

**CREATING AN INTEGRATED COMPUTER
ASSISTED LEARNING AND ASSESSMENT
EXPERIENCE IN THE SCHOOL OF
EUROPEAN LANGUAGES AND CULTURES
AT THE UNIVERSITY OF EDINBURGH**

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Creating An Integrated Computer Assisted Learning and Assessment Experience in the School of European Languages and Cultures at the University of Edinburgh

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Abstract

In the field of Computer-Aided anything, acronyms abound. They are, after all, useful tools. However, there is a risk that we become constrained by them and, as a result, fail to see beyond them.

It is ironic, therefore, that the aim of this paper is to discuss the merits of yet another acronym, one which draws together the two which are so familiar to those working in this field: CAA and CAL. These, despite their similar backgrounds in teaching, learning and assessment often remain separate entities. During the course of this paper, the authors will argue that the specific needs and requirements of staff and students in a discipline not associated with high levels of computer literacy emphasise the need for a new approach. This revised methodology will putatively be referred to using the acronym **CALA** - Computer Assisted Learning and Assessment in the field of language study.

This conclusion has been reached 6 months into a project undertaken at the University of Edinburgh in the School of European Languages and Cultures to provide learning and assessment materials to students in a variety of formats using the TRIADS engine developed at the University of Derby.

Initial surveys of language students in their second year of study or above revealed that although all of those surveyed used a computer in their studies, only 19% had ever used a computer application to help learn a language. Faced with such a student profile - and the staff profile did not differ greatly, it became clear that no off-the-peg solution would be able to bridge the gap for these learners.

With this in mind, the authors undertook a deconstruction of the flexible TRIADS engine with a view to adapting it to the needs of users who not only needed detailed pedagogical help, including instant feedback and multimedia tutorials and texts, but also required clear and informative technical advice in order to successfully learn with the aid of computers.

The reconstructed design, created in collaboration with Don Mackenzie at the University of Derby is loosely based around the concept of the video game in which the player first learns the necessary moves before passing through a series of increasingly difficult levels.

This highly structured framework reflects the structured complexity of language and enables the tutor to divide the material into a number of sequential units. Each unit consists of three pathways for learning and assessment.

The first pathway is a tutorial on the topic in question. Having completed this the student progresses to the second pathway, a series of formative exercises. During this formative stage the student receives instant and answer-specific feedback directing him/her back to the relevant pages of the tutorial. Once all exercises have been completed, the student progresses to the third pathway and is presented with exercises designed as a final test of knowledge. The marks from this summative stage are calculated, forwarded to tutors and, most importantly, verified to allow the student to pass to the next level. Only on achieving the threshold mark in each unit's summative section can the student progress to the next unit. In the video game analogy good marks are the key to progression.

The benefits of such an integrated learning and assessment solution are numerous. The student is able to become familiar with the nature of computer-aided learning before embarking upon exercises that will eventually count towards final course assessment. The feedback provided in the formative environment can be related directly to the material learned in a way which is often not possible with other CAL / CAA packages. The highly structured framework enables students to gain a clear sense of learning progression, and rewards motivated and able students with fast access to higher levels, whilst all the time providing formative and summative assessment.

Introduction

The School of European Languages and Cultures at the University of Edinburgh offers a range of *ab initio* language courses including Italian, Portuguese, Spanish and German. This paper reports the experiences of a project funded by the University of Edinburgh Development Trust which has resulted in the creation of Packages for Assessment and Learning in Multimedia (PALMs). Each package is designed to provide an integrated learning and assessment environment in which students encounter tutorial material, practice and assessed questions. The format, based on the concept of the video game - in which the player learns skills and progresses from level to level - is unique in the context of language learning and although no large-scale testing with students has been undertaken, the preliminary findings show that combining Computer Aided Learning (CAL) with Computer Aided Assessment (CAA) - can significantly enhance the teaching and learning experience in modern language departments.

Background

As is the case in many universities, a substantial element of *ab initio* language courses is the tuition and testing of elementary and intermediate grammar. Indeed, findings from an informal survey of staff indicate that approximately 25% of these courses are devoted to grammar learning. This may seem somewhat traditional but without the ability to understand how and why words fit together in certain ways, students are unable to progress to higher levels of language learning in which they are expected to manipulate complex grammatical structures in a variety of registers. This classroom approach is supported by research which shows that in recent years a revival of interest in the explicit instruction of grammar has produced positive results: (Ellis; McEnery, Wilson and Baker)

The greatest disadvantage to such an approach is the heavy demand made on staff time by the marking of basic grammar assignments. These often take the form of gap-filling exercises, vocabulary development tests, verb tests, etc. In response to rising student numbers and increased administrative burdens on staff, members of so-called 'minority' languages within SELC considered the potential effectiveness of CAA. There were initially several obstacles to overcome in this regard, mainly relating to the lack of IT experience of many colleagues in the

discipline. Figures from a recent survey into the use of computing in the minority languages carried out by the VDML (Virtual Departments for Minority Languages) project at the University of Edinburgh attest to the fact that not only staff, but also students in the modern languages are still relatively IT-phobic. For example, although most staff considered themselves competent in web browsing, email and word processing, only 18% of staff surveyed had used computing in teaching or assessment. The pattern amongst students was even more striking. Less than a quarter of students surveyed use computers for language learning and only 20% were able to name an application they had used for language learning. These facts provide some statistical support for the general experience of teaching staff which is that students are reluctant to use computers for any element of the learning process, including simply submitting assignments, unless forced to do so by staff.

Overcoming these obstacles is not only in the long term interest of staff, for whom the reduction of marking loads is a priority, but also has the added benefit of providing students with one crucial element of the career skills in the curriculum requirement: IT proficiency. Of course staff can also benefit from this and enhancing staff profiles is in the interests of every further and higher education institution.

In the minority languages, there are often few, if any 'off the shelf' solutions for teaching and assessing basic and intermediate grammar. Consequently, the solution for this project was to select software with sufficient flexibility not only to deliver multimedia language tuition along with formative and summative assessment, but also to offer developers the freedom to incorporate technical help for students and staff.

It is important at this stage to highlight the extent of fears amongst staff and students regarding the use of CAL in the modern languages. The type of prejudice perhaps already encountered by other disciplines are encountered with regularity in language departments, where inter-personal communication is a key skill and the computer is viewed very much as a tool for writing and adding up, and little else. This might be overstating the case, but comments from staff and students made anonymously to the VDML survey reveal the extent of the fear and lack of trust:

'I am not a great believer in using the computer more than I do since I see it as another tool like the other aids. The most essential thing is direct contact of students with students and teachers with students'

'I do not like computers, I know very little about them, I do not expect to use computers unless I am obliged to do so as part of my course.'

'Don't make language learning so computer oriented. What's wrong with talking or opening a book?'

These statements are categorical but representative and raise serious issues about the design of a system which must simultaneously be able to help staff and students overcome their fears and also enhance the assessment process. Interestingly, the fears of staff in particular, which are based on the notion that the preparation of computer aided learning material is far more time consuming than traditional pen and paper methods are not supported by the research which suggests that employing CAL in language learning can in fact be very effective and time efficient. (Nagata, Lam & Pennington, McEnery et. al.)

The solution to these fears has been to integrate three stages of learning and assessment: tutorial information, formative assessment and summative assessment. By this means, the developers hope to be able to provide students with a 'safe' and ever more familiar, highly structured learning experience which from the point of entry to the point of exit not only encourages in-depth learning (making the student aware of the learning outcomes of each exercise they undertake, and explicitly linking the learning with the assessment process) but also provides help on technical issues. This is achieved by means of a 'portal' which locates the software in an environment familiar to the students (the desktop of the machines in the most commonly used microlabs). This portal not only provides a link to the academic content, but

also introduces the student to a more detailed breakdown of the technical environment (with detail of the overall framework as well as instructions / demonstrations created using Authorware which show students how to navigate through the range of individual template styles).

From the point of view of staff, the process of inputting exercises has been simplified to an extreme degree, to the extent that knowledge of word processor and spreadsheet are all that is required for the creation of all kinds of tutorial and assessment material including multimedia video and audio. Research in the early stages of the project highlighted the need for a simplification of the process of creating material to the degree that it equated to time spent on traditional methods. This has been made possible through the creation of a framework which is easily integrated into already existing courses, as well as a package of help materials for tutors. This includes pre-prepared text files and templates for the inputting of tutorial material with multimedia capabilities, exercise definition forms in the form of word documents, as well as forms which detail the overall structure of the series of units to be included for any given course. These forms are saved on a shared drive according to predefined conventions and uploaded by the multimedia developer who is available to provide technical assistance if necessary. The simplicity of the system means that one possible development of its use might be in the area of student projects where students themselves learn about a particular topic and create a tutorial and exercises to go with it.

Sustaining Interest

Clearly, however, the project will not survive if students' interest is only briefly captured. In order for CAA to fulfil some of the more ambitious aims of the developers, it must sustain the interest of all users (staff and students). This can only be done through the creation of reliable, user-friendly software and a graphical interface that promotes clarity and is intuitive to use. The flexibility of the TRIADS architecture has enabled the fusion of academic and technical approaches within SELC in order to make the software an ongoing and integral part of each course. As a result, it is intended that PALMs be subsumed into students' private learning time. This flexibility promotes sustained learning and assessment over the course of a longer period (such as the full academic year) and shifts the focus away from one-off assessments and the associated potential for a blinkered revision process which leads to short term retention of information but does not encourage deep learning.

It may seem strange that, in a field where advanced natural language processing systems are beginning to emerge, the developers have chosen to support and assess the learning of a foreign language using a tool primarily designed for scientists. The reason however is in many ways very straightforward. Whilst many Intelligent Learning Systems based on Natural Language Processing techniques are able to provide very specific feedback on parsed sentences, allowing freeflow user input, their technical and linguistic complexity can result in limitations in other areas. Both in terms of the resources needed to create, run and maintain such programs and in terms of the limited scope of their coverage - many being dedicated to one relatively small area of grammar or speech (Lambacher) - the system is not suitable to the needs of departments where packages are needed to assess a range of skills over an extended period. The PALM project, whilst unable to provide great flexibility in terms of sentence parsing and free learner input is nonetheless able to provide an environment in which input-based feedback can be provided on a wide range of grammatical and other linguistic issues. Providing a single 'one-stop shop' route to CA(L)LA in this way has significant benefits for both students and staff in terms of the creation and maintenance of material, coverage of areas, distribution of results, etc.

Enhancing Teaching

After consultation with various subject areas, developers undertook a deconstruction of the flexible TRIADS engine and rearranged it into a more fixed framework whose structural integrity

reflects the structured complexity of language and enables the tutor to divide the material to be taught into a number of sequential units. The units can be devised to reflect the progression required of students in the 'traditional' course format, and so permit students to clearly identify the role played by CALA in the overall curriculum. In effect the overall framework functions along the lines of a video game where progress is only achieved through the successful completion of each level. In the case of PALMs, each unit consists of three pathways for learning and assessment. The first pathway is a tutorial on the topic in question. Having completed this the student progresses to the second pathway, a series of formative exercises. During this formative stage the student receives instant and answer-specific feedback directing him/her back to the relevant pages of the tutorial. Once all exercises have been completed, the student progresses to the third pathway and is presented with exercises designed as a final test of knowledge. The marks from this summative stage are calculated, forwarded to tutors and, most importantly, verified to allow the student to pass to the next level. Only on achieving the threshold mark in each unit's summative section can the student progress to the next unit. In the video game analogy good marks are the key to progression.

This format provides students with one point of contact for the information they need to complete each unit. It also incentivises progression from basic to complex forms by rewarding the student for good marks with a pass onto the next level. The clear benefit of the video game analogy is that for all that the students are computer phobic, they are almost all familiar with the video game and so can relate its philosophy and understand that the key to success is that practice makes perfect.

By incorporating the computer aided material into the traditional course in this way and articulating explicitly the relationship between what is learned in class and what is reinforced and tested by the machine, developers hope to dismiss some of the fears of students who cannot see the point of CAL. There is, after all, nothing wrong with 'talking and opening a book'. Indeed, the real benefit of this system is the time that it frees up to concentrate on traditional contact and communication with students.

We also hope to overcome the fears of some members of staff for whom the issue of 'trust' is paramount. Several discussions regarding the reliability of data and the potential for cheating have led to the creation of a system whereby students' identities are verified at login and results are posted to tutors by email or via FTP to a website. This process cannot of course eliminate the possibility for cheating. However, by placing the emphasis on the successful completion of a series of units at a particular passmark, rather than on the mark itself, time spent by tutors on the marking of exercises now done by computer can be devoted to the marking of more traditional pen and paper and oral assessment. Effectively, the successful completion of the series of units becomes the passkey to the 'real' marks gained in traditional assignments. This solution has alleviated the worries of many who saw the potential for cheating as a major obstacle.

Enhancing Learning

By embedding the process of testing understanding and knowledge into the curriculum, the link between learning and assessment is made abundantly clear. As a result, the learning process is inevitably enhanced. Students have responded very positively to the concept and design of the PALM framework, indicating that the need to pass at a certain rate before progressing onto further learning is an important factor in consolidating their knowledge of each subject element before moving on.

In the case of the pilot language Portuguese students had not previously been exposed to computer aided learning. Their only experience of CAL had been with the KCCALL Spanish package which includes only direct feedback formative assessment. As a result, students

indicated that there is no incentive to internalise or deep learn the material they are presented with. Rather, they tended to simply type the correct answer and promptly forget it.

Students also responded positively to the variety of question styles and tutorial templates, which included sound and video. For the first time, they were able to learn about the conjugation of verbs or the use of demonstrative pronouns and hear the words spoken, or listen to a brief dialogue exemplifying a written text. In some cases, students found this a useful means of reinforcing material learned in class or revising structures already discussed. This notion that CALA can reinforce classroom learning is key to the philosophy of the project and has enabled developers to demonstrate that far from reducing contact time, the intention is to shift the focus of staff resources towards the types of teaching and assessment which must take place face to face. In order for this to occur successfully, however, students must be convinced of the benefits. The only way to achieve this is to provide a stable platform for the delivery of informative and engaging multimedia tutorial and assessment material.

Creating Tutorial Material

In the case of tutorials, there are 10 templates to choose from. These have been developed after extensive research into methods used for the teaching of ab initio language and include the facility for tables, diagrams, pictures, sound and video. Tutors simply choose a template and input their content into prepared simple text files using easy-to-follow instructions. This content is then picked up by the software and displayed directly on screen according to predefined layouts. Students quickly become familiar with the templates, further enhancing the 'familiarity' of the package.

Question Styles

INTERFACE

These have been developed on the basis of the wide range available through the TRIADS engine. Initial informal testing with students led to the developers favouring 6 particular types of basic TRIAD question templates. The templates were revised for the purpose of teaching and testing a range of European languages. As a result a completely new interface was established which was designed to consolidate the existing TRIADS screen elements with the needs of IT-inexperienced students in mind. For example, TRIADS provides a movable feedback box which early tests with language students proved to be a significant distraction from the content it provided. It was therefore important to produce a visually uncluttered and user-friendly set of screens that would support sustained usability throughout an academic year, whilst also providing an appealing way for students to practise a language starting with its most basic components.

METHODS

In order to support the creation of content from tutors, a set quantity of help and entry forms has been provided with two clear aims. Firstly, the terminology and layout for each entry form, for both tutorials and questions, encourages the language tutor to think about their work in a form that will suitably translate from paper to screen. The pedagogical spine inherent in each of these *exercise definition forms*, preserves the teaching methodologies of a range of languages while making the input and output of all data easily accessible to the CAL environment. Finally, the formulation of detailed help and reference material for each of the forms is set out to maximise the efficiency of content production for the PALMS applications. It is hoped that these current methods will invite tutors to bypass the transposing of current paper materials and help them compose material directly for the applications.

TEMPLATES

As well as including the six basic TRIADS templates we also developed a set of variations that would be common to each of the question styles. These are now presented to tutors as a set of

options that can easily incorporate video, audio, text extracts (of varying lengths), images, URL links or translation facilities. Each of these technical / multimedia appendages have been formulated to aid the language tutor in putting together a wide range of questions and aid the uptake of basic and higher level content by the students.

The quantity of individual questions provided by true / false, matrix, text entry and label diagram templates has been set to a maximum of five. Some practitioners might see the limit set here as not the ideal quantity for testing a substantial range of issues. However, this type of standardisation has given authors within this context the space to test lengthy phrases as well as providing clarity in the display of their information. The practice exercises have also been designed to combine with the tutorial material provided by tutors. The symbiosis of the tutorial and practice pathways is aimed at increasing the student's knowledge and provides tutors with a learning and assessment tool of a kind not available to them in the market place today.

The early indications from testing with students are that text-entry and label diagram templates provide the most challenges while also retaining the ability to serve the students' various practice and revision needs. The text entry method while also providing the most direct interaction between the student and software is also capable of monitoring the subtle margins of error that are part of learning to spell in a foreign language (such as use of accents and double letters, etc.). The addition of audio and video to the text entry template, plus the response from teachers in the form of immediate feedback, combines useful teaching and learning methods which traditional materials provide separately. Students have responded positively to this innovation.

Incorporating Multimedia

The potential to incorporate sound and video is a significant benefit of the PALMs system, especially when it is applied to the teaching of foreign languages, since these represent the most useful of teaching resources, providing learners with 'native speaker' content and the potential for cultural and linguistic immersion. The current delivery setup is such that this potential can be maximised, as students access material through Authorware, with its built-in multimedia facilities and via one of the University's Local Area Networks which supports high connectivity rates. As a result, video clips of approximately two minutes in length can be delivered without disturbance to the playback rates and decoding of sound and image. This is crucial in helping students to learn about the formulation of sounds in the foreign language. Off-Air video recordings are selected by tutors and transposed to digital video. This format has been selected because it provides stable quality and time referencing capability during the capturing process. Again, such accuracy is vital for tutors wishing to concentrate on particular sounds or phrases. Since it is envisaged that tutors will wish to incorporate large quantities of sound, a referencing system has been developed to allow sound material to be recorded directly onto minidisc and transferred into .wav format.

Feedback

Appropriate feedback for learners on a wide range of grammatical points is an essential factor for individual study and hence an important factor in the design of any Computer Aided Language Learning and Assessment system. Although, as already indicated, PALM is by no means an Intelligent Language Tutoring System, great importance has been placed on the quality of feedback given to students in the formative stage of the assessment process. The significant advantage of an in-house package over a shop-bought solution is that the tutor's own experience of the performance of students on a particular course can inform the feedback process. This enables tutors to 'personalise' the feedback, instructing students to return to particular sections of the tutorial which may also have been written by the tutor.

In the early stages of each unit, students receive the most explicit feedback which promotes self-correction rather than directly indicating the correct answer. The merits of self-correction

indicated by researchers (Schachter) are borne out by student comment, which suggests that the process of getting the answer wrong, returning to the relevant tutorial page and working out the right answer provides a sense of achievement not realised by being told the correct answer as soon as the wrong one is input.

Feedback which directs students to the relevant tutorial pages also has the added benefit of encouraging them to reflect on the learning process, to think about the reasons for not having remembered or understood the point in question. In pilot tests, students demonstrated a level of enthusiasm for grammar learning not previously seen using traditional methods. When questioned, most indicated that they felt challenged by the machine and that a sense of competition with the computer provided a healthy enthusiasm for grammar learning.

Preliminary Conclusions

It is really too soon to tell whether this system will be a success or not. The early signs are however positive. Testing on a small number of students indicates that the close interweaving of learning and assessment creates an environment of healthy competition and a desire for learning. The highly structured framework enables students to gain a clear sense of learning progression, and rewards motivated and able students with fast access to higher levels, whilst all the time providing formative and summative assessment. Students have responded positively to this, indicating that the division of material into sequential units provided them with a clear context and set of aims, quite contrary to the more free-flow, open structures of many multimedia language learning tools also available to them. They have also commented favourably on the provision of help information which aids them in overcoming the technical barriers discussed above.

The benefit of Authorware / TRIADS' multimedia capabilities means that students can be presented with a unique learning and assessment environment. The authors are not aware of any other package currently available which provides tutorial, practice and assessment material in a single, easy to access format.

Some negative student comment indicates that there is scope for future enhancements based on a full year trial. It is clear that the ease with which audio and interactive text-based course material on the one screen is a powerful way to reinforce the key rules that are then put to the test by the software's assessment facility. However, some students found the interaction process somewhat unwieldy. It is likely that this is brought about by a series of small flaws which wider testing will highlight more clearly and enable developers to solve. On the whole, though, the prospects are fairly positive.

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