

Learning outside the classroom. Visiting the Institute for Energy Technology.

By M. Spagnol

This article describes how a properly conceived educational visit may serve to encourage science learning outside the classroom. The article particularly considers the experience of secondary school students visiting the Institute for Energy Technology. It tries to present suggestions for those teachers who might want to organise a half-day educational visit at the Institute. The description includes tips how teachers might prepare for the visit, a personal account of what the visit and sessions might involve and some suggestions how the visit might be followed-up.

Visiting the Institute for Energy Technology

For the last five years a regular occurrence in the school calendar of events at Liceo M.A. Vassalli has been the educational visit at the Institute for Energy Technology (IET) that forms part of the University of Malta. The visit is held in connection with the project 'Going Renewable' that annually involves Form three Physics students from our school in a number of activities. The aims of these activities are to convey to students (1) a deeper awareness on the use of renewable sources of energy; and (2) promote a greater understanding of the role of science and technology in every day life. The activities which take place throughout the whole scholastic year involve students in developing their own research projects, the setting up of an exhibition where all the students' work is displayed, a science fair and finally the climax of events, the visit to the IET.

During these years, hundred of students from our school had the opportunity to visit the Institute's buildings located at Marsaxlokk. At the Institute the students are involved in half-day sessions and presentations held by the members of staff and at the same time they also obtain a firsthand experience how renewable energy sources may find their application in a Maltese context. During the sessions the students also benefit from the experience of the researchers in the field as they had the possibility to discuss their own queries regarding their particular research projects.

Learning outside the classroom. Is it possible?

Far from being a simple excuse to escape from the formal setting of the school, an educational visit can ultimately serve as an excellent means as to how the theoretical scientific knowledge discussed in the classroom can be bridged with something more concrete and perhaps more relevant to the students. Learning outside the classroom can truly become a curriculum enriching activity (Adamczyk and Willson 2004, pp.56) since during properly conceived, well planned and effectively followed-up educational visits learning is based on something that can be presented as more real, meaningful and relevant to the students. Such a claim can be grounded on substantial evidence that indicates that good quality educational activities outside the classroom can lead to a better understanding of concepts that span traditional subjects (DfES 2006, pp.2), hence adding depth to the curriculum while concurrently promoting cognitive, personal and social developments in young people (O'Donnell, Morris and Wilson 2006, pp.1).

By involving the students in 'a learning outside the classroom activity' (O'Donnell et al. 2006, pp. i) the teacher is actually expanding the concept of classroom, giving some added value to the curriculum since typically, classroom-based instruction has a missing ingredient - 'the situations' (i.e., real experiences,

environmental problems, local issues) and it is this factor that may invite true mind engagement (Yager 2003, pp. 6). In this way the experience through which the students undergo, may not just serve the purpose of complimenting what is done at school but actually places the students in a favourable position to elicit further learning. Through such activities students can obtain hands-on experience about the phenomena being studied, may find themselves directly engage in public discourses and debates about materials of scientific concern and have the possibility to interact with experts about particular issues. Hence through the novel situation they can actually be involved in activities that sometimes are missing or cannot be achieved if teaching and learning remained limited to the four wall of the classroom. It is however inevitable to say that for all this to happen and in order to maximise the positive outcomes from the visit, the teacher need to be clear about her/his own purposes for the visit and adequately plan beforehand.

Preparing for the visit

Before taking the students for an educational visit, the teacher clearly needs to consider the strengths and limitations of the site and prepare her/himself for any remote preparation needed.

First and foremost, the teacher needs to clearly set her/his own purposes for the visit, ascertain what material shall be treated along the visit and how this can be related to what is done in the classroom. At the IET the principal focus is energy technology and throughout the visit presentations are made on different aspects related to energy; energy use in buildings, energy conservation and renewable sources of energy. The students are also introduced to solar and wind energy and how these can find their application in a Maltese context. The researchers working at the Institute (Iskander, Farrugia and Fsadni 2000) state that:

‘The programme aims at increasing the awareness level of students and teachers on the present energy situation in Malta and the detrimental effects that it is having on health, the environment and buildings. It also stimulates them to realise that their present social and living habits, whilst providing them with a temporary better quality of life, frequently conflicts with the long-term sustainability of that quality’.

When considering the areas being covered, it is immediately evident that the visit is mainly aimed for those students and teachers who want to delve further in the study of energy, particularly focusing on energy sources and energy efficiency. However as the visit progresses, it can be noticed that other aspects mainly related to heat transfer and current electricity are also considered.

When considering the size of the group it is advisable to take less than twenty five students for a single visit since at the IET space is very limited and most frequently presentations have to be carried out in the researchers’ offices. An adequate number of students may also make it a single visit since at the IET space is very limited and most frequently presentations have to be carried out in the researchers’ offices. An adequate number of students may also make it easier for the presenters to manage the group and actually involve all the students throughout the sessions.

Students should be advised to bring with them a packed lunch and drinks since the nearest food outlet is about ten minutes walk from the institute. In case of hot weather, it is also recommended to ask students to attend with their school tracksuit and sports shoes since during the visit they may be asked to move in different locations within the premises, even on the roof.

When considering accessibility at the Institute, one has to say that all rooms are on ground floor and hence accessible for students on wheelchairs. However the main entrance is not provided with a ramp and accessibility to the roof may also be problematic since the sole access is provided through a spiral staircase. Parking close to the Institute’s premises is also limited however school transport can stop the students in front of the Institute’s gate and the main premises can be reached after a 2 minute walk.

The premises of the Institute can be considered to offer no particular health and safety hazards. However the students have to be warned that on the roof there are no lateral supports and they should be conscious not to adventure themselves close to the edges. One has to say that in case of bad weather the visit to the roof is cancelled to avoid any further risks for the students. Teachers are finally advised to book as early as possible since only one daily visits per school is accepted. Bookings can be done by e-mail or by phone however an official letter from school is also required. Clearly certain arrangements for the visit such as those for transport have to be made at school prior to the visit.

The sessions at the IET

Once all arrangements have been made and the students finally arrive at the doors of the Institute, they are welcomed by a member of staff who dedicates the first part of the programme to explain how energy is utilised all over the world and its environmental effects. During this part the students shall also consider the local energy scenario, how renewable sources of energy may be utilised in order to decrease the dependence on fossil fuels and practical ways how energy can be conserved. The students may also clear out any particular queries about the topics being discussed or for instance ask questions about their own research projects. After a short break, the presenters share with the students some aspects regarding the current research being carried out at the Institute. Depending on the number of students present, they are split into two/three groups and each group has the possibility to attend the following sessions.

Energy use in buildings; At the Institute research on building design is being carried out and during this session the students look at different aspects that influence building design. During this session, the students observe how building methods may tend to ignore even the most basic measures in order to reduce the need for heating and cooling. The presenter also considers possible solutions to achieve an optimal design in relation to our local climate.

Energy from the wind; During this session the students are presented with some of the ideas emerging from the research being developed to evaluate the wind potential of the Maltese islands. The students eventually become familiar with the instruments used to monitor wind conditions and with the emerging data. Through the session, the presenter also illustrates how energy can be generated through a wind turbine and how different types of wind farms can be setup. Finally the students consider possible consequences resulting from the application of wind energy in a local context.

Energy from the sun; The following session shall be carried out on the roof of the Institute where the group can view the weather station and the photovoltaic systems present there. The presenter explains how research is currently being carried out over a vertically grid connected photovoltaic systems and a solar tracking photovoltaic systems. Both systems have been connected to the public grid. On the roof the students also have the possibility to look at the various features making up a solar water heater and discuss how these features maximize the effectiveness of the system.

Video shows: If time is available there is the possibility to watch some video presentations related to the topics discussed in the sessions.

Follow-up activities

It is important that the students reflect on and are encouraged to use the knowledge gained during the visit. For this reason it is vital that the visit is followed-up in some way or another. In order to achieve this, the students can be asked to;

develop a poster, a presentation or a model. Clearly the students should relate their research to the aspects

treated during the visit. However as I have experienced myself when involving my students in these type of research projects, there is no limit to the inventiveness and creativity of the final results presented by the students who can come up with brilliant ideas even using simple or recycled material.

conduct further research at home so that when they return in class they can be divided in two groups and debate some controversial aspect that emerged during the visit.

write an article describing the visit and later place it in the school's website.

Teachers can also compile their own activity sheets if they want to emphasis some particular aspect of the visit. These activity sheets may be completed by the students at school or just after the visit so that they are able to think back on the important ideas that were discussed during the visit and maybe set the scene for some final considerations.

Final thoughts

Throughout the years, the annual visit to the IET has truly proven to be a valuable experience since it not only helped to generate an increased motivation towards learning Physics but it actually gave the students certain insights that cannot be possibly achieved if learning remained limited to classroom-based instruction. From the feedback I get after visits, students point out that the sessions at the IET helped them to understand better certain ideas because they can actually experience the particular situation. Hence learning is not just limited to what the textbook or notes suggest but it is applied to a particular context or situation. Moreover, students point out that the visit was important for them to appreciate that the different topics and even different subjects that are done at school are not separate entities but are intertwined and closely related to each other. Apart from this, the visit at the Institute adds an additional tool in the teacher's toolbox. It provides an alternative way how teaching and learning can take place since through the visit the students can benefit from the experience of the researchers and hence expand their knowledge in that particular area. At this point one also needs to appreciate that during these visits, the researchers do a laudable job when carrying out the sessions and as educators they manage to interact effectively with all the students. It is particularly through there effort, patience and dedication that the visit is made possible and is actually transformed in a true learning experience for all the participating

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For further details about the Institute for Energy Technology, Marsaxlokk visit :

<http://www.um.edu.mt/iet>