E-LEARNING IN HIGHER EDUCATION INSTITUTIONS: ACCEPTANCE AMONGST STUDENTS AND STAFF

Henny Mills
Newcastle University,
CEG, Cassie Building, Newcastle University, Newcastle Upon Tyne, GB-NE1 7RU
WGVI/1

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ABSTRACT:

This paper presents an investigation into the approval of e-learning tools and applications in higher education institutions. The developments of e-learning tools are still very time-consuming and require commitment and enthusiasm of university staff. This study investigates if e-learning tools are worth the investment and if students as well as academic staff accept these as new innovative learning tools. The investigation is based around two e-learning tools which were developed at Newcastle University to support the learning experience of students in the area of Geomatics.

A virtual traverse and a levelling e-learning tool were developed to provide students with an opportunity to improve, enhance and test their learning experience and knowledge in a Geomatics context. It was hoped that the tools would provide a replacement for the cancelation and cut-backs of fieldcourses and practicals due to escalating cost (both financial and staff time) in recent years. Both tools were created as interactive tools, which require the students to perform measurements, calculations and answer questions, thereby offering a learning tool as close to a real practical exercise as possible. Immediate feedback is provided to the students for measurements and calculations to confirm or offer the students a chance to improve and assess their learning.

Both tools were made available to different cohorts of undergraduate students at Newcastle University via the University's website. Students were encouraged to use the e-learning tools in preparation to practicals and the fieldcourse, as well as for exam revision. No formal assessment was linked to the use of the e-learning tool, therefore students were using the tool on a volunteering basis.

This paper will present the results and analysis of the student's feedback to using e-learning tools, assessing thereby if e-learning tools find acceptance among students but also university teaching staff. Students and university staff members were questioned regarding their opinion of e-learning as teaching tools. The opinion of academic staff was rather conservative regarding the replacement of traditional teaching methods, such as practicals and seminars, with e-learning. Students on the other side were a lot more open to e-learning tools and certainly saw potential in them as learning tools. However, the questionnaires as well as monitoring of the use of the tools showed that students require an incentive to use the tools, i.e. an assessment. This paper will show that the development of e-learning tools may seem exiting and innovative, but the student's acceptance of these tools has to be considered in their development, so resources and time can be allocated appropriately.

1. INTRODUCTION

E-learning tools, techniques and applications have gained a lot of attention in various levels of education over the last years. It resulted in the development of a several e-learning tools, partially involving large amount of public money investment, e.g. Gitta (Gita, 2009). A large amount and variety of e-learning tools therefore now exist and can often be accessed free- of charge over the internet. An overview of e-learning tools and software in the area of remote sensing and photogrammetry can be found on the website of the ISPRS working group VI/2 ((ISPRS_WG_VI/2, 2009)). The range of tools, software and applications shows the interest of teaching staff in e-learning tools and that a high potential is seen in such tools. Some of the tools have clearly been developed with the student in mind, but it is not always logistically possible to involve students in the development process. This study therefore aimed to assess the student opinion of e-learning tools. It investigated if e-learning tools are worth the investment and if students accept these as new innovative learning tools. The investigation is based around two e-learning tools which were developed at Newcastle University to support the learning experience of students in the area of Geomatics.

1.1 Geomatics at Newcastle

Geomatics at Newcastle University offers two Geomatics related undergraduate degree programmes, Geographic Information Science and Surveying and Mapping Science. Additionally, surveying is also taught as a Stage 1 and Stage 2 modules in the Physical Geography (20 students) and Civil Engineering (c. 85 students) undergraduate degree programmes at Newcastle University, consisting of numerous practical sessions, in addition to lectures. Traditionally, residential fieldcourses contributed to the learning process of the students, as these are seen as an effective learning experience for students to gain competent knowledge in any subject related to surveying. However, the escalating cost (both financial and staff time) of running residential fieldcourses have led to cancellations and cut-backs in the subjects of Geomatics at Newcastle University, UK. Alternative teaching methods therefore have to be found to improve the learning experience to compensate for the missing fieldwork experience. It was expected that e-learning tools could offer a possible solution to overcome the missing practical experience.

2. THE USE OF E-LEARNING TOOLS AS VIRTUAL FIELDCOURSES

Fieldwork and fieldcourses are an important learning tool for any Geoscience degree. Residential fieldcourses have been carried out in many studies successfully for many years and have found a wide appreciation for learning amongst students. However, as residential fieldcourse are very financial and staff resource intensive, alternatives for fieldcourse are often sought by universities. E-learning tools may provide such alternative.

Virtual fieldcourse, as examples for e-learning tools, have been developed with the aim to enhance the learning experience of students in the context of existing residential fieldcourses. Any virtual fieldcourse development can be understood as an inspiration to improve the overall student learning experience (Phipps, 2001). There is no definition for virtual fieldcourses (VFC) yet available, but the UK Higher Education academy defines a virtual field trip as a "type of simulated field trip undertaken trough the Internet" and a virtual laboratory as a "technological instrument that allows the simulation of laboratory or other equipment on a computer" (HEAcademy, 2007).

VFCs have now been developed at several institutions across the world. Existing VFCs in the UK range from live web-cameras to full interactive virtual fieldtrips (GDN, 2001). An example for an existing VFC is the development of a Dark Peak virtual tour as a introduction and preparation tool for a geography fieldcourse (McMorrow, 2005). It took up to three years to develop the complete virtual tour, highlighting the cost and time associated with its construction. A student survey for this virtual tour highlighted that students got mixed enjoyment out of using such learning tool and did not necessarily see it as an improved learning tool to help their understanding of the subject (McMorrow, 2005).

On the other hand, the costs of the development of any e-learning tool are often underestimated, as any new development in the virtual world involves costly starting costs (Issroff and Eisenstadt, 1997). Additionally to the cost and time consuming production, as well as specialist computing and web-management skills which may have to be obtained, requiring additionally training for staff members (Curry and Burton, 2006). This shows, that the development of a VFC does not automatically promise a new successful teaching resources or a revolution of teaching.

3. THE VIRTUAL INTERACTIVE TRAVERSE LEARNING TOOL (VITLT)

The analysis of the acceptance of e-learning tools amongst students was carried out on the basis of two e-learning tools which were developed at Newcastle University. Both tools aim to aid the learning experience of students in Geomatics related subjects. To achieve an acceptance of the tools by students, students of different stage in the degree programme were asked to provide feedback during the development and their suggestions and comments were integrated in the final VITLT. Additionally, the following recommendations, gained of previous studies, were consequently considered during the development phase of both e-learning tools (McMorrow, 2005):
- Use of linear structure including a link on each page back to the main map
- Use of annotated graphics

- Offer self-assessment at the end of the on-line exercise.

3.1 Development of the virtual interactive traverse learning tool

A virtual interactive traverse learning tool (VITLT) was developed in 2007 to improve the understanding and learning of surveying methods, in particular of traversing. The development of the e-learning tool was funded for 1 ½ months by Newcastle University. The tool aimed to simulate the observation and calculation of a surveying traverse. The VITLT is based on several traverses around Newcastle University campus. Maps and photographs are presented together with an explanation and description in a surveying context to familiarise students with the setting of a realistic traverse observation environment.

Virtual observations at each traverse station were realised via hotspots on an overview map and 360 degree panoramic images. This allowed the students to gain a similar spatial orientation to that which they would have when observing a real traverse. The student can pan and zoom the image to locate the target and click to take a measurement, the horizontal, vertical angle and slope distance are displayed in a virtual total station display. The virtual interactive traverse tool was prepared using Asynchronous JavaScript Technology (AJAX), allowing a dynamic website to be created.

3.2 The Virtual Interactive Traverse Learning tool

The VITLT design consists of the two main elements: the admin pages allowing new traverse to be entered and only to be accessed by the administrators and of course the student exercise pages, which presents the public face of it.

The admin webpage of the VITLT summarises the existing traverses within the system to the tool administrator (Figure 1). Additionally, the webpage allows to set-up new traverses together with data, pictures and design.
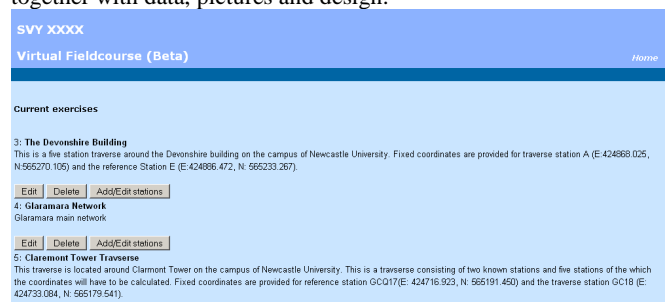

Figure 1: Admin page of the VITLT

Any new traverse to be added to the VITLT database is required to have been calculated and the complete solution entered into the project database.

The first student page of the VITLT (http://www.ceg.ncl.ac.uk/pls/vfcourse/index.aspx) informs the students of the outline, objectives and assessment of the VITLT (Figure 2). Once the students familiarised themselves with the objects and aims of the exercise, a traverse can be selected.
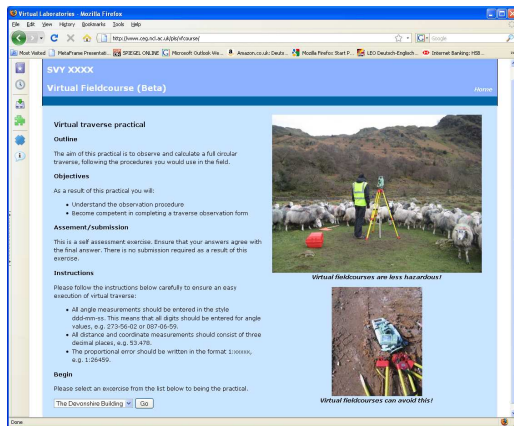
Figure 2: The student introduction page to the VITLT

Once the traverse is chosen, the students are presented with a Google Map overview of the traverse stations. The student must decide which station should be observed first and has to choose the station. This loads the QuickTime movie presenting a 360° picture panorama. It allows the students to scroll and zoom around in the picture (Figure 3). Once the other station is identified, a measurement can be carried out by clicking on the image. This measurement exists of a traverse observation consisting of the horizontal and vertical angle together with the slope distance (Figure 3).
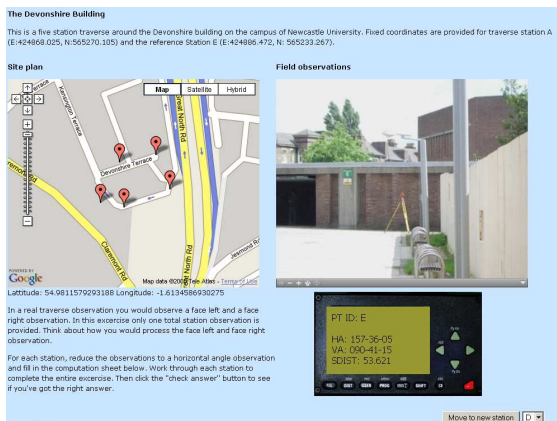
Figure 3: Set-up for traverse observation from one station

Once all measurements are observed, the students are required to calculate the traverse data by hand and fill in the traverse calculation sheet. The traverse calculation sheet is based on the Newcastle University template for the calculation of a 2D traverse and should therefore be familiar to the students. All data inserted by the students is assessed in real time and an indication for a correct or incorrect value is given. The VITLT allows students, to self-assess their traversing observation and calculation skills, instead of the currently used summative assessment.

4. THE LEVELLING E-LEARNING TOOL

The developed levelling e-learning tool was developed at Newcastle University with the substantial input of a final year student. It is therefore based on student input and opinion and developed directly under the student's influence. The levelling tool was created to provide students with a revision tool for levelling, allowing them to gain some background information but also testing their knowledge with several quiz questions, as well as testing their levelling skills with an e-learning levelling exercise. The tool was generated with the software Adobe Captivate. This software allows to capture movements on screen, e.g. software but also the creation of quizzes as part of its Learning Management System. The final output is a set of interactive HTML webpages.

The student is presented with an overview on the start page (http://www.ceg.ncl.ac.uk/pls/virtual_levelling_tutorial/home.html), which allows the student to work through the e-learning tool chronologically or jump to a particular section of the levelling e-learning tool (Figure 4).
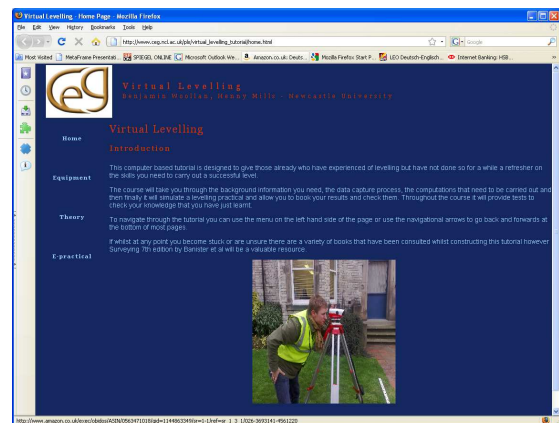

Figure 4: Start page the leveling e-learning tool

Animations and graphics are used interactively show different aspects of levelling and involving the student in the e-exercise. It aims to help students to use the e-learning tool but also to engage in the tool and thereby the learning process. Animations and interactive quizzes are used for every aspect of levelling, providing the students a comprehensive e-learning tool (Figure 5).
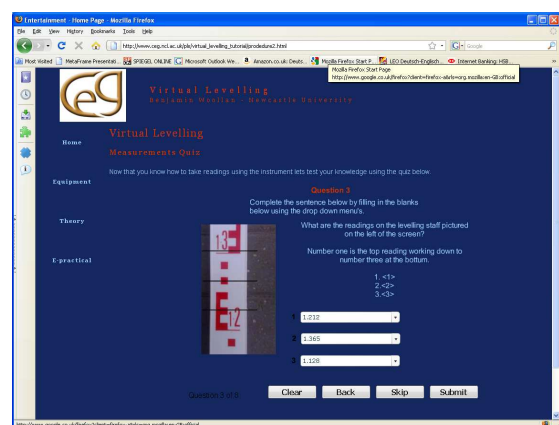

Figure 5: Quiz question example

The e-learning exercise is concluded with an e-practical consisting of a complete levelling routine/loop (Figure 6). The student is required to read the staff, presented on a picture and complete the levelling booking form including all calculations. Immediate feedback is provided to the students, as soon as one value is entered.
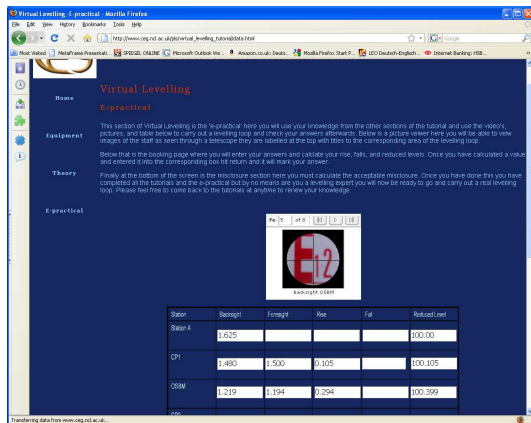
Figure 6: E-levelling practical

The levelling tool benefits to the learning and revision of students, as is can be repeated at anytime and provides a real life example to the subject area.

5. EVALUATION OF E-LEARNING AMONGST STUDENTS AND STAFF

It was hoped that both e-learning tools would provide a replacement for the cancelation and cut-backs of fieldcourses and practicals due to escalating cost (both financial and staff time) in recent years. Both tools were created as interactive tools, which require the students to perform measurements, calculations and answer questions, thereby offering a learning tool as close to a real practical exercise as possible.

Both tools were made available to different cohorts of undergraduate students at Newcastle University via the University's website. Students were encouraged to use the e-learning tools in preparation to practicals and the fieldcourse, as well as for exam revision. The tools were briefly mentioned during lecture and links to the website were provided from Blackboard. No formal assessment was linked to the use of the e-learning tool, therefore students were using the tool on a volunteering basis.

To assess the use of the e-learning tools and the student's opinion of them, questionnaires were given to the students. The questionnaires ranged from questions if the students enjoyed the use of the e-learning tool and if they would like to use more e-learning to questions which asked the students under which circumstances e-learning tools would be used or seen as helpful. The following section presents the results of the questionnaire of Stage 1 and Stage 2 Geomatics students at Newcastle University.

Generally, it was disappointing to see how few students used the e-learning tools on this optional basis. In stage 1 only 5 out 51 students (less than 10%) and in stage 2 only 8 out of 30 students (27%) used the tool for revision.

5.1 Feedback on the use of e-learning tools

Due to small sample of students who used to e-learning tool the feedback was combined from Stage 1 and Stage 2 students.

Generally, the students found the e-learning tool easy to use and easy to follow (Figure 7). This is encouraging for the developers, that the tools were generated in an appealing style and with sufficient instruction for students. From a design

perspective, the use and acceptance of the e-learning tools should therefore not be a limited.
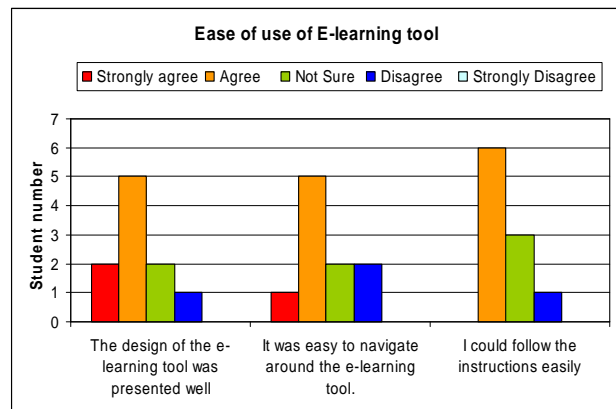

Figure 7: Response to use of e-learning tools

A larger variation in answers was found if the students were questioned regarding the outcomes and benefits of the e-learning tools. There was generally agreement amongst the students that the e-learning can be helpful to support the learning and understanding (Figure 8). As such the students saw the potential for the preparation of practicals. However, the student opinion overall showed that such e-learning tools could not be used as a replacement for practicals.
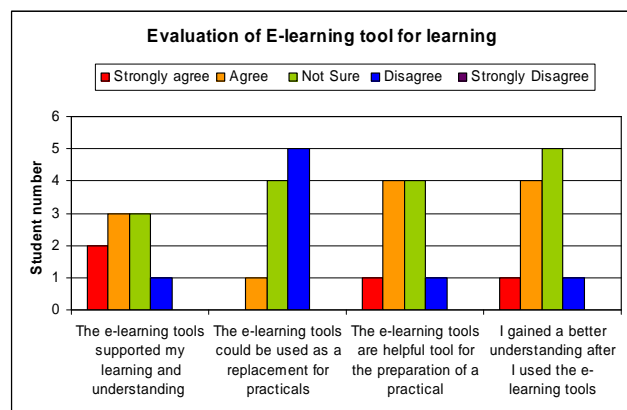

Figure 8: E-learning tools for learning

The last section asked the students to compare the e-learning's tools to more conventional teaching methods, such as face to face. Unfortunately, the student opinion on this comparison varied a lot, providing no clear answer for the student preferences (Figure 9). On one site, it showed that there is no overall strong agreement amongst students to use e-learning tools instead of conventional learning methods. At the same time there was no clear disapproval of e-learning tools following the questionnaire results.
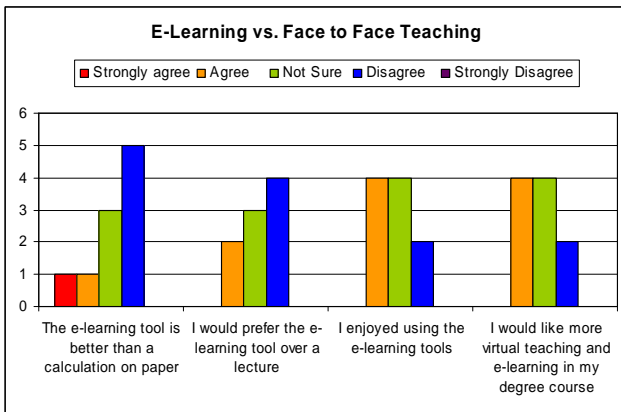
Figure 9: E-learning vs. traditional teaching methods

The questionnaire results of the students who used the e-learning tools showed no clear approval or disapproval of e-learning tools, highlighting that students see them as possible complimentary tools but not as replacements for existing teaching methods.

5.2 Feedback on possible use e-learning tools

As mentioned above the majority of the students did not use the e-learning tools on an optional basis for e.g. the preparation of the fieldcourse. If e-learning tools are being developed, it has to be taken into consideration under which circumstances students would use of such tools.

The first set of questions aimed to analyse why the students did not use the e-learning tools (Figure 10). It showed that it was not the e-learning tools themself, which prevented the students from using it but rather a missing incentive. Additionally, the students declared that a practical exercise such as covered with these specific e-learning tools would be prefered. Of course without actually carrying out the e-exercise, the students may have not realised that the e-learning tools were designed on the basis of real world examples (Figure 10).
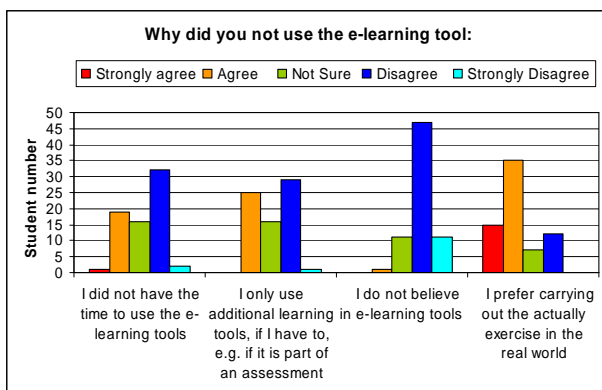

Figure 10: Reasons for avoidance of e-learning tools

Apart from investigating why the students did not use the e–learning tools, it seemed important to analyse under which circumstances e-learning tools would be used for learning by students. It showed very clearly that students require an incentive or motivation to use e-learning tools. Students will not use e-learning tools to support their learning if the tools are available (Figure 11 and Figure 12). If however, an assessment is tied to the e-learning tool or it presents the only option to

obtain new teaching materials, students would carry out the e-learning exercised to obtain the skills.
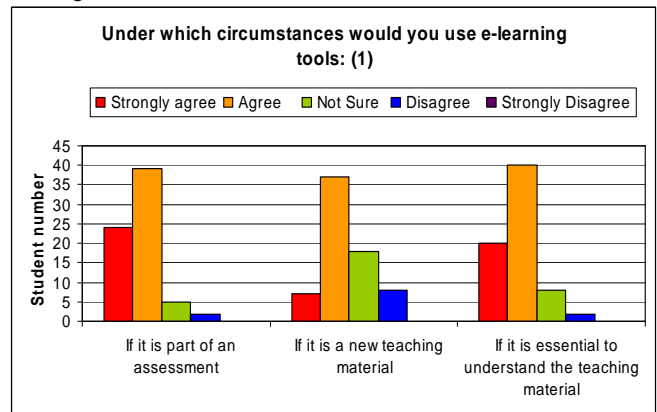

Figure 11: Conditions for using e-learning tools (1)

These statements were confirmed with a further analysis which showed that e-learning tools would gain a much higher acceptance amongst students if they were part of a practical or essential for the preparation and therefore execution of a practical exercise (Figure 12). A large discrepancy showed when students were asked if they would prefer e-learning tools over practicals. This preference depended on the individual and therefore personal strengths and opinions.
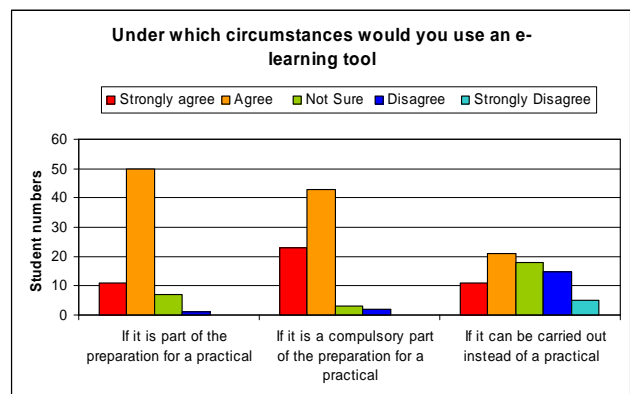

Figure 12: Conditions for using e-learning tools (2)

6. CONCLUSION AND SUMMARY

The study investigated the acceptance amongst students for e-learning tools using a variety of questionnaires. The analysis was carried out on the basis of two e-learning tools which were developed at Newcastle University to aid the understanding and learning for students of basic surveying skills and knowledge. The students who used to e-learning tools enjoyed their use and felt engaged by them. Students were open to e-learning tools and certainly saw potential in them as learning tools. However, the e-learning tools were not seen as a replacement option for actual practicals. This view was confirmed by the large amount of students who did not carry out the optional e–learning exercises in preparation of practcials. The analysis showed very clearly that students require an incentive to use the tools, i.e. an assessment.

These finding confirmed views that e-learning tools show a high potential as new and innovate learning experience for students (Spicer and Stratford, 2001). But such tools cannot replace traditional well-established teaching methods or

substitute any. Despite the students familiarity with e-tools, in their day to day life (e.g. facebook, MySpace) e-learning tools have to be designed with the student in mind, as student do not automatically take to these over traditional teaching methods. Resources used for the development of e-learning tools should therefore be used accordingly and appropriately.

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