td>GCHSS</td>
<td>BLUE</td>
</tr>
<tr>
<td>St. Aloysius College Sixth Form</td>
<td>SAC</td>
<td>PINK</td>
</tr>
<tr>
<td>Sir. Mikelang Refalo Centre for Further Studies Post-Secondary Complex</td>
<td>GOZO</td>
<td>GREEN</td>
</tr>
<tr>
<td>Thorildsplans Gymnasium</td>
<td>SWE</td>
<td>LIGHT BLUE</td>
</tr>
</tbody>
</table>
3.8.1. Ordination plots including data from Sweden

![Plot showing data from different institutions.](image)

**Figure 20**: Data obtained from closed ended questions answered by all respondents including the Swedish students. The stress of the plot is: 0.287

If one looks at the graph above, there is considerable clustering with regards to data obtained from GOZO, GCHSS, DLS and SAC. This shows that the data from these institutions is very similar in content which dealt with the frequency, length and type of fieldwork. The convex hull produced by data from SAC had one student who was an outlier since he claimed to have done two fieldwork sessions even though none of the other students claimed to have done so. Data from GCHSS seems to overlap with all institutions showing that within one institution there was a lot of variety. Two of the convex hulls, those of GOZO and DLS overlap almost perfectly showing that the data from the two was very similar in nature.

On the other hand data from both JC and SWE was significantly different from all the other data represented in the plot. This shows that the practices of fieldwork in both Junior College and Sweden are very different from those done in other institutions.
Figure 21: Data obtained from the open ended questions answered by all respondents including the Swedish students. The stress value of this plot is: 0.3476

By observing the ordination plot Figure 21 there are clear differences in the way students look at fieldwork in Malta when compared to the views of Swedish students. In fact there is no overlap at all between the two.

Whereas there were significant differences when dealing with the practices of fieldwork in post-secondary institutions especially in the Maltese scenario as seen in Figure 22, the differences between students’ feelings towards fieldwork were significantly similar as can be seen above. The convex hull which spans the entire range of post-secondary institutions in Malta was that of GOZO and GCHSS. SAC and DLS were very similar in nature, yet extremely different from the results obtained for JC.
Figure 22: Data from the closed ended questions answered by all teachers including the Swedish teachers. Stress value of this plot is 0.1782

As can be seen from the ordination plot Figure 22, the SWE results have compressed all other results obtained. This shows the significant difference between the educators in Malta and Sweden. There were also significant differences between the Maltese educators who teach in different institutions, the only overlap in this plot is between GCHSS and DLS. On the other hand the data from JC is exceptionally different from the data obtained from all other Maltese institutions. In the plot there was one outlier with regards to SAC1 and this was because the participant did not answer many of the questions which were taken into consideration for this plot.
In Figure 23, there is very little overlap between the groups, as can be seen the results from JC and from SWE are very far apart from the other post-secondary institutions. On the other hand, there is some overlap between GOZO, GCHSS and DLS, SAC is also very close to these institutions. The broadest range of responses was observed from GCHSS institution since all teachers gave varied responses with regards to the open ended questions.
3.8.2. Ordination plots of Maltese data

These ordination plots represent the local data collected in the survey, giving a clearer image of the Maltese situation with regards to fieldwork.

Figure 24: Data from closed ended questions of Maltese students. Stress value of this plot: 0.2574

As can be seen from the ordination plot above Figure 24, there is a lot of overlap between the different post-secondary institutions. The two institutions which gave a similar result were DLS and GOZO showing that the fieldwork done in both institutions is very similar in nature. On the other hand SAC and JC are very far apart; in fact JC only overlaps with GCHSS.
Figure 25: Data from open ended questions of Maltese students. Stress value of plot: 0.3165

Again in this graph SAC and DLS gave very similar results as can be seen from the ordination plot Figure 25. Their results overlapped with those obtained from GOZO and GCHSS. The results from JC again did not overlap at all with SAC and DLS. On the other hand the results obtained from GOZO and GCHSS were very varied producing a convex hull which overlapped with all other institutions.
In the above ordination plot Figure 26, there is very little overlap between the post-secondary institutions, this shows that the nature of fieldwork in the different post-secondary institutions is very different. As can be seen, GOZO, JC and SAC are completely cut off from the other post-secondary institutions. With regards to the outlier JC10, this was due to the fact that this particular teacher did not answer many of the questions which were used within this ordination plot.
The above ordination plot (Figure 27) again shows JC on its own and the other post-secondary institutions overlapping each other. This shows that the differences between JC and all other institutions is a recurrent theme especially when observed in this format. Again the vast area covered by the teachers from GCHSS implies that there are varying views towards fieldwork within this institution.
3.9. Case study with Maltese students who visited Sweden in 2005

Open-ended questions were used to understand the perceptions of Maltese students who experienced fieldwork abroad in Sweden. The students were asked six questions which dealt with the differences between fieldwork in Malta and the fieldwork in Sweden, the differences in environment between Malta and Sweden, the similarities between Malta and Sweden and their overall experience of doing fieldwork abroad.

The first question which was asked was: ‘Describe your experience of fieldwork in Sweden.’

From the responses obtained there is clear evidence that all the students who went to Sweden on this exchange really enjoyed doing fieldwork in Sweden.

<table>
<thead>
<tr>
<th>Table 13: Answers given for the first question</th>
</tr>
</thead>
<tbody>
<tr>
<td>They appreciated the fact that in Sweden they experienced different habitats which could not be found in Malta, they also observed different species which are not indigenous to the Maltese islands.</td>
</tr>
<tr>
<td>Students were given a chance to practice different techniques themselves, something which did not occur in Malta, “I found fieldwork very interesting and I liked the hands-on focus very much.”</td>
</tr>
<tr>
<td>Since fieldwork took place under conditions which were not examinable or pressed for time, the experience was much more meaningful.</td>
</tr>
<tr>
<td>Two students claimed that this fieldwork experience encouraged them to consider a career in science, &quot;My first real glimpse of fieldwork occurred in Sweden...After that trip, I started considering taking up a Bachelor in Science with a specialization in Biology and Chemistry, it had never crossed my mind before.&quot;</td>
</tr>
</tbody>
</table>
The second question was: ‘How was your experience of fieldwork in Malta similar to your experience of fieldwork in Sweden?’

Most of the students who took the questionnaire claimed that:

Table 14: Second question of questionnaire

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both fieldwork activities in Malta and in Sweden “involved us learning about the different habitats and species through observation and sampling.”</td>
</tr>
<tr>
<td>In both locations, fieldwork took place outdoors, “the feeling of being out of the classroom, in contact with nature is just great.”</td>
</tr>
<tr>
<td>In Malta and Sweden, activities took place in groups, there was also a person supervising the activities ensuring that everyone is on task.</td>
</tr>
<tr>
<td>Another aspect of the fieldwork activities which was common in both locations was the fact that “it bonded the group members and helped us see each other in a new light.”</td>
</tr>
<tr>
<td>Both fieldwork sessions “fieldwork, both in Sweden and in Malta helped me to understand biological concepts that were dealt with in each session and these were then easier to bring to mind and remember in our exams.”</td>
</tr>
</tbody>
</table>
The third question was: How was your experience of fieldwork in Malta different from your experience of fieldwork in Sweden?

There were various differences presented by the respondents, these were a few of the most prevalent differences.

**Table 15: Third question of questionnaire**

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>The length of the fieldwork activity, whereas in Malta fieldwork was done</td>
<td></td>
</tr>
<tr>
<td>in a two hour slot, a whole day was dedicated to fieldwork in Sweden.</td>
<td></td>
</tr>
<tr>
<td>The location of fieldwork in Sweden was always very far away; in Malta the</td>
<td></td>
</tr>
<tr>
<td>locations of fieldwork are always relatively close.</td>
<td></td>
</tr>
<tr>
<td>The habitats and species in Sweden were completely different for example:</td>
<td></td>
</tr>
<tr>
<td>natural forests.</td>
<td></td>
</tr>
<tr>
<td>In Sweden we studied water-related habitats which we were never given an</td>
<td></td>
</tr>
<tr>
<td>opportunity to study in Malta.</td>
<td></td>
</tr>
<tr>
<td>In Malta the students ‘knew what to expect’ but in Sweden they were always</td>
<td></td>
</tr>
<tr>
<td>in a novel setting making the activity much more challenging.</td>
<td></td>
</tr>
<tr>
<td>In Sweden, students had a much better ‘friendly’ relationship with their</td>
<td></td>
</tr>
<tr>
<td>supervisor making it much easier to ask questions.</td>
<td></td>
</tr>
</tbody>
</table>
The fourth question was: What differences (which were relevant to fieldwork) did you note about Sweden when compared to Malta, during your stay? (Your answer can include: temperature, climate, size, distances of travel etc.)

The most prevalent differences observed by the students were the following:

Table 16: Fourth question of the questionnaire

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>The temperatures in Sweden were always much lower than the temperatures in</td>
<td>The temperatures in Sweden were always much lower than the temperatures in Malta.</td>
</tr>
<tr>
<td>Malta.</td>
<td></td>
</tr>
<tr>
<td>Since Sweden is much larger in size, the distances of travel were also much</td>
<td>Since Sweden is much larger in size, the distances of travel were also much longer.</td>
</tr>
<tr>
<td>longer.</td>
<td></td>
</tr>
<tr>
<td>Rainfall in Sweden is much more prevalent, this leads to rivers and lakes</td>
<td>Rainfall in Sweden is much more prevalent, this leads to rivers and lakes which are not found in Malta. In Sweden we also studied an area made up of brackish water, not found in Malta. These features give rise to very different habitats which are not found in Malta.</td>
</tr>
<tr>
<td>which are not found in Malta.</td>
<td></td>
</tr>
<tr>
<td>In Sweden we used apparatus such as data loggers which were not available</td>
<td>In Sweden we used apparatus such as data loggers which were not available to us in Malta.</td>
</tr>
<tr>
<td>to us in Malta.</td>
<td></td>
</tr>
<tr>
<td>Sea temperature was much colder in Sweden than the sea temperature in</td>
<td>Sea temperature was much colder in Sweden than the sea temperature in Malta.</td>
</tr>
<tr>
<td>Malta.</td>
<td></td>
</tr>
<tr>
<td>Only a small area was used for fieldwork in Malta whereas in Sweden field-</td>
<td>Only a small area was used for fieldwork in Malta whereas in Sweden fieldwork took place in a larger area of land.</td>
</tr>
</tbody>
</table>
The fifth question: Did you visit any type of environment/ habitat which you would not find in Malta?

We visited various sites which one would not find in Malta, these were the ones mentioned:

Table 17: Question five of the questionnaire

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A river/ lake which had an influx of</td>
<td>Natural forests which are never found in Malta</td>
</tr>
<tr>
<td>sea water making the water brackish.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>With regards to site visits we went to: the Nobel Museum, the</td>
</tr>
<tr>
<td></td>
<td>Linnaeus Garden and the Vasa museum.</td>
</tr>
</tbody>
</table>
The last question number six was: What type of activities did you do whilst on fieldwork? (for example: observation, sampling: quadrats, line transects).
Were these activities similar to those which you did in Malta?

Table 18: Question six of the questionnaire

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>In Sweden we did a lot of observation work such as nature walks, an activity which we never did in Malta.</td>
<td></td>
</tr>
<tr>
<td>We also sampled an area with water such as a lake by using nets. In Malta we never did any activity related to water even though we live in an island surrounded by sea.</td>
<td></td>
</tr>
<tr>
<td>Whilst doing fieldwork in Malta we used line transects and measured the temperature. We did not do these activities in Sweden.</td>
<td></td>
</tr>
<tr>
<td>Most of the techniques of performing fieldwork are similar worldwide, the apparatus used and the habitats and diversity are what make the difference.</td>
<td></td>
</tr>
<tr>
<td>In Malta we counted the number of plants within a quadrat, whereas in Sweden we took samples back to the lab to be analysed.</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 4

Discussion
Chapter 4: Discussion

4.1. Response to the Questionnaires

The teachers’ and students’ response to the questionnaire gave a clear picture of the Maltese situation with regards to fieldwork in post-secondary institutions. The fact that the questionnaire was simple and to the point, together with the fact that the questionnaires were distributed and collected personally all ensured that there was a fairly high response rate from both teachers and students.

Most of the biology teachers from the post-secondary institutions answered the survey. On the other hand a sample of students from each institution was given a questionnaire, these students were chosen at random. For this reason there was no element of bias with regards to the response sample.

4.2. Performance of fieldwork in Post-Secondary Institutions

4.2.1. How often does fieldwork take place and how long are the fieldwork activities.

All the Maltese teachers who answered the survey claimed that their students experienced at least one fieldwork session throughout their Biology ‘A’ level studies. Most of the teachers claimed that their students experience one fieldwork session. Only one teacher from Gozo claimed that his/her students may experience two to three fieldwork sessions. The teachers from Sweden
claimed that their students experience at least two fieldwork sessions throughout their advanced studies.

Although all students experience fieldwork, the quality of the fieldwork activities is different in different institutions. This can be seen by referring to Figure 7 in the results.

The reluctance of teachers to carry out fieldwork in the weekend is understandable since this would mean that they would have to dedicate their free time to the academic work of their students. Fisher (2001) claims that fieldwork is very much dependent on the ‘goodwill’ of teachers, who would have to sacrifice time to plan the activity and also to implement it. Teachers may also find it difficult to organise such an activity since these activities require a lot of planning and resources. Students may not be willing to dedicate their own weekends for the sake of fieldwork. This is especially the case with students who may have a part-time job or other obligations in their free time. According to Fisher (2001, p.90) ‘Students now have part-time, paid employment, during evenings and at weekends which they (and their parents) regard as important, therefore it becomes difficult to persuade some to give up ‘out of school’ time for the sake of experiencing desirable, but non-essential fieldwork.’

As could be seen from the results, fieldwork in Sweden normally takes place over a weekend, at a field centre which was made available to the school. Whereas in Malta most students only experience a few hours of fieldwork, students in Sweden are given an opportunity to experience four days of fieldwork, at a location which is specifically designed for this purpose. This indicates that teachers in Sweden are willing to dedicate time both for planning of a fieldwork activity and implementing it. On the other hand, in Sweden, the costs of the fieldwork activity (accommodation, food and laboratory usage) are covered by the school, both for the students and also for the teacher, making this activity much more viable. Whereas in Sweden field centres are available to be used by post-secondary teachers, in Malta no such field centre currently
exists, making it much harder for teachers to plan an activity which spans over a whole weekend. Very often teachers in Malta are not given the necessary resources (such as funding) to implement such an activity.

4.2.2. Site preference for fieldwork activities

There is clear evidence from the results (Figure 6), obtained that teachers make use of a variety of sites for their fieldwork activities. Most post-secondary institutions, take their students out on fieldwork to places which are close to the institution. Yet since Malta is such a small country, all locations are relatively close and little time is ever spent on travelling. Therefore institutions should not limit themselves to places which are close by or convenient to visit. For example, Buskett is the traditional location to carry out fieldwork; this does not mean that it is the best place for fieldwork.

On the other hand, Sweden is a much larger country which offers a variety of habitats and locations within which one can carry out field. Yet distances in Sweden are much longer and the proportion of time dedicated to travelling is much higher. A Maltese student who visited Sweden claimed that: “The location of fieldwork in Sweden was always very far away; in Malta the locations of fieldwork are always relatively close.” Therefore it is much more viable for the Swedish educators to carry out fieldwork over a weekend within a particular ecosystem, for example, close to a lake.

From the results, there is clear evidence that state run post-secondary institutions use the school premises for fieldwork activities. This is a solution to the problem which is being caused by the ever increasing number of students who are sitting for their advanced level biology exam. As could be seen from the results (Figure 3) the number of candidates over the past eleven years has tripled. Most of these students attend state run post-secondary institutions. As the number of students taking Biology at Advanced level increase, so do the difficulties faced by educators who organise the fieldwork activities. Therefore
using the school grounds is less time consuming and is also easier to organize and co-ordinate.

According to Fisher (2001, p.89), the general belief is that fieldwork necessitates ‘extended periods away from the classroom’. This could result in time being taken away from other subject departments which are not willing to sacrifice lesson time since they are also under pressure to meet syllabus requirements. These long fieldwork sessions also cause problems on the Head Teacher since he would need to decide on priorities. Therefore fieldwork within school grounds is a quick and easy alternative. Although these locations may be ‘unglamorous’ to students, they may be more meaningful since the students are studying their own environment. The school grounds can be designed in such a manner as to facilitate fieldwork for example by allowing a garden plot to become overgrown.

4.2.3. Topics which teachers associate with fieldwork

From the results (Figure 5) there is clear evidence that illustrates the fact that most teachers associate any fieldwork with ecology. Since time is limited, teachers try to make the most of the time they have out on the field with their students. Therefore they try to perform fieldwork in conjunction with statistics (such as the t-test and the Chi-Squared Test).

When one looks at the MATSEC Advanced Level Biology syllabus requirements (p.3), fieldwork is described in this manner: “fieldwork, if carried out, must be more than just an account of a field course.” This implies that students need to carry out some form of activity which is not just the observation of the field site. Therefore teachers take the opportunity to include these statistical tests where fieldwork is involved, giving students a real-situation within which to apply these calculations. Calculations which when done in a theoretical manner may be very abstract for some students who ‘learn by doing’.
Teachers could incorporate different topics in a fieldwork session, making the experience much more interesting since students are allowed to integrate the different topics in biology, not just ecology. For example ‘plant structure and function’ can easily be integrated with both the topics of ‘ecology’ and ‘classification’. In Sweden, equal importance is given to all topics except biotechnology.

4.2.4. Activities which take place during fieldwork

From the results obtained, there was clear evidence that activities which are done during fieldwork are done in groups, both in Malta and in Sweden. By allowing students to work in groups, teachers are allowing the interpersonal relationships between the students to be strengthened. In fact four teachers claimed that through fieldwork, ‘students work together and help each other’. A Maltese student who went to Sweden on the exchange claimed that the fieldwork experiences: “bonded the group members and helped us see each other in a new light.”

As can be seen from the results obtained (Figure 8), fieldwork which is related to statistics (measurement and recording of data) is given the most importance by Maltese educators. This is probably due to the importance given to this kind of fieldwork by MATSEC. Students and teachers alike feel that fieldwork of this kind, prepares students for problems of a similar nature, which they may find in exams. One teacher claimed that fieldwork allowed students to: “apply theory to practice, especially in an exam.”

The activities which were given the least importance by educators are generally activities which are done ‘on paper’ in class; for example the use of keys to identify organisms, the construction of food chains and food webs and population studies using theoretical situations. It is a pity that in Malta educators do not take their students to marine habitats when Malta is an island surrounded by sea which offers varied coastal habitats. A Maltese student who visited Sweden for fieldwork said: “We also sampled an area with water such as
a lake by using nets. In Malta we never did any activity related to water even though we live in an island surrounded by sea.” This may be due to safety concerns and because it may also not coincide with the teacher’s area of specialization.

4.3. Resources required for fieldwork

4.3.1. Are fees paid for fieldwork activities?

As could be seen from the results (Figure 11), most students did not need to pay any kind of fee for fieldwork activities. In Malta, the only fee incurred due to fieldwork was that of transport: to and from the location of fieldwork. In Sweden any costs incurred from fieldwork are paid for by the school itself, the students do not pay for any part of the activity. Yet this is a very rare situation, in fact according to Fisher:

“Financial limits set for educational budgets rarely allow for the funding of transport or for the overnight accommodation of students without substantial parental or other support, and this now seems to have become a major factor in determining the opportunities for field studies” Fisher (2001, p.89)

According to Fisher (2001) very often students coming from less prosperous families whose parents cannot afford to pay for school activities are robbed of any chances to carry out fieldwork, since fieldwork is not considered an integral part of the science syllabus. Therefore to give everyone a fair chance, decisions are made where not just the privileged students can benefit from fieldwork activities, setting a standard for all students not just the wealthy ones who can afford to pay for such activities. In some post-secondary institutions, this may very well be the situation, for this reason fieldwork is being done within school grounds giving everyone an equal chance to experience fieldwork
at negligible cost. Yet since Maltese students are given a stipend, this resource could be exploited for the sake of fieldwork.

4.3.2. Insurance and fieldwork

From the responses given by the Maltese teachers who took the survey, students do not need to be insured during fieldwork activities. Students are just required to obtain a signature on a letter of consent from their parents, implying that they can go out on fieldwork. This is not the case in other countries, as can be seen in the case of Sweden where all students in the city of Stockholm are insured during school hours. The implication of insurance with fieldwork arose after various accidents which took place when students were out on an educational excursion.

According to Barker, Slingsby and Tilling (2002), various accidents which occur outside of the classroom may highlight the fact that fieldwork is dangerous. Very often when these incidents occur, it is the teacher and the school which gets the blame, even when the incident would clearly be accidental. Various teachers feel that the risks of fieldwork outweigh the benefits. In fact according to Fisher (2001) the fear of an accident is not only affecting fieldwork but it is also affecting laboratory science, making experiments over-safe, bland and on various occasions boring. “The excitement and involvement, which turned many of us toward science in the past, has been replaced with paper exercises, second hand experience and theoretical commentaries.” (Fisher, 2001, p. 92.) Therefore it is important to consider what our students are missing out on, when everything is made safe and predictable in science.
4.3.4. Time Constraints and fieldwork

Time restrictions seem to be one of the principal causes of the limited amount of fieldwork which is being done in post-secondary institutions. Approximately half of Maltese teachers claimed that their students are not excused from other lessons to conduct fieldwork. This limited their fieldwork sessions to two hours or at most half a day. On the other hand, only one Maltese teacher claimed that his students were excused for a whole day for the sake of fieldwork. This shows that even though teachers may be interested in conducting fieldwork, they may find objections from the institution’s administration, making it difficult to take students out in the field. This is probably because there is little importance given to biology fieldwork in the syllabus.

As could be seen from the results (Figure 14), the Swedish teachers claimed that their students were excused from their other lessons because of fieldwork. This is probably because fieldwork is a compulsory part of the curriculum; therefore it is given much more importance. A Swedish teacher claimed:

“Biology is much more than just being in the classroom. Many of our students had never had any experience of being in the nature, fieldwork was the first time to row a boat, to catch fish with a net, to pick up small animals and observe them using a microscope. It is vital to allow our students to experience real science.” Swedish educator- Mrs. Cecilia Rehnstrom

According to Fisher (2001), most of a student’s lesson time is spent on “routine tasks” which “serve little purpose in the process of developing a conceptual understanding of science, and which clearly fail to intellectually challenge and engage the more able students.” (Fisher, 2001, p. 84). Very often these routine tasks can easily be done at home. Lesson time should be spent on demanding activities which require a teacher’s expertise such as fieldwork and practical sessions which can be challenging to students of all abilities.
Barker, Slingsby and Tilling (2002) claimed that students can learn so much more when they are out in the field, theory can be taught outdoors making the experience both enjoyable and interesting. In fact they stated that students think of fieldwork as one of the most memorable and “deeply satisfying aspect of their ‘A’ level studies.” Students are often astonished with the amount of material which they learnt in such a short period of time. When fieldwork is done well, “intellectual activity and fun go hand in hand.” Therefore theory can be taught through fieldwork making the students’ learning experiences both interesting and unique.

4.3.5. If given more resources would teachers perform more fieldwork

All of the teachers who took this survey said that if given the resources required, they would do more fieldwork. This demonstrates the fact that although most teachers are aware of the benefits of fieldwork they are being kept back. Cuschieri (1997) also found that a larger proportion of teachers would have liked to teach more fieldwork if given the opportunity to do so. Teachers gave various reasons why they would perform more fieldwork if given the chance to do so; the most common reason was that if given the resources teachers would perform fieldwork in different local habitats including marine conditions. Another response to this question was that students’ learning is enhanced through fieldwork.

Teachers understand that through fieldwork students enjoy the subject, grasp concepts better, are more motivated and interested in the subject and that students learn how to put theory to practice. These responses were consistent with the results obtained by Cuschieri (1997, p.87) who found that “the vast majority of Maltese teachers accept fieldwork as a necessary part of the effective teaching of biology.” On the other hand Swedish teachers claimed that the teacher’s time is also a limiting factor which needs to be taken into consideration.
4.3.6. Whether or not the syllabus influences the amount of fieldwork students experience and whether or not teachers feel biology should be a compulsory part of the syllabus.

When asked whether the syllabus influences the amount of fieldwork being done, the majority of teachers claimed that the syllabus does have an effect on the quantity of fieldwork being done. Most teachers feel that they are restricted by time since they have a lot of topics to cover and therefore this limits the fieldwork done. One teacher claimed that at least one fieldwork session has to be included in the practical course and another teacher claims that the fieldwork session is tailored to meet syllabus requirements. Yet the syllabus clearly states that biology fieldwork is not an obligatory part of the syllabus, this shows that some teachers are unsure about what is stated in the biology advanced level syllabus. Only one teacher claimed that fieldwork is not obligatory part of the syllabus.

All the teachers who took part in this survey claimed that fieldwork should be a compulsory part of the syllabus. Many of the teachers claimed that if fieldwork were compulsory students would appreciate the activity much more. This indicates that the students’ attitudes towards the subject of fieldwork may have an effect upon teachers’ regard for the activity. Many teachers feel that biology fieldwork should be a central part of the students’ ‘A’ level studies and that it should be done in greater detail and depth. Other teachers fear that fieldwork will be eliminated by some schools in the future if it is not made compulsory.
4.4. Specific attitudes of students to biology fieldwork

4.4.1. Whether or not students enjoy fieldwork

After observing the results, (Table 6) there were various reasons why students enjoyed/did not enjoy fieldwork. Most of the students claimed that the fieldwork session was an interesting activity which was different and unique since they were outdoors instead of in a classroom or laboratory. Another aspect of fieldwork which was appreciated by many students was the fact that it is a 'hands on activity', they also enjoyed the fact that they could work with their friends and in groups. Through fieldwork students learnt new techniques and information related to the topic being studied and also about local species of animals and plants.

The main reason students did not enjoy fieldwork was that they felt that the fieldwork session was only done to complete the laboratory sheets which were prepared for the occasion. They felt that the fieldwork was only being done to fill some kind of quota of their practical course. Some students felt that the fieldwork session was not sufficient since it took place within school grounds. Other students found the activity boring and very time consuming. These results show that time which is supposed to be spent on fieldwork is not being spent wisely. According to Dillon (2006 p.6), “Teachers and other outdoor educators should consistently help pupils to understand how what the experience in the outdoor classroom connects to, extends, and reinforces their in-school work.” Some students did not enjoy the work which was involved in the fieldwork session. Other students felt uncomfortable and confused during the fieldwork session. These may have been due to inappropriate timing of the session and inapt instructions.
4.4.2. Importance given to fieldwork by students

As could be seen from the results (Table 8), most of the students who answered the survey said that fieldwork is an important part of their ‘A’ level studies. The students gave various reasons why they think fieldwork is important/not important. A few students even wish that more fieldwork was included in their ‘A’ level studies. Most students feel that fieldwork gives them a better understanding of the topic. For many students, fieldwork makes the subject being studied much more interesting. It also gives them an opportunity to put to practice what they have learnt in class and experience real science. Fieldwork allows students to integrate various topics in biology, allows students to practice a variety of skills and also prepares them for a job which they may have in the future. In fact one student who went to Sweden on the exchange claimed that “after that trip, I started considering taking up a Bachelor in Science with a specialization in Biology and Chemistry, it had never crossed my mind before”, this shows that fieldwork can have an effect upon students’ future careers.

Another aspect of fieldwork which was brought up by the students who took this survey was that of the enhanced teacher/student, student-student relationship after fieldwork. For some students fieldwork gives them an opportunity to become more aware of animal and plant diversity. Other students think that fieldwork allows them to sit for and do well in the ‘A’ level exam.

The students who thought that fieldwork was not important claimed that fieldwork does not need to be done in detail, that it has a low weighting in the MATSEC exam and that there is no relation between fieldwork and biology. According to Fisher (2001), students often do not see the need for fieldwork. Fisher claims that students try to achieve qualifications with the “minimum amount of effort and application.” Since qualifications can be achieved without the need of research in the field, students cannot be blamed for having this attitude towards the subject of fieldwork and the work it entails.
4.5. Specific attitudes of teachers to biology fieldwork

4.5.1. Whether or not teachers feel they are suitably trained to conduct fieldwork

Teachers were asked to rank their expertise in the area of fieldwork on a scale of 1-5, one being the lowest and five being the highest level of expertise. The majority of Maltese teachers (48%) who answered this question, ranked themselves as a ‘3’, showing that most teachers feel they have an intermediate level of expertise in the area of fieldwork. 19 percent of teachers claimed that their level of expertise can be ranked as being a ‘2’, showing that they do not feel very confident with regards to fieldwork. Two Maltese teachers claimed their level of expertise is that of a ‘4’ and one Maltese teacher who has a lot of experience in teaching biology, ranked himself as a ‘5’, the highest level of expertise in the area. On the other hand both Swedish teachers claimed that their level of expertise in fieldwork can be ranked as a ‘4’ due to their numerous experiences whilst working on an ecological field site in the past.

With regards to the Maltese situation, there were various reasons why teachers felt that they had/did not have a high level of expertise with regards to fieldwork. Half of the teachers claimed that experience and expertise are gained with time and cannot be achieved immediately. One teacher stated that in the past he use to organize residential fieldwork for his students. Some teachers claimed that experience was gained through organizing fieldwork, and attending courses which included fieldwork. On the other hand, many teachers felt that they did not receive adequate training with regards to fieldwork at university level and suggest that more training in this area should be done at university. One teacher said that he/she was never given the chance to organize a fieldwork trip.
According to Fisher (2001), younger teachers may not value the role of biology fieldwork since they themselves are coming from an academic background which is based on a “modular” degree therefore they themselves never had any formal ‘field qualifications’. For this reason many teachers feel they are not very knowledgeable in the area. On the other hand in Sweden the teachers participating in this survey had a background which was based on a ‘field-site’ giving them the knowledge and experience which many local teachers feel they are lacking.

4.5.2. Whether or not teachers feel that students benefit from fieldwork

As could be seen from the results Table 10, all teachers think that students benefit from fieldwork activities. The reasons why teachers felt that students benefit from fieldwork were very similar in nature to the reasons given by the students for why they appreciate fieldwork. Teachers feel that students benefit by just being in the outdoors, this is especially true for some students who have little or no opportunity to be outdoors. Fieldwork allows students to become closer to each other and also to their teacher it also allowed them to work in groups. According to Dillon et al. (2006) teachers normally appreciate the informal settings brought about by fieldwork since this allows them to get to know their students better.

The teachers also claimed that students appreciate the subject more through fieldwork. Fieldwork made the subject more interesting for the students it also improved the students’ attitude towards the subject. Since through fieldwork students appreciated local fauna and flora and understood the subject being studied better.

Another aspect of fieldwork which was discussed by the teachers, was that through fieldwork, students gain many psychomotor skills, such as how to handle apparatus used in fieldwork. Students are given a chance to practice what they learnt in class and also to connect different subjects, both out on the field and also through the report which they would hand in after the activity.
4.6. Differences and similarities between the post-secondary institutions with regards to fieldwork

By looking at the plots shown in section 0, there is clear evidence that there are distinctions between the post-secondary institutions. With regards to the Maltese situation, the greatest differences were between Junior College (JC) and the other Maltese post-secondary institutions. This was mainly due to the fact that fieldwork at JC takes place within school grounds, in a small plot of land which is used for this purpose. Since JC has the largest number of students, organizing a fieldtrip for all the students attending this institution is very difficult; this fact was pointed out by many of the teachers who also feel that students should experience more fieldwork. Yet this is very difficult since students are not excused from their other lessons for the sake of fieldwork, thus limiting any fieldwork sessions to a meagre two hour session. The students attending this post-secondary institution felt that the fieldwork session was just done to complete the practical sheets which were given to them at the beginning of the year and also felt that the activity was not sufficient since it took place within school grounds. This shows that although both teachers and students look favourably towards fieldwork, limitations in resources such as time has had a negative effect upon the fieldwork done in this institution.

The only institution which overlapped with JC was that of Giovanni Curmi Higher Secondary School (GCHSS), this was because some students who are currently at GCHSS were repeating their advanced level studies after being at JC. GCHSS also overlapped with the other post-secondary institutions. All other institutions carried out fieldwork once and outside of the school grounds; this is because these institutions have fewer students, therefore making it much easier for the teachers to take their students out on fieldwork. Students in these post-secondary institutions are also excused from their other lessons for the sake of fieldwork. Students from these post-secondary institutions enjoyed the
fieldwork activity much more than students from JC. This shows that students appreciate environments which are foreign to them much more than those which are familiar such as the school grounds. This was because in habitats which were foreign to them, they could observe different habitats which contained flora and fauna which are indigenous to Malta. The results from Gozo showed that fieldwork is different because students experience a whole day of fieldwork when compared to all other institutions where students only experience half a day of fieldwork.

The results from Sweden were very different from the results obtained from the Maltese institutions as could be seen in the ordination plots. This is mainly because the Swedish teachers are given more resources such as time, financial aid and also support from the administration in the post-secondary institutions. Fieldwork in Sweden takes place twice over a weekend since this cuts back on travelling costs since distances are much longer in Sweden. Teachers in Sweden do not need to worry about injuries which students may incur during the field trip since students are always insured for school related activities. This is a benefit which Maltese teachers do not have. It is also important to note that in Sweden, fieldwork is an obligatory part of the curriculum which is not the case in Malta. Since fieldwork is obligatory this puts pressure on the teachers to give fieldwork more importance.
Chapter 5

Conclusion
Chapter 5: Conclusion

From this study the following conclusions were reached:

1. Although there is a diminishing importance given to fieldwork in the transition from SEC biology to MATSEC Advanced level biology, all post-secondary institutions perform fieldwork. There is no significant difference in the quantity of fieldwork which is carried out in state run and church run institutions.

2. Although fieldwork is being done in every post-secondary institution, the quality of fieldwork in different post-secondary institutions varies.

3. The number of students which attend a post-secondary institution has an effect upon the amount and quality of fieldwork which students experience. The greater the number of students, the more difficult it is to cater for all of them with regards to fieldwork.

4. Teachers perform fieldwork within school grounds and in other locations which are normally in the vicinity of the institution. This shows that teachers use a variety of resources with regards to locations for fieldwork.

5. The length of fieldwork activities depend very much upon the policies and organisation of the institution and upon whether students are excused from their other lessons to attend the fieldwork session. Most fieldwork sessions in Malta last between two hours to half a scholastic day. On the other hand in Gozo fieldwork activities last for a whole day.

6. So far insurance is not a key limiting factor with regards to fieldwork in the Maltese Islands.
7. With regards to the different approaches to fieldwork being utilised by schools, fieldwork related to quantitative research is preferred by most teachers. Therefore the activities which take place during fieldwork are used to cater for this type of research, such as the use of quadrats and line transects.

8. The perceptions and attitudes of educators and students towards fieldwork were very positive. Both educators and students felt that fieldwork is an important and indispensable part of the students’ advanced biology studies.

9. All educators felt that students benefit from fieldwork since through fieldwork students are outdoors, are able to practice different skills, put theory to practice and develop better interpersonal relationships both with their colleagues and with their teachers.

10. Students felt that fieldwork is an enjoyable experience, since it helps them appreciate local flora and fauna, strengthens the relationships with their classmates and teachers, allows them to work in groups, gives them an opportunity to practice what they learnt in class, prepares them for a future career in science and gives them an opportunity to practice real science.

11. Therefore one can conclude that the limited amount of fieldwork which is done in some institutions has no relation with the perceptions of educators and students.

12. The differences between Malta and Sweden were quite evident since students in Sweden experience two weekend-long fieldwork sessions throughout their studies. There is clear evidence that educators in Sweden are better resourced with regards to fieldwork. All fieldwork activities are paid for by the school, students are also insured for any activities which are school related. Even though distances are always greater in Sweden, they still perform much more fieldwork than the Maltese institutions.
Limitations of research:

1. The teacher's gender, age and area of specialization were not taken into consideration in this research. These factors may have an effect upon the way that teachers perceive the subject of fieldwork.

2. The post-secondary institutions did not include the private institutions since they did not wish to participate in the research, the inclusion of their information would have made the study much more representative of the Maltese situation with regards to fieldwork.

3. The research would have been more valid if the Maltese institutions were compared to more than one post-secondary institution in Sweden.

Recommendations:

1. Since the benefits of fieldwork are many, it is recommended that post-secondary institutions give students a chance to experience proper work which will not only leave a memorable experience but which will also help the students to understand the key biological concepts which are being studied and give them a feel for the scientific method.

2. When possible fieldwork should take place outside of school grounds since students appreciate this type of fieldwork much more than they would within a familiar setting.

3. Post-secondary institutions should choose a fieldwork site which is appropriate to the work which they would like their students to carry out.

4. Prior to taking their students out on fieldwork, educators should prepare their students for the session through lessons, talks and the distribution of resources such as handouts. After the session has taken place, educators
should also include follow-up work. Through activities before and after the fieldwork session, educators obtain the maximum benefit from the field experiences. These activities also allow the students to place their learning within a context which makes the activity more meaningful.

5. Future research in this field should include the teacher’s gender, age and area of specialization since these factors may influence the quantity and quality of fieldwork which students experience.

6. Another recommended area of research would be that of the observation of fieldwork sessions and the comparison of pedagogies implemented during these sessions.
Appendix 1

Questionnaire distributed to Maltese students in post-secondary institutions
Appendix 1

The following is the questionnaire distributed to Maltese students in post-secondary institutions.

Questionnaire for students

Name of post-secondary institution__________________

Dear student,

Firstly I would like to thank you for accepting to answer the following questionnaire. My name is Valentina Aquilina and I am a third year student at University. Your answers will be used to better understand the role and importance given to biological fieldwork in post-secondary schools, such as the one you are in. Please tick the answer which best suits your reply and where necessary please fill in your reply.

Thanking you in advance,

Valentina Aquilina

Section 1:

Please enter the sign (X) were needed

1. Did you have any fieldwork sessions since you started first year at your post-secondary school?
   - 0 times
   - 1 time
   - 2 times
   - More than 3 times
2. Which topic was this fieldwork associated with?
   - Ecology [ ]
   - Classification [ ]
   - Plant structure and function [ ]
   - Other (if so please specify) ______________

3. What activities did you carry out whilst doing fieldwork?
   Tick with a (✓) if this activity took place whilst you were doing fieldwork

<table>
<thead>
<tr>
<th>Activity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Using quadrats and line transects to record statistically fauina and flora in particular areas.</td>
<td></td>
</tr>
<tr>
<td>Comparative study of plants in different habitats</td>
<td></td>
</tr>
<tr>
<td>Relationship between structure and function (support, xerophytes, hydrophytes)</td>
<td></td>
</tr>
<tr>
<td>Variation between and within species (quantitative analysis- no. of leaves, height of trees, thickness of trunks)</td>
<td></td>
</tr>
<tr>
<td>Construction of a simple food chains and food webs.</td>
<td></td>
</tr>
<tr>
<td>Use of keys to identify trees, insects, pond water animals, flora, soil and litter animals</td>
<td></td>
</tr>
<tr>
<td>Study of garigue, maquis, woodland, valley and grassland communities</td>
<td></td>
</tr>
<tr>
<td>Study of rocky and sandy beaches</td>
<td></td>
</tr>
<tr>
<td>Population studies. Use of markers to record gastropod(snails) mobility</td>
<td></td>
</tr>
<tr>
<td>Other... if yes please specify where.</td>
<td></td>
</tr>
</tbody>
</table>
4. Where did this fieldwork take place and how did you go to the location of fieldwork?
   - Buskett
   - Chadwick lakes
   - Near the sea (if so please specify where)
   - Dingli
   - Dwejra (Gozo)
   - Within school grounds
   - Other (if so please specify where)

5. How long was the fieldwork activity?
   - A double lesson
   - Half a day
   - A whole day
   - A weekend

6. Did you need to pay a fee for any activity that took place during fieldwork? If yes why?
   - Yes _____
   - No _____
   - Why?

7. Did you work individually or in groups?
   - Individually _____
   - Groups _____

Section 2:
1. Did you enjoy the fieldwork activity?
   - Yes _____
   - No _____
   - Why?
2. Has it given you a better understanding of the topic being studied?
   Yes ____  No ____
   Why?
   --------------------------------------------------------------
   --------------------------------------------------------------

3. Do you think that fieldwork is an important part of your ‘A’ level biology studies? Why?
   Yes ____  No ____
   Why?
   --------------------------------------------------------------
   --------------------------------------------------------------
Appendix 2

Questionnaire distributed to Maltese teachers in post-secondary institutions
Appendix 2

The following is the questionnaire distributed to Maltese teachers in post-secondary institutions.

Name of post-secondary institution: ________________

Dear teacher,

Firstly I would like to thank you for accepting to answer the following questionnaire. My name is Valentina Aquilina and I am a fourth year student at University. Your answers will be used to better understand the role and importance given to biological fieldwork in post-secondary schools, such as the one you are in. Please tick the answer which best suits your reply and where necessary please fill in your reply.

Thanking you in advance,

Valentina Aquilina

Section 1:

1. How many fieldwork sessions do your ‘A’ level biology students experience throughout their ‘A’ level biology course?

1 ___  3 ___

2 ___  4 ___
2. Where does this fieldwork take place?

Buskett
Chadwick lakes
Near the sea (if so please specify where)
Dingli
Dwejra (Gozo)
Within school grounds
Other (if so please specify where)

3. How did you go to the location of the fieldwork?

By bus
On foot

4. Which topic was this fieldwork associated with?

Ecology
Classification
Plant structure and function
Biotechnology
Other (if so please specify where)
5. What activities did you carry out whilst doing fieldwork?

Tick with a (✓) if this activity took place whilst you were doing fieldwork

<table>
<thead>
<tr>
<th>Activity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Using quadrats and line transects to record statistically fauna and flora in particular areas.</td>
<td></td>
</tr>
<tr>
<td>Comparative study of plants in different habitats</td>
<td></td>
</tr>
<tr>
<td>Relationship between structure and function (support, xerophytes, hydrophytes)</td>
<td></td>
</tr>
<tr>
<td>Variation between and within species (quantitative analysis- no. Of leaves, height of trees, thickness of trunks)</td>
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</tr>
<tr>
<td>Construction of a simple food chains and food webs.</td>
<td></td>
</tr>
<tr>
<td>Use of keys to identify trees, insects, pond water animals, flora, soil and litter animals</td>
<td></td>
</tr>
<tr>
<td>Study of garigue, maquis, woodland, valley and grassland communities</td>
<td></td>
</tr>
<tr>
<td>Study of rocky and sandy beaches</td>
<td></td>
</tr>
<tr>
<td>Population studies. Use of markers to record gastropod(snails) mobility</td>
<td></td>
</tr>
<tr>
<td>A place of biological interest, such as the biotechnology centre in Lija</td>
<td></td>
</tr>
<tr>
<td>Other... if yes please specify.</td>
<td></td>
</tr>
</tbody>
</table>

6. How long was the fieldwork activity?

A double lesson  _____
Half a day  _____
A whole day ______
A weekend ______

Section 2:

8. Did you need to pay a fee for any activity that took place during fieldwork? If yes why?
Yes _____ No _____
Why?
____________________________________________________________________________________
____________________________________________________________________________________

9. Did the institution need to fund any type of insurance for the students to be allowed to go out on fieldwork? Why?
Yes _____ No _____
Why?
____________________________________________________________________________________

10. Where the students excused from their other lessons to attend fieldwork or was the fieldwork limited to a lecture session?
____________________________________________________________________________________
____________________________________________________________________________________

11. If given the resources (time, apparatus, funding etc.) would you incorporate more fieldwork than what is already being done by the school? Why?
Yes _____ No _____
Why?
____________________________________________________________________________________
____________________________________________________________________________________
12. Does the syllabus influence how much fieldwork your students experience?
   Yes ____  No ____
   Why?
   __________________________________________________________________________
   __________________________________________________________________________

Section 3:

1. As a qualified teacher of Biology, do you feel that you had enough teacher training with regards to conducting fieldwork? (On a scale of 1-5, rate your expertise in the area, 1 being the lowest and 5 being the highest rating) Why have you chosen this level of expertise?
   1  2  3  4  5
   Why?
   __________________________________________________________________________
   __________________________________________________________________________

2. Do you think that students benefit from fieldwork? If so, in which ways?
   __________________________________________________________________________
   __________________________________________________________________________

3. Do you think that fieldwork should be a compulsory requirement within the practical section of the Biology ‘A’ level exam? Why?
   Yes ____  No ____
   Why?
   __________________________________________________________________________
   __________________________________________________________________________
Appendix 3

Questionnaire distributed to Swedish students in
Thorildsplans Gymnasium
Appendix 3

Questionnaire for students in Sweden.

Name of post-secondary institution____________

Dear student,

Firstly I would like to thank you for accepting to answer the following questionnaire. My name is Valentina Aquilina and I am a fourth year student at the University of Malta. Your answers will be used to better understand the role and importance given to biological fieldwork in post-secondary schools, such as the one you are in. Please tick the answer that best suits your reply and where necessary please fill in your reply.

Thanking you in advance,

Valentina Aquilina

Section 1:

Please enter the sign (X) were needed

1. Did you have any fieldwork sessions since you started studying Biology school?
   0 times ☐  1 time ☐  2 times ☐  3 times ☐
   more than 3 times ☐

2. Which topic was this fieldwork associated with?
   Ecology ☐
   Classification ☐
3. What activities did you carry out whilst doing fieldwork?  
Tick with a (✓) if this activity took place whilst you were doing fieldwork

<table>
<thead>
<tr>
<th>Activity</th>
</tr>
</thead>
</table>
| Using quadrats and line transects to record statistically fauna and flora in particular areas. | ✓  
| Comparative study of plants in different habitats                      |  
| Relationship between structure and function (support, xerophytes, hydrophytes) |  
| Variation between and within species (quantitative analysis-no. Of leaves, height of trees, thickness of trunks) |  
| Construction of a simple food chains and food webs.                    |  
| Use of keys to identify trees, insects, pond water animals, flora, soil and litter animals |  
| Study of garigue, maquis, woodland, valley and grassland communities    |  
| Study of rocky and sandy beaches                                       |  
| Population studies. Use of markers to record gastropod (snails) mobility |  
| Other... if yes please specify where.                                  |  

4. Where did this fieldwork take place and how did you go to the location of fieldwork?

<table>
<thead>
<tr>
<th>Location</th>
</tr>
</thead>
</table>
| Forest/ woodland                       | ✓  
| Fresh water pond                       |  
| Near the sea (if so please specify where) |  
| Fresh water lake                       |  
| Within school grounds                  |  

104
5. How long was the fieldwork activity?
A double lesson
Half a day
A whole day
A weekend

6. Did you need to pay a fee for any activity that took place during fieldwork? If yes why?
Yes ___ No ___
Why?

7. Did you work individually or in groups?
Individually _____ Groups _____

Section 2:

4. Did you enjoy the fieldwork activity?
Yes ___ No ___
Why?

5. Has it given you a better understanding of the topic being studied?
Yes ___ No ___
Why?

Other (if so please specify where) _____

105
6. Do you think that fieldwork is an important part of your Biology studies? Why?
   Yes _____  No _____
   Why?
   
   ______________________________________________________________________________________
   
   ______________________________________________________________________________________
Appendix 4

Questionnaire distributed to Swedish teachers in Thorildsplans Gymnasium
Appendix 4

Questionnaire for teachers in Sweden.

Name of post-secondary institution:________________________

Dear Teacher,

Firstly I would like to thank you for accepting to answer the following questionnaire. My name is Valentina Aquilina and I am a fourth year student at the University of Malta. Your answers will be used to better understand the role and importance given to biological fieldwork in post-secondary schools, such as the one you are in. Please tick the answer that best suits your reply and where necessary please fill in your reply.

Thanking you in advance,

Valentina Aquilina

Section 1:

1. How many fieldwork sessions do your biology students experience throughout their biology course?

   1 ___               3 ___

   2 ___               4 ___
2. Where does this fieldwork take place?

- Woodland/forest
- Fresh water pond
- Near the sea (if so please specify where)
- Fresh water lake
- Within school grounds
- Other (if so please specify where)

3. How did you go to the location of the fieldwork?

- By bus
- On foot
- By train

4. Which topic was this fieldwork associated with?

- Ecology
- Classification
- Plant structure and function
- Biotechnology
5. What activities did you carry out whilst doing fieldwork?

Tick with a (√) if this activity took place whilst you were doing fieldwork

<table>
<thead>
<tr>
<th>Activity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Using quadrats and line transects to record statistically fauna and flora in particular areas.</td>
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<td>Construction of a simple food chains and food webs.</td>
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</tr>
<tr>
<td>Population studies. Use of markers to record gastropod(snails) mobility</td>
<td></td>
</tr>
<tr>
<td>Other... if yes please specify.</td>
<td></td>
</tr>
</tbody>
</table>

6. How long was the fieldwork activity?

<table>
<thead>
<tr>
<th>Duration</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A double lesson</td>
<td></td>
</tr>
<tr>
<td>Half a day</td>
<td></td>
</tr>
<tr>
<td>A whole day</td>
<td></td>
</tr>
<tr>
<td>A weekend</td>
<td></td>
</tr>
</tbody>
</table>
Section 2:

1. Did you need to pay a fee for any activity that took place during fieldwork? If yes why?
   Yes ____  No ____
   Why?
   ________________________________________________________________
   ________________________________________________________________

2. Did the institution need to fund any type of insurance for the students to be allowed to go out on fieldwork? Why?
   Yes ____  No ____
   Why?
   ________________________________________________________________
   ________________________________________________________________

3. Where the students excused from their other lessons to attend fieldwork or was the fieldwork limited to a lecture session?
   ________________________________________________________________
   ________________________________________________________________

4. If given the resources (time, apparatus, funding etc.) would you incorporate more fieldwork than what is already being done by the school? Why?
   Yes ____  No ____
   Why?
   ________________________________________________________________
   ________________________________________________________________
Section 3:

1. As a qualified teacher of Biology, do you feel that you had enough teacher training with regards to conducting fieldwork? (On a scale of 1-5, rate your expertise in the area, 1 being the lowest and 5 being the highest rating) Why have you chosen this level of expertise?
   
   Why?
   
   _____________________________________________________________
   _____________________________________________________________

2. Do you think that students benefit from fieldwork? If so, in which ways?
   
   _____________________________________________________________
   _____________________________________________________________

3. Is Biology fieldwork a compulsory part of your students’ studied? Why?
   Yes _____ No _____
   Why?
   
   _____________________________________________________________
   _____________________________________________________________


Appendix 5

Questionnaire distributed to Maltese students who carried out fieldwork in Sweden whilst on an exchange in 2005
Appendix 5

Questionnaire distributed to Maltese students who carried out fieldwork in Sweden whilst on an exchange in 2005.

Question 1:

How would you describe your experience of fieldwork in Sweden?

________________________________________________________________________________________________
________________________________________________________________________________________________
________________________________________________________________________________________________

Question 2:

How was your experience of fieldwork in Malta similar to your experience of fieldwork in Sweden?

________________________________________________________________________________________________
________________________________________________________________________________________________
________________________________________________________________________________________________

Question 3:

How was your experience of fieldwork in Malta different from your experience of fieldwork in Sweden?

________________________________________________________________________________________________
________________________________________________________________________________________________
________________________________________________________________________________________________
Question 4:

What differences (which were relevant to fieldwork) did you note about Sweden when compared to Malta, during your stay? (Your answer can include: temperature, climate, size, distances of travel etc.)

________________________________________________________________________________________

________________________________________________________________________________________

Question 5:

Did you visit any type of environment/habitat which you would not find in Malta?

________________________________________________________________________________________

________________________________________________________________________________________

Question 6:

What type of activities did you do whilst on fieldwork? (for example: observation, sampling: quadrats, line transects). Were these activities similar to those which you did in Malta?

________________________________________________________________________________________

________________________________________________________________________________________
Appendix 6

Interview with Professor Ventura
Appendix 6

Interview with Prof. Ventura (who is both an educator and the chairman of the MATSEC department) regarding the history of biology fieldwork in recent decades.

Date of interview: 11/12/2008

In your view, has the frequency of fieldwork in science changed during the course of your career or has it remained more or less the same?

Biology was taught at sixth form level in the 1960s to the late 1980s, it was taught at various institutions:

Junior College in Valletta, St. Joseph at Corradino which was the Government Sixth Form.

Frank Pace was the Head of the biology department in 1969 and there was no formal fieldwork since it was probably not in the syllabus.

In 1973 two institutions joined together to form the Upper Secondary School which was housed in Evans building in Valletta. Guido Lanfranco became the Head of department and there was an increase in the amount of fieldwork. Mr. Lanfranco was keen on fieldwork and included it whenever possible.
Where did this fieldwork take place?

Fieldwork was done at the Science Field Study Centre (SFC) which was owned by the Education Division. Students between form 3 and 5 were taken to Mellieha (the centre was located instead of what is now the Danish Village) and fieldwork took place in the Ghadira area.

Residential fieldwork in the 1960s, took place at Dingli at Villa Psaigon which is located close to Buskett. Fieldwork took place within Buskett.

How has the form of science fieldwork changed during these years? Is it still substantially the same activity or has there been a noticeable shift in attitudes and practices?

The activities which come to mind are:

Capture-recapture techniques for example of snails.

Observation of trees and habitats.

Since Biology is not Prof. Ventura's area of study, he had little knowledge with regards to this question.

What do you think the trend will be like in years to come?

Students would actually do the activities and take measurements which they can then plot graphs and extrapolate data from them.
Are student-teachers, in your experience, likely to look favourably upon fieldwork?

This depends on the student’s experience of fieldwork, whether they themselves had found fieldwork enjoyable or not.

- Do you think that increasing awareness of health and safety issues would eventually make fieldwork unviable?

- Several educational institutions are now insuring their students and educators during fieldwork sessions and whilst this is obviously a positive development it does also mean that the expenses incurred are now significantly greater. Might this mean that fieldwork may eventually be perceived as too expensive or too risky?

Fieldwork activities require responsible educators who can supervise students who are working in different areas, a class of 20/30 would only have two teachers supervising them.

Health and safety issues are a problem and some teachers are not willing to undertake that risk.

Fieldwork activities require a lot of planning, organisation and preparation. Students need follow up activities such as write ups to keep them on task.

As chairman of MATSEC do you think that enough time is allocated to fieldwork or is it crowded out by the theoretical part of the syllabi. In other words, as a matter of policy, would MATSEC be prepared to omit field sessions from the syllabus, keep them as they are or mandate an increase?

The syllabus is written and then it is implemented in different ways by different institutions, this varies according to the institution and the educators within it.
On one hand, missing lessons because of fieldwork would probably be frowned upon by other educators. A lot of planning and coordination with the institution is required to carry out fieldwork. Parental consent is required and needs to be obtained prior to any fieldwork activity.

Science is not learnt just from books, science is learnt from observations and activities which give the feel of the scientific method. Fieldwork is a good way through which students can practice the scientific method. The scientific method where students develop a question, then a method, decide on materials and practical problems which may arise, they then obtain data and analyse it.
Appendix 7

Transcript of interview with Guido and Edwin Lanfranco
Appendix 7

Interview with Guido and Edwin Lanfranco

Date of interview: 26/8/2009

Notes taken during interview:

The study of Biology in the Maltese Islands is a recent phenomenon. In the 30s and 40s people studied Natural History which was a scientific based subject which was not considered to be very important. Later on in the 50s the Department of Biology, Chemistry and Physics were established. The subject of Biology was mainly focused on the topics of classification and anatomy.

1980-1994- The post-secondary institution has changed from being the New Lyceum to the Upper Lyceum to the Junior College as it is today. (Upper Secondary --→ 1970s) At first no fieldwork used to take place at these post secondary institutions; but with the introduction of foreign exams such as the AEB and the University of London GCSE Examinations, fieldwork started to be given importance since it was considered as a component of the exam. In fact in the AEB exam, fieldwork was a project which could be submitted to the examination board, this project if done properly could elevate the candidates mark by a grade. For this reason one can say that the AEB gave a lot of importance to the fieldwork component of the exam. On the other hand the London examination was made up of two parts: the examination itself and the practical book (a book/folder where students placed all their practicals); fieldwork was just one of the many practicals which students carried out.
Experiences of fieldwork

- **Where and when did fieldwork take place?**

  A site for fieldwork was found very close to a school, this normally used to be at Wied il-Ghasel in Mosta which was very close to the Lily of the Valley school. Fieldwork took place in March and was held during school hours instead of a practical session.

- **What health and safety precautions were taken prior to and during fieldwork?**

  Prior to the fieldwork Mr. Lanfranco used to inform the local police that they will be conducting fieldwork in the valley and he used to visit the site with someone else to ensure that it is safe since they used to go there in Spring time when hunting was at its peak. Fieldwork took place within walking distance from the Lily of the Valley school where they could take refuge if there was a sudden change in weather.

- **What type of fieldwork took place?**

  A site for fieldwork was chosen which contained various habitats such as: a fresh water pool or garigue. Before the students arrived, gridlines were drawn; these were important since they gave students boundaries concerning where they are supposed to work. Students who worked individually or in pairs were assigned to a particular part of the grid therefore everyone was working on a different part of the grid.

  During fieldwork students used to do various activities such as:

  - Use quadrats to estimate population density and species distribution.
  - Estimate distribution of one or two species within the area
• Take note of variation of a particular species within the area; students observed particular features such as species height, soil within which the species grew, number of flower heads.
• Temperature of the environment
• Soil analysis: to associate particular plants with particular soil types
• Place sticks of varying heights in the soil with a test-tube (which was previously covered with Vaseline) attached at the top. This was used to study different insects at different heights above the soil.

Since students were assigned a particular spot on the grid, everyone’s result was different and then all the results were pooled in together to have a complete analysis of the area studied.
Appendix 8

Letter to Ms. Cettina Axiak
Appendix 8

Letter to Ms. Cettina Axiak (Chairperson of Dissertations Committee)

Valentina Aquilina
82, Geronimo Abos Str., Ilklin, ILI 1023
Tel: 21417345
Email: vaqu003@um.edu.mt

Ms. Cettina Axiak
Chairperson
Dissertations Committee
Faculty of Education
University of Malta

26th February 2010

Dear Ms. Axiak,

I am currently a fourth-year student following a B.Ed.(Hons) with specialization in Biology and Science. I am currently writing my dissertation which is titled 'The role of biology fieldwork in postsecondary institutions in Malta'. As a subsidiary objective of my thesis I intended to carry out a comparative study between post-secondary institutions in Malta and one in Sweden (Thorildsplan Gymnasium, Stockholm).

With regards to obtaining information from Malta this was no problem whatsoever, yet when I tried to obtain certain information from Sweden, the people who were supposed to assist me in my studies did not follow through with their promise. For this reason, one of the case studies (that was to be done through a questionnaire) could not be completed since I did not receive all the responses required from the participants, despite several attempts from my part to solicit such a response.

I am therefore writing to enquire whether this would necessitate a change in the wording of the dissertation proposal on my part. It should be emphasized that this case study is a minor branch of the dissertation and does not affect the main focus of investigation. I have discussed the matter with my supervisor and he is in agreement with the content of this letter.

Sincerely,

Valentina Aquilina ID: 115988(M)

[Signature]

No need to change proposal
Accepted by Committee 1/3/2000

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References
References


Post- Secondary Education in Sweden  (n.d.)


