**Research Methods**

**Can pre course activities help improve student learning?**

**Abstract**

My premier project aim is to research and develop eLearning resources which will benefit unemployed people and those considering employment and training opportunities in the Green technology sectors. Current statistics testify to the large number of former construction workers currently unemployed, research has indicated that there is a potential for many of these workers to gain employment, after retraining in the Green Technology sectors of the economy, many of these workers have little prior knowledge of the Green technology sector.

**Context and rationale**

The resource I propose to develop is directed at people that aspire to gain expertise to work in the Green technology (renewable energy) sector, the resource will be designed so students can use and navigate it in a clear and coherent manner. Allowing them both to find, access, and form concepts of career paths they may have not have known or thought were relevant to their background and experience. An initial aim of the proposed eResource will be to offer basic introductory information and to assist learning by providing a collection of electronic, basic electrical and maths resources specifically designed to help and encourage novices to this sector. I propose to establish a focus group and through this to run a needs analysis process, helping to identify and match the learning needs of the group to the development of the proposed resource. The audience for this resource will have had limited exposure to Green Technologies and knowledge of maths, electronics and basic electricity. I deemed the social constructivist approach as most effectual for the initial development of the eResource. The materials and activities selected will support the learning of maths, electronics and basic electricity and the resource will attempt to use and construct e-activities, using pedagogical reasoning as the source of the learning methods selected.

**Aim of the research & research objectives**

My premier research enquiry is, can introductory activities help improve student learning.

This premier aim is supported by secondary objectives,

* To validate and confirm that the course content is meaningful linked to genuine opportunities for this cohort to pursue in related Green technologies.
* Use suitable pedagogies to improve student retention and confidence, Social Constructivism, e.g. Co-operative learning, Computer-supported collaborative learning (CSCL), Transformational Learning through Prior Learning Assessment” (Stevens. Gerber & Hendra. 2010),
* Verify that the development of prior knowledge can be promoted by the use of eActivities.
* Explore the effectiveness of relevant learning methods, asynchronous and synchronous learning platforms.

Many of the Green technology courses I researched require there participants to have knowledge of basic maths, electronic and electric skills. Learning electronics and electrical skills for the beginner can be a challenging task, coming to grips with a new technology that has its own terminology, rules, symbols and principles. Knowledge and the ability to use these skills to an advanced level are of paramount importance for many Green technology roles. It is with this in mind that I propose the provision of an eLearning resource, which will introduce these skills at the induction stage of a course. The way students perform these processes is assumed to depend on their knowledge of the task domain. Students with domain expertise can generate hypotheses from prior knowledge” “Students without domain expertise cannot generate initial hypotheses from prior knowledge”. (Mulder. Lazonder & de Jong. 2010).

**Literature Review**

As the nature of my applied research project is designed to be of benefit to people currently experiencing displacement, it is important that the data I use is from currently relevant statistics. To this end I chiefly concentrated on current reports and publications, this was reflected in the range of sources accessed. The validation of the rationale for the resource which I propose to develop justifies this approach, because of the wide scale nature of the enquiry; information was reviewed from different economic sectors such as Construction, ICT, and the green Technology sector. The proposed eResource will be interacting with potential students from a nontechnical background, some of the knowledge will be completely unfamiliar to them and can be considered as threshold concepts which are deemed difficult to teach, the following points are therefore important:

* Establish learners level of knowledge and competence in relation to maths, electronics and electrical principles
* Ensure any pre-requisite knowledge is in place by conducting a needs analysis.
* Have the learners carry out activities/tasks/tests to check this

My proposed eResource will be cognizant of the learning needs of its audience by conducting a needs analysis on this group.

The benefits to be gained through engagement with an introductory resource became apparent as part of the literature review, as students will need to participate with the e-activities provided. The preliminary learning activities will be designed to help students absorb information on the green technology sector, gain knowledge and competence in relation to maths, electronics and electrical principles and act as a method to improve their comfort and mastery of the digital technologies that will be required in the Green Technology workplace.

The concept of providing an eLearning resource directly to the learner which is designed to promote introductory subject learning was supported by my readings of “Can instruction as such affects learning? The case of learner control” (Vandewaetere & Clarebout. 2011). In this study 165 first-year university students took part in an on-line English learning course on verb conjugation. When the perceptions and motivation of learners that received additional instructions using learner control were compared with a group of learners that did not receive additional instruction, the results indicated that it was satisfaction with the degree of control that affects learning outcomes and motivation. This study points to the benefits obtainable to the novice student by having an enhanced level of control over their learning, the provision of readily available eLearning resources will help attain this goal.

Further supporting literature for this stance is provided by a research report on the implications for supporting domain novices in inquiry learning environments (Mulder. Lazonder & de Jong. 2010). This report compares students with prior subject knowledge and novices, involved in conducting experiments in an electronic training laboratory, their findings confirmed that, the effectiveness and efficiency with which students perform these processes (experiments) can be expected to differ depending on the level of their domain expertise. (Klahr and Dunbar’s (1988) Scientific Discovery as Dual Search (SDDS) model was used to describe and explain these differences. The findings are used to further explain this position that, “according to the SDDS model, inquiry learning consists of three iterative processes: hypothesising, experimenting, and evaluating evidence. The way students perform these processes is assumed to depend on their knowledge of the task domain. Students with domain expertise can generate hypotheses from prior knowledge” “Students without domain expertise cannot generate initial hypotheses from prior knowledge”. (Mulder. Lazonder & de Jong. 2010). The research findings went on to report that Students with prior knowledge thus engage in more theory-driven experimentation which leads to superior task performance. These findings help to confirm the importance of developing prior knowledge especially in the novice learner, the elearning resource will deliver subject expertise thus helping to develop prior knowledge and facilitating the learner’s academic path.

Further support for this pedagogical position is presented in the report “Transformational Learning through Prior Learning Assessment” (Stevens. Gerber & Hendra. 2010), the authors maintain that as “As students identify and organize principles and processes associated with the prior learning area, the narratives gain depth and richness, especially when analysed in light of relevant theory”. These studies further emphasise the importance of the use of e-activities in developing prior knowledge.

Of special interest to the pedagogical position of my elearning resource is the conclusions on some of the possible effects of unemployment, “For According to Mezirow (1991), a disorienting dilemma, an event that forces one to call into question the adequacy of previous habits of mind and points of view, can trigger perspective transformation”. “For example, the loss of income associated with downsizing may be coupled with a sense of worthlessness; both together may contribute to the triggering of transformative learning, Mezirow went on to describe the phases adults go through in transforming such a dilemma into a new perspective on life, work, relationships, and other roles—a new frame of reference. This transformation is the result of critical thinking, reflective discourse, and, ultimately, an action or change of some sort (Merriam et al, 2007).

The information provided by (Mulder. Lazonder & de Jong. 2010), (Klahr and Dunbar’s (1988), (Stevens. Gerber & Hendra . 2010) and Mezirow (1991), helped to convince me of the importance of developing relevant e-activities to develop prior knowledge. The most beneficial outcome that could be anticipated is that the information provided or channelled through the eResource will help change existing perceptions and attitudes by helping to provide a transformative learning experience. The provision of prior learning resources will allow for an introduction to the subject material that will permit students to examine theories and develop narrative.

It is the Educators role to guide and direct learning, to act as a facilitator and to be aware of and encourage self-directed learning; the social constructivist paradigm offers many benefits in encouraging team working and collaboration (such as group discussion’s asynchronously and synchronously), supporting the transfer of student knowledge and creating the correct conditions for communities of practice to flourish. It is these attributes of Social constructivism that have also made it the focus of attention as a suitable theory for successful online learning. Computer-supported collaborative learning (CSCL) is a pedagogical approach wherein learning takes place via social interaction using a computer or through the Internet. Collaborative learning is integral in Communities of Practice (Lave, & Wenger, 2006) where groups of people share a process of collective learning in a shared domain of endeavour, the successful understanding of threshold concepts is enhanced by this process. This kind of learning is characterized by the sharing and construction of knowledge among participants using technology as their primary means of communication or as a common resource. (Stahl, Koschmann, & Suthers, 2006). I envisage that the final design of the eResource will incorporate elements of CSCL so as to promote this didactic rationale.

**How to Create a Pedagogically Resource**

Useful insights in how to approach the layout and structure of the eResource was provided in the Sage handbook of eLearning research, “Elearning research should always start with the pedagogy, research begins with learning context from which the exploitation of technology can be viewed” (Andrews & Haythornthwaite 2007). Taking into account that many of the learners will have little prior knowledge of the subject areas the avoidance of cognitive overload in the initial design of the eResource is an essential consideration, with this in mind a major research concern will be to coordinate the layout of new materials and concepts so as to avoid overwhelming working memory capacity. The research Literature I examined made me aware of the drawbacks of employing multimedia into an eLearning resource without an understanding of its influence. Findings have shown that both the position of text and moving and flashing objects cause distraction and result in an inferior level of learning as accounted for by test performance in certain multimedia conditions. Research supports the notion that display design can split attention, increase cognitive load, and reduce transfer learning (Austin. 2009).

**Research Design**

Research methods reading’s indicated that qualitative research methods more precisely reflect my research question, “the use of qualitative methods allows the researcher to take into account contextual factors of the research participants; data is collected from a small number of purposely selected research participants” (Kritsonis, W.A).

This view is also supported by the Data collector’s field guide,” What is qualitative research?”(Mack. Woodsong. MacQueen. Guest & Namey 2005). Qualitative researchers aim to gather an in-depth understanding of human behaviour and the reasons that govern such behaviour. The qualitative method investigates the why and how of decision making, not just what, where, when. Hence, smaller but focused samples are more often needed than large samples.

Qualitative research is a type of scientific research

* Seek to explore phenomena
* Instruments use more flexible, iterative style of eliciting and categorizing responses to questions
* Use semi-structured methods such as in-depth interviews, focus groups, and participant observation (Mack. Woodsong. MacQueen. Guest & Namey 2005).

The purpose of educational research is to use a scientific and disciplined method of inquiry to study educational challenges. By using scientific and disciplined inquiry techniques, I will endeavour to map out the educational issues, questions and processes that must be addressed in the context of the applied eLearning project selected. The scientific and disciplined inquiry method is characterized by four critical steps, “1/ recognize and identify a question or a problem to be studied, 2/ describe and execute procedures to collect information about the questions and problems being studied, 3/ analyse the collected information, 4/ state the results or implications based on the analysis of the information”. (Kritsonis, W.A).

Step one above is responded to by examining the context and rationale for the applied research project, steps two, three and four will be dealt with by implementing research methods and by employing analytical techniques suitable to the context of the project.

Applied research is used to find solutions to current practical problems, the question identified as the rationale for the project falls into this category and the solution to develop an eLearning resource is based on strategic priorities of eLearning activity, namely, “enhancing flexibility and choice for learners, enhancing student achievement, improving employability and skills, widening participation and improving access, effective management of learning resources, and designing and maintaining effective environments for learning”(Pachler, N. & Daly, C. 2011 )

**Methodology**

Case studies have many of the merits required to appraise and clarify a research group, case studies can use a variety of data sources to thoroughly conduct an investigation, qualitative research methods will be used as the clarifying method. Case study research allows the researcher to investigate the behaviour of small groups in a variety of settings, “Case study is an ideal methodology when a holistic, in-depth investigation is needed” (Feagin, Orum, & Sjoberg, 1991). “Case studies have been used to discover new relationships rather than verifying existing hypotheses” (Yin 2009). This type of inductive reasoning is beneficial for a more in depth investigation of the cohort under question. Yin (1993) identified specific case study types that could be used appropriately to the context of the project under investigation. I have chosen a descriptive case study (Yin 2009) as the research approach for the target user group, to help implement a pre course evaluation of student’s prior learning, including experience, qualifications, areas with the greatest potential for work, and personal preference as regards specific areas of interest.

Feasibility studies will include needs analysis; this will be conducted using a focus group to examine the need for the resource, its effectiveness, layout, initial construction and to establish its boundaries. The establishment of a target user group will be an essential first step in conducting this assessment. The information gathered at the pre course development stage will be vital in determining the most effective eLearning resource design to pursue. Within the case study, methods used to further refine the eLearning resource will be the use of structured and semi structured interviews, surveys within the target user group. On line questionnaires will be used to gather data for the purpose of post course resource evaluation, this will be essential to judge the effectiveness of the resource. The use of these analytical tools will help in achieving a multi-perspectival analysis. Fine tuning and further modifications of the resource will occur as this iterative process proceeds. The validity and accuracy of the process and the data will be safeguarded by the use of triangulation which is the use of multiple sources of data, the use of redundancy- by asking the question in various ways, multiple data collection strategies, and the use of different tools of analysis, in order to get a more complete picture and to cross-check information. Denzin (1984) identified four types of triangulation, the most appropriate for the context required, is date source triangulation, “when the researcher looks for equivalent data in different contexts” (Denzin.1984).

**Ethical Considerations**

Research ethics is concerned with the interface between researchers and the people they study. A body of standards has been developed and established in research ethics, this ensure’s that researchers explicitly consider the needs and concerns of the people studied, that appropriate oversight for the conduct of research takes place, and that a basis for trust is established between researchers and study participants. Whenever research is conducted on people, the well-being of research participants is the top priority. The research question is always of lesser significance. (Mack. Woodsong. MacQueen. Guest & Namey 2005).

Informed consent is a mechanism for ensuring that people understand what it means to participate in a particular research study so they can decide in a conscious, deliberate way whether they want to participate. Informed consent is one of the most important tools for ensuring respect for persons during research (Reid, N., 2003).

Informed consent is a vital part of the ethics process, as part of this I will have to seek permission from all participants and receive permission from Co Wicklow VEC’s Standards and Ethics overseer.

All participants in the research must be informed off or provided with:

1. Provision of an information sheet and consent form
2. The reason for the research
3. What will be required of each of them, and the amount of time involved
4. The risks and benefits, including psychological and social
5. That participation is voluntary and they can withdraw at any time with no negative consequences
6. Confidentiality will be protected
7. My name and contact information will be available for questions

The name and contact information of an appropriate person to contact with questions about one’s rights as a research participant.

**Delimitations and outline of timescales**

Further research has to be carried out to guarantee the validity of the proposed group as an advisable basis for my research project; in this regard I am waiting to hear back from Co Wicklow VEC to whom I have submitted my proposal. The degree and possible difficulty of guaranteeing adequate student participation, is a concern which I will discuss with involved colleagues in Wicklow Vec. I will shortly begin the process of researching effective electronic/ green technology teaching materials that could be integrated into the e Resource. I have been in contact with “Fas” who as a provider of training and retraining initiatives may become a source for student participation in the eResource; this is also subject to confirmation. **Time Plan** (is subject to review)

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|  | **Sep** | **Oct** | **Nov** | | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** |
| Literature research and  eResource development |  |  | |  |  |  |  |  |  |  |  |
| Pre course interviews and questionnaires |  |  | |  |  |  |  |  |  |  |  |
| Data Analysis |  |  | |  |  |  |  |  |  |  |  |
| Reconfigure: Redesign eResource |  |  | |  |  |  |  |  |  |  |  |
| Instigate eResource |  |  | |  |  |  |  |  |  |  |  |
| Collect post course data |  |  | |  |  |  |  |  |  |  |  |
| Evaluate post course data, analysis and preparation of final paper for submission |  |  | |  |  |  |  |  |  |  |  |
| Submit Journal Paper |  |  | |  |  |  |  |  |  |  |  |

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**Appendix 1:** “Employment in construction fell by 10% from nearly 282,000 in the second quarter of 2007 to 255,000 in the same period of 2008. This drop can be attributed to a decline in employee numbers rather than the self-employed. Employment in construction rose by 40% over the period 2002 to 2008. The construction sector accounted for 13% of total employment in 2007; this compares to an EU average of 8%”. Construction & Housing in Ireland CSO Report (2008).

The Organisation of Economic Co-operation and Development in Europe supplied an extensive amount of the statistics required for the period 2007 to 2011. It discussed the sharp rise in unemployment and emigration especially amongst youth and with significant regard to the weaknesses in activation policies. “There was a massive acceleration in the overall level of unemployment in the Irish republic in the period 2007 to 2011, the unemployment rate rose from 4.6% in 2007 to 14.2% in the second quarter of 2011. In addition, labour-market participation has declined significantly, particularly among youth, and there has been a sharp increase in emigration. Long- term unemployment has risen significantly. In this environment, there is a risk of structural unemployment remaining high, as the skills of job seekers are not matched by the job offers and human capital erodes” (Manchin & Manning, 1998).

**Appendix 2:** Labour and social policies need to focus on workers most severely hit by the recession. The economic recession had a severe impact on the labour market, especially on those who were employed in the construction sector. Ireland’s unemployment rate is now among the highest in the OECD area, most newly unemployed people are young workers – especially males – with low or intermediate qualifications. Those under 35 without tertiary education accounted for 42% of total unemployment (against 23% of the total labour force) at the end of 2010.