REVIEW ARTICLE

UDENTE (Universal Dental E-Learning)
A Golden Opportunity for Dental Education

Abstract

The incorporation of technological advancements in higher education has started to bridge the gap in local, national and global delivery of dental courses. This gap, including the global decrease in senior clinical academics, has influenced the development of new teaching and learning techniques. Institutional virtual learning environments (VLE) and other e-learning resources are now in higher demand [1, 2].

This paper describes how one such innovative solutions has been IVIDENT (International Virtual Dental School), has enabled secure and seamless access to high quality e-content and tools through an innovative, universal flexible learning platform. IVIDENT, now UDENTE (Universal Dental E-learning) has been shown to offer new learning experiences for students of dentistry, but its approach can apply across all educational domains. UDENTE also benefits staff as it allows them to contribute and access resources through peer reviewed publishing processes, which ensure the highest quality in education [3].

UDENTE was developed thanks to a £2.3 million grant from the Higher Education Funding Council for England (HEFCE) and the Department of Health. http://www.udente.org. This academically led educational research project involved dental schools in seven countries. An initially scoping of requirements was followed by elaboration of the tools needed. Pilot testing of the tools, systems and learning resources in particular and the impact of the UDENTE in general were carried out.

The pilots revealed evidence of positive impact of a space for learning, teaching, development and communication, with tools for planning of electives and administrative support. The results of these initial pilots have been positive and encouraging, describing UDENTE as an accessible, user friendly platform providing tools that otherwise would be difficult to access in a single space [4]. However, attention to supporting faculty to embrace these new learning domains is essential if such technology enhanced learning (TEL) is to be viewed as a golden opportunity in Higher Education.

Introduction

Why UDENTE?

Nowadays, there is an increasingly important necessity to bring traditional methods of education into the 21st century. Lectures, practical sessions and study groups can all be improved with online learning. Projects like King's College Universal Dental E-learning (UDENTE) provide tools for higher education dental courses and innovative solutions for institutions with a shortage of teaching staff as detailed in the 2009 report by the Dental School Council [1]. This report indicated that there has been a 22% decline in the number of Professors, Senior Lecturers and Lecturers since 2000 and that this loss of research and clinical expertise will have a concerning impact on the research agenda. It does, however, acknowledge how encouraging is that Dental Schools are finding creative solutions to support teaching, research and clinical practice. One of these solutions was IVIDENT, now UDENTE, lead by King's and originally funded by four part-

ners, including the University of Portsmouth, Eastman Dental Institute, University College London, and the University of Bristol, and this project has been tested further and piloted internationally.

UDENTE provides innovative and flexible dissemination of high quality education and has been successfully benchmarked against the Higher Education Funding Council of England's seven strategic priorities for the development and embedding of Technology Enhanced Learning (TEL) [2, 3]. UDENTE has already demonstrated a capacity against the HEFCE parameters [4] in the following:
• enhancement of institutional connectivity across provision;
• extension of teaching and pedagogical capacity, research and delivery;
• offering of a greater choice and effective adaptation of learning materials;
• enhancement of learning through the transformative process of technology;
• capture of employer, student, tutor and other feedback to improve greater employability;
• enhancement of life-long learning through Continuing Professional Development (CPD), employer involvement and student e-profiling;
• Achievement of green computing through virtualisation.

With this system, not only support and a learning environment is provided for students, but also for the teaching staff, allowing for continuing professional development and giving them tools to keep track of their student's pro-gression throughout the courses. Nonetheless, there is a continuing priority to engage faculty and institutions at strategy and delivery levels.

But why is UDENTE important for individuals? Students are given the ability of working independently, to communicate and share learning experiences with their peers both nationally and abroad. Instructors are able to design a course that will allow them to upload documents for students, deliver lectures online and streamline the grading process. Institutions are able to monitor these activities and obtain feedback from all the processes involved in the provision of the syllabus.

UDENTE Architecture
UDENTE addresses the shortages in teaching staff by supporting the complete dental education cycle through a flexible learning environment; it also has the purpose of content distribution for teaching and learning from a central database (Learning Content Management System, LCMS) through a non-for-profit online publishing facility. This is all linked together through a Service Orientated Architecture (SOA) in the form of an advanced interoperable solution that links any Virtual Learning Environment (VLE) to standards based tools and the reusable content in a (LCMS) [5] [Figure 1]. This next generation of VLE has many similarities to the VLE 2.0 described by Weller (2006) [6]. The VLE 2.0 is a software tool which, though lightweight programming
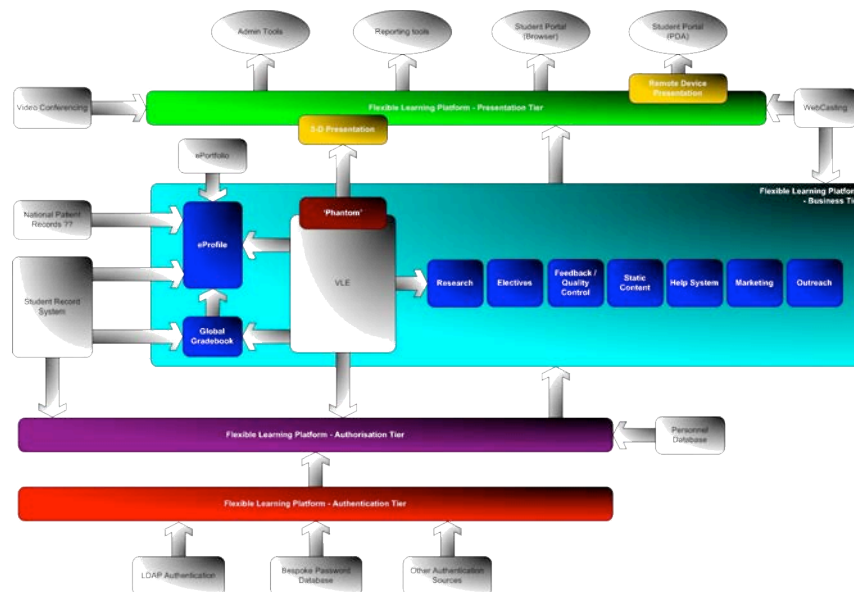

Figure 1. Diagram of the components of UDENTE seamlessly integrated through the SOA.

delivers content and components, which can be personalized and updated, and for which the users, in part, will be the drivers of its development.

The SOA provides a Flexible Learning Platform with a suite of interoperable tools and components underpinning the activities of UDENTE. These activities do not only provide the learning and teaching support, but also provide the platform tools which are of great importance in the administration of the courses, such as user authentication, timetabling, global gradebook, double-blind marking [Figure 2a] and standard setting, electives administration, links to VLEs such as Moodle [Figure 2b] and WebCT, a bulletin board, LCMS e-content and help pages.

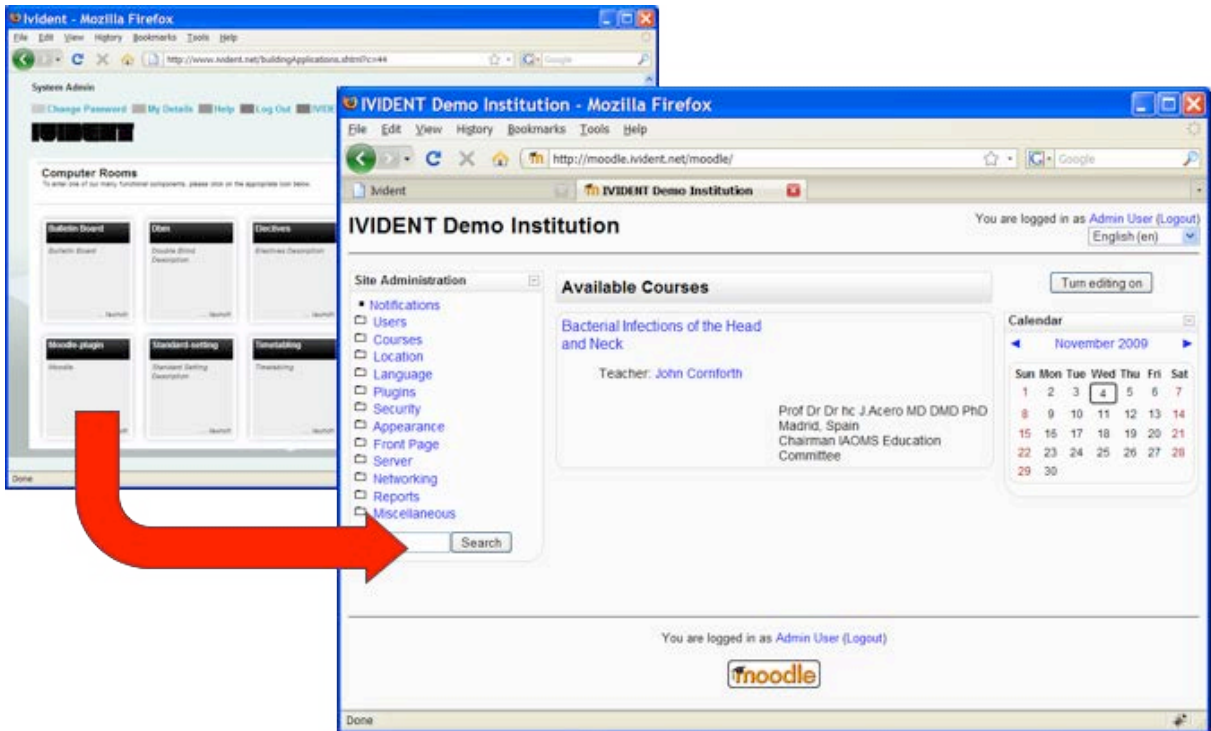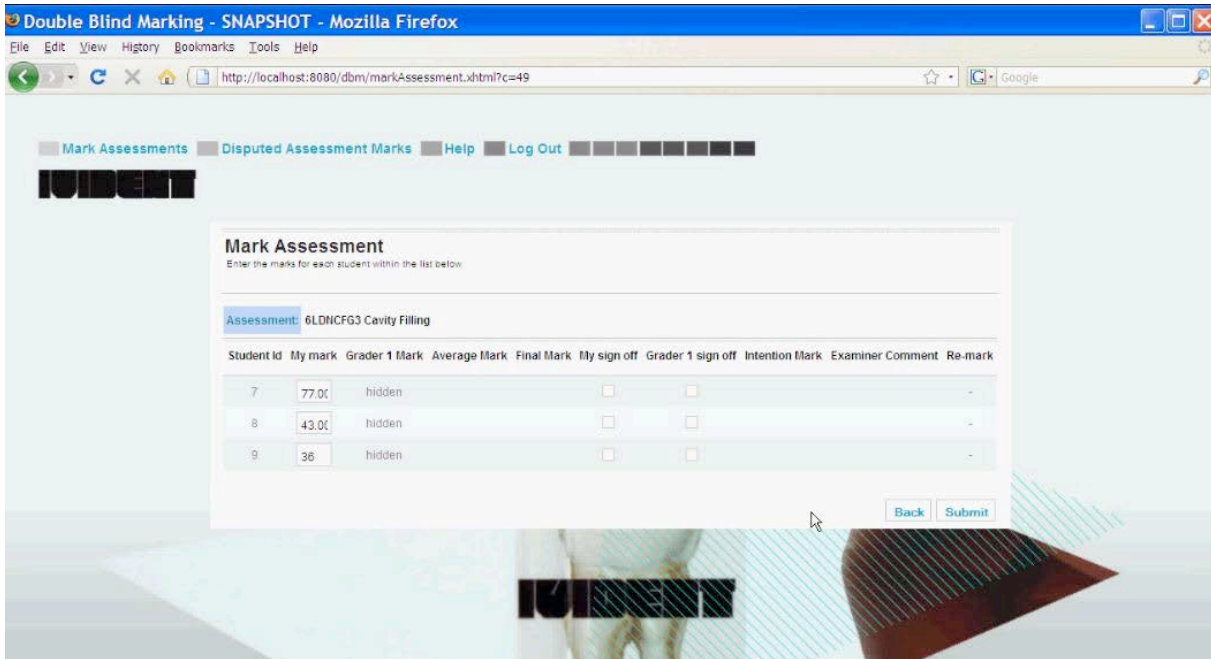The e-content provided through UDENTE [Fi-

Figure 2. a) Double-marking Login pages at IVIDENT and b) Moodle plug-in.

gure 3] includes the use of enterprise level repository, a series of reporting capabilities, access to a selection Elsevier and Blackwell's dental books and to the Continuing Professional Development (CPD) material from the

UK's Department of Health, plus a growing number of other materials from King's and its partners [7]. UDENTE also features educational games, such as the Prescribing Game, built in a Flash template as case scenarios
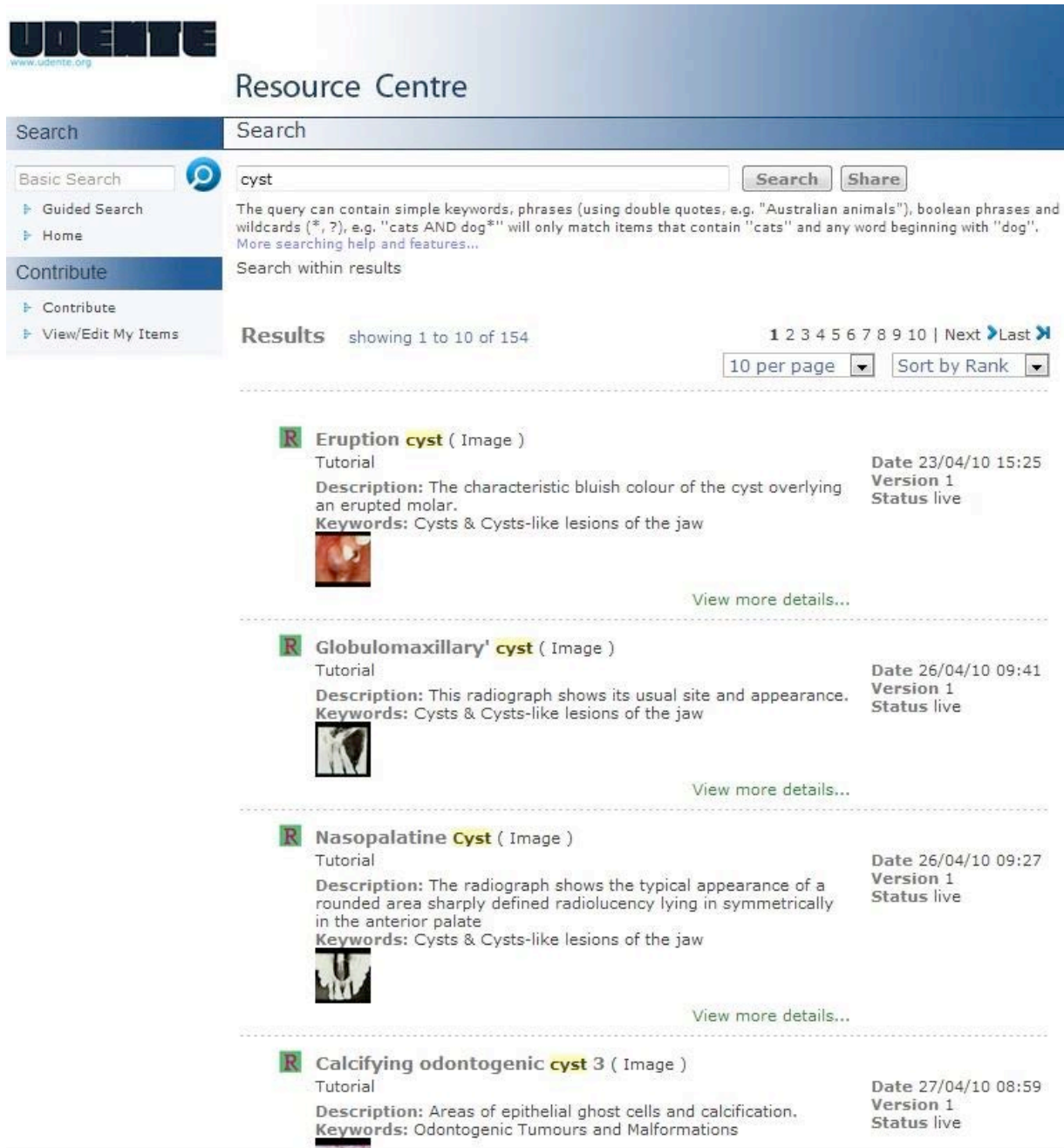

Figure 3. E-content in the LCMS of the UDENTE system.

with wild card additions for extra complexity. Students write appropriate prescriptions per case and are given scores and feedback. This has been evaluated across three European

countries, Austria, Italy and UK [8].

Quality Assurance
Having the infrastructure in place is of para-

mount importance for the development of on-line learning environments. However, it is the content that ultimately will provide both staff and students with quality assured resources that can help build their teaching programmes. But how does UDENTE ensure that the content is of a high standard at the level of education expected in the top universities?

The quality assurance procedure for published content on IVIDENT includes independent peer review of the content, the incorporation of learning outcomes, currency and copyright attribution in the reusable learning objects, instructional design input, and web-media functionality testing. After such testing the object is uploaded and final checks are made by the author - the subject matter expert - before the release of the material for publication [Figure 4].

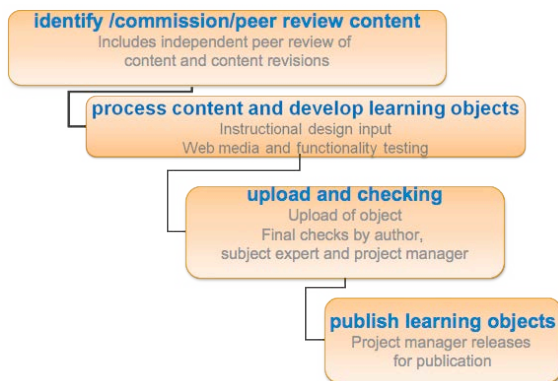Outcome assessments, evaluations and feedback are also in use to be able to measure

Figure 4. Quality Assurance Workflow in UDENTE.

the effectiveness of UDENTE. All teaching, administrative and student users are able to provide feedback regarding the usability, ease of access, quality of content, etc. These responses can then be evaluated to provide a benchmark for the service

Intellectual Property
The content of UDENTE is subject to Copyright, and it has to comply with agreements with the authors and third party providers of the content. This closely follows established publishers' models. Examples of licenses include:

1. Individual authors
    a. Development of pre-existing teaching material
    b. Commissioning 'new' material
2. Third party content providers

a. Academic institutions
    b. Commercial organizations (e.g. publishers)
3. Third party commercial and business partners
4. Subscribing institutions and charter membership (end-user licenses)

Methods
An evaluation of UDENTE's distributed learning environment, including its tools, e-content and learning experience was performed through seven global pilot projects.

These projects were performed in Malaysia, Germany, Italy, Austria, Norway, Malta and the UK [Figure 5]. With this, the technical access of UDENTE, such as accessibility and navigation, and functional components, such as electives and gradebook, were tested. Similarly, the e-content, including user experience was evaluated [9, 10].

Overall, 200 students from the seven countries aforementioned participated in the pilot tes-
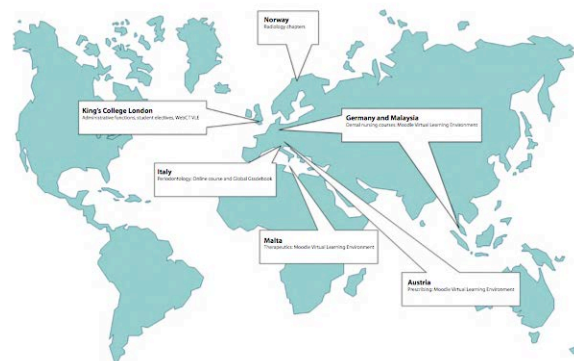

Figure 5. Global participation in UDENTE trials.

ting, with the cohorts selected for geographical diversity and specific local learning needs (for example, lack of specialty teachers). The evaluation instruments used included pre and post-testing of prior and post course knowledge, user experience questionnaires, student and staff focus groups and interviews [10].

In particular, the evaluation of an online course for dental surgery assistants in Malaysia was performed at the Asian Institute of Medicine, Science and Technology University (AIMST) where the dental faculty is a relatively new initiative [10]. A shortage was seen of dental surgery assistants (DSAs) and the need was recognized for a training programme. The Dental Nurse Education and Training Centre of King's Health Partners and UDENTE were

invited to provide this course. The course was seen as a pilot for the overseas market, but more importantly it allowed the evaluation of the impact of such a flexible learning course. This course was authored using Moodle [Figure 6] and provided learning materials over eleven weeks covering nine modules. In addition to the e-content, users had access to a discussion forum, a glossary and a workplace logbook. The evaluation of the impact was performed through:

· A pre-course learner online questionnaire to assess learners' experience of computers, VLEs and confidence levels in completing a course in English.
· A post-course learner questionnaire assessing perceptions of effectiveness of the course and on-site support.
· Collection of data from course delivery and learners' interaction with the environment.
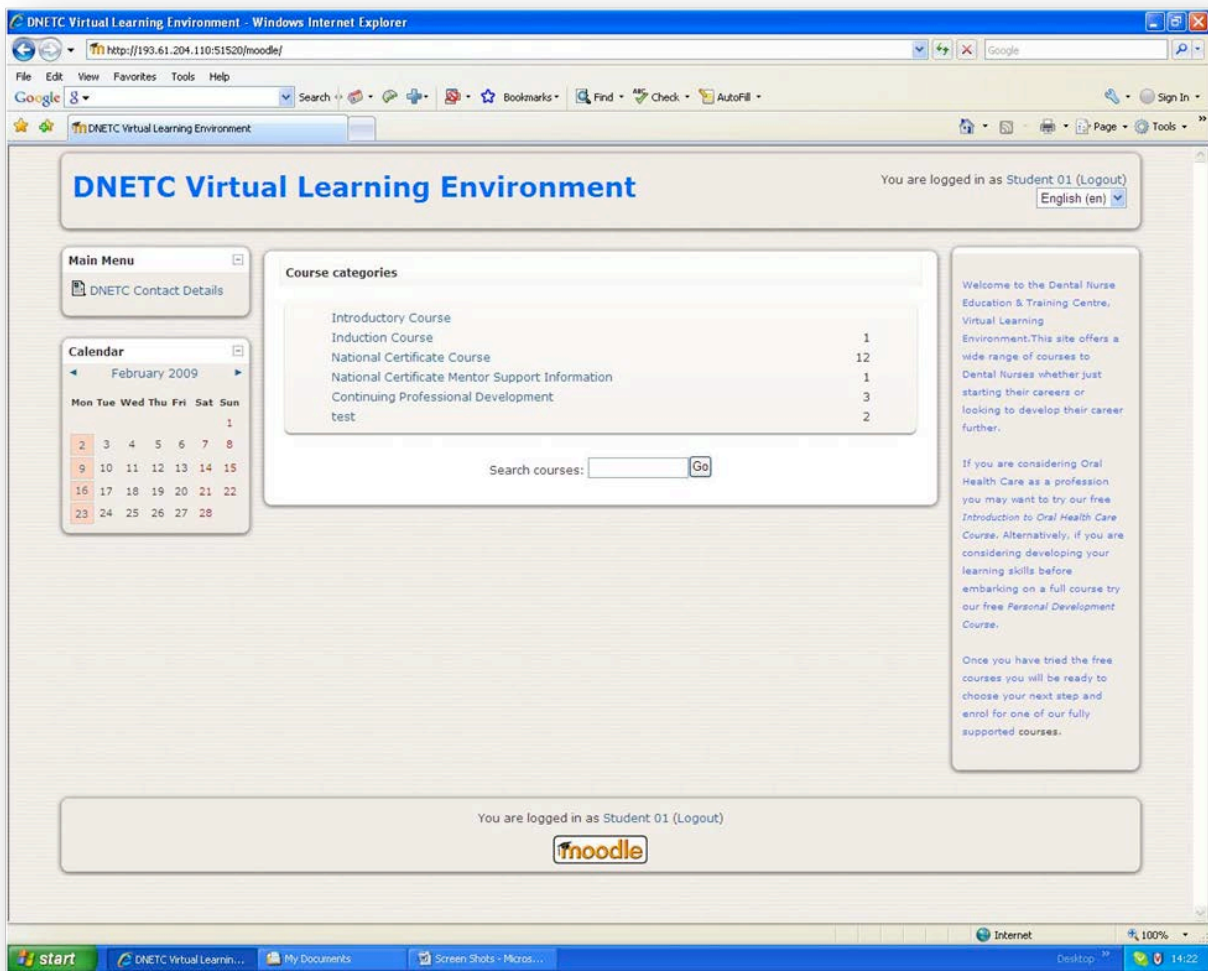· Staff interviews.

Results

Figure 6. Screen shot of Dental Nursing Course in Moodle.

Initial results from the global pilot indicated that the functional components were considered intuitive to use. The evaluation of the electives component revealed that 85% of students found the elective forms easy to use [Figure 7]. Some of the e-content was seen useful for revision, and the Moodle Dental Nurse courses yielded high pass rates in

Germany and Malaysia. In general, the focus groups seemed to accept the UDENTE system and its approach to learning, without the language being a barrier. It was observed, however, that there is still a difficulty engaging faculty members in the use of UDENTE [10]. For the Malaysian pilot, the results for the pre-course questionnaire indicated a familiarity

Figure 7. Screen shot of electives software
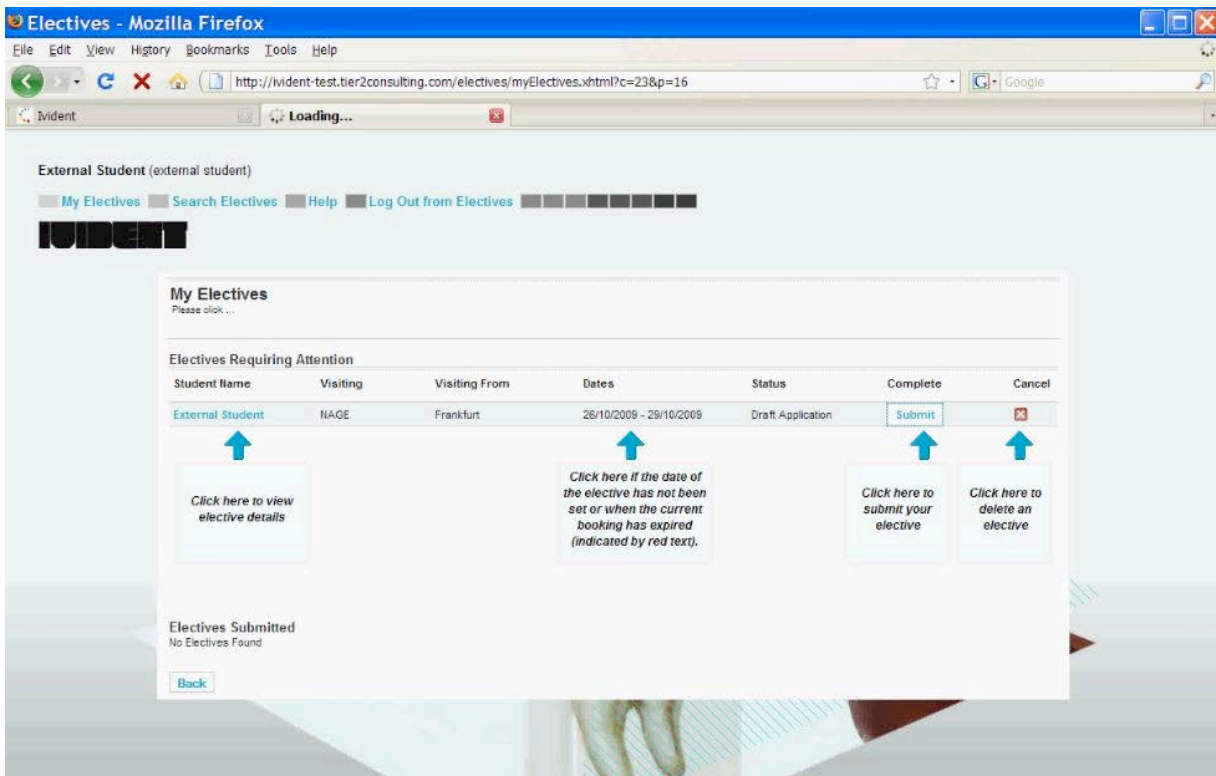
with the use of computers and a preference the use of English for learning. Post-course questionnaires indicated that the system had helped them consolidate their learning and keep track of their experiences. The students also felt at ease in the use of the forum, which they accessed to help with questions and to communicate with peers and tutors. The course was deemed of better or similar quality than face-to-face courses, and the faculty at AIMST embraced the course indicating that it was cost effective as fewer staff were needed

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Conclusion

UDENTE has already proven successful in pilot exercises and in current dental teaching in the UK. Several benefits of the system are already emerging. Firstly, it provides a joined up delivery and dissemination of flexible learning. This can help free up academics from administrative and repetitive tasks and spend more time in their research or clinical activities. It improves the student experience, including feedback. This was particularly evident in the administration of student's electives. For admin staff, UDENTE allows dynamic changes in students' details through records systems interface with the administration and authentication system of UDENTE. Monitoring of online education activity has the advantage that data will be available for educational outcome assessments. Furthermore, UDENTE acts as a publisher of high quality teaching materials – which provides a basis for rewarding staff and allows for the secure attribution and recording of senior faculty's teaching resources. UDENTE also addresses copyright and regulatory issues using a publishing model. Through a benchmarking exercise, best practice in TEL was demonstrated as being achieved.

In pilots, UDENTE was well received, viewed as a suitable method of training in terms of outcomes, time and satisfaction. The pilots have also proven its potential for future use in overseas courses, however, to minimise issues related to the course language, it was recommended that local workplace tutorial support should be available. Furthermore, constant improvement and updating on modules both as a result of new medical evidence and users feedback is recommended. Most importantly support for faculty is important to facilitate the cultural change to such new and golden educational dimensions [11].

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