Designing Multimedia for Differences: e-Lecturer, e-Tutor, and e-Student Perspectives

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Abstract.

The outlook on the roles and needs of the centre players in the cycle of production and delivery of e-learning materials is investigated. The perspectives of e-lecturers, e-tutors and e-students on use and design of multimedia learning objects are presented in this paper. Their various cultures, skill levels and learning styles necessitate integration of flexibility into learning environment. Flexible use of multimedia learning objects and how the scalable design principles can be applied in practice are demonstrated. This adaptable framework relies on the learning style and background knowledge of the tutor in selecting, organising, and presenting learning material produced by e-lecturers. It adopts a flexible approach to educational content organisation and delivery based on multimedia components that can be integrated into a wide range of courses. The flexible framework leverages XML metadata for describing multimedia learning objects and XSL for their seamless integration into the existing e-learning systems.

1. Introduction.

A major challenge in e-learning today is to improve both instructional productivity and learning quality for a large and diverse student population. A great majority of e-learning systems are content rather than learner centred, whereas the impact of diversity in the process of development and delivery of study materials has not been investigated fully.

Research shows that students prefer engagement into learning with resources[1]. E-learning challenges applicability of the “one-size-fits-all” paradigm for learning material development. By giving students different ways to learn in a virtual environment it is anticipated that improvement of learners’ acceptance and impact of the study resources will occur.

The roles of three major players in the e-learning cycle have been explored:

- **e-lecturer**: as the designer of e-learning strategy and materials.
- **e-tutor**: as the conveyor of study materials
- **e-student**: as the end consumer in the learning cycle.

Blended learning is emerging as a winner among various distance learning models. However, it puts to the test the effectiveness of e-learning materials. The fact that online study materials are produced in one cultural context by an e-lecturer, whilst delivered in the case of a blended e-learning thousands of miles away by an e-tutor from a different cultural background has not been addressed in-depth by current research. Finally, learning style and culture influence students’ acceptance of e-learning materials, which affect their engagement, motivation and ultimately their learning success [3].

The research presented in this paper investigates the diverse needs and functions of e-lecturers, e-tutors and e-students. We are investigating how culture and IT skills influence development and delivery of e-learning materials. The diverse needs and expectations of e-learners can be met by allowing for flexibility in organisation of study materials. Modification in learning materials for successful adoption in another culture is analysed through integration of multimedia learning objects [2]. The paper addresses multimedia development issues and technical considerations important when constructing flexible e-learning content through visual Learning Objects (LO).

2. Survey Results.

In this paper e-tutors are those who do not develop content, but teach already developed content and provide learning support to students in e-learning environments.
E-lecturers, on the other hand, develop learning content as well as provide students with educational support in e-learning. Finally, e-students are learners who participate in online or blended learning forms of study.

**E-tutors and E-lecturers.**

A survey was developed to identify the needs of e-learning experts. The online questionnaire consisting of 36 quantitative and qualitative questions was placed online and completed by professionals from EU and Asian countries. Responses were received from 52 participants of varying levels (tutors and lecturers) and cultural backgrounds (e.g., Thai, British, Chinese).

The sample consisted of 26% e-tutors and 50% e-lecturers (with 15% of the participants engaging in both e-tutoring and e-lecturing). The percentage of the participants who define themselves as e-lecturers is 67% amongst those specifically of Western background and 42% amongst those of Eastern origins. There are a comparable number of participants who define themselves as e-tutors and e-lecturers (13% for Western and 16% Eastern). The relative majority of the participants, 44%, were involved in blended learning with no particular variation between the Eastern and Western subsets of data. Twenty-six percent were involved solely with e-learning and 26% were engaged in teaching both in blended and e-learning formats.

Communication surfaced as one of the most important aspects in the needs survey in terms of being a necessary facet of training for e-learning professionals as well as a barrier to providing e-learning in a cross-cultural setting. The participants are interested in developing an appreciation of the cultural differences in communication style as well as non-linguistic aspects of communication. Others areas to consider in communication are feedback, class management, providing guidance to the class, presentation skills, online facilitation, collaborative learning, tone of notices, frequency of access, discussion forums, rapport with students, non face to face communication, and foreign language skills.

Module design was considered to be a necessary aspect of training for e-learning professionals. Creativity in design was also considered an important e-learning skill. This seems a natural combination as often times module material may be seen as dry, standard and following a set format.

Using a creative approach has been shown to encourage participation and interest on the part of the students [4]. Aspects of design such as interactivity of the content, knowledge of best practises and planning should also be taken into account. More concretely, instructors should be familiar with evaluation, their role, quality monitoring, assessment, development of easy to understand material, competence in the content of the module and professional knowledge.

These findings provide a stronger impetus to focus on development of flexible, easy to understand, and engaging learning materials in order to raise the standard of teaching skills in the new learning environment.

**E-students.**

Web-based educational systems provide a way for students to access learning content from a distance, thus increase the possibility of course attendance and interaction regardless of the location and time constraints. An important factor impacting the quality of learning is the resources available for learners. In multicultural environments the choice of resources must take into account the added complexity of cultural aspects affecting learning style. Students participating in online learning programmes have been surveyed on their needs reflected in three different areas: culture, learning styles and their effect on the preference of educational materials. They also have completed an evaluation of the flexible multimedia framework based on study performance. The sample of 100 UK and non-UK students provided a multicultural response reflecting the needs of e-learners as depicted in Figure 1. All of the respondents have been using the WebCT virtual learning environment in their studies. 24% of the sample said that the online educational technology was new to them. An overwhelming majority (50 % of respondents) of international versus domestic students stressed the importance of self-paced quality in e-learning materials. A similar trend was observed in the positive perception of visualisation of materials (59% difference between international and domestic students). Again international students found the opportunities for observation and reflection more important for the success of learning then their UK colleagues. Both groups felt equally about the importance of incorporating examples relevant to their experience.

![Figure 1. Cultural Diversity of e-Students.](image)
The findings of the survey supplied a synopsis of preferences for e-learning materials amongst multicultural students. The emphasis on interactive, self-paced materials, giving opportunities for observation, emerge as the preferred means of learning as identified by the students participating in the survey. E-learners have been asked to rate the effectiveness of various types of study materials. Their preferences for the use of textual static content, image enhanced content and multimedia educational materials are summarised in Figure 3. The strong emphasis in student responses was placed on multimedia making its rating three times more effective than text. Students were also asked about their preferred length of multimedia materials. These results are shown in Figure 4.

The fast pace computer technology opens new opportunities for education. Transition from the ordinary classroom towards the electronic mode of delivery has successfully created new learning media. Development of educational materials for an electronic classroom is more complicated than for the old fashioned chalk-and-talk paradigm. As indicated by the findings of the surveys of e-lecturers and e-tutors, e-learners needs and preferences define requirements for success of e-learning materials.

These requirements are flexibility, visualisation and interactivity.


As suggested by earlier research, interactive exercises are the key in keeping students engaged in learning. Activities are linked into static pages to enhance hands-on learning experience. Integration of multimedia into the online course enriches static content, enhances learning experience and produces credible results [7].

We have investigated the aspects of flexibility in educational materials by means of structuring multimedia components. The framework addresses the need for customisation of content in computing courses, where the diversity of students’ technical and cultural backgrounds is very high. In this framework we have demonstrated a straightforward mechanism for integrating the desired multimedia components into an e-learning environment. The multimedia components visualise and explain a particular concept, for example development of a distributed application. Each component demonstrates a certain step in this process, therefore by stitching up all of the components or clips, a detailed demonstration of the process is obtained. The clips are developed under the guidance of the e-lecturer. A number of students who access these materials may be familiar with some of the concepts demonstrated in the multimedia, and some may not be. Thus, under the judgement of the e-tutor, who delivers the materials to e-students, the presentation of the clips can be adjusted for students with different needs.
metadata, which adheres to SCORM[2,9] standards. Depending on the skill level of students, module instructors have the opportunity to add or remove relevant pieces of digital content from the presentation. Metadata focused on the learning outcomes providing a comprehensive descriptor for the content of the multimedia objects.

The proposed metadata format presents a recursive form for learning content descriptor. The same format can be applied for small multimedia objects, as building blocks for larger learning objects.

4. Evaluation.

The main interaction that e-students have with the learning environment is viewing and listening to the course material in the multimedia format. In order to judge how much comprehension the student has gained through completing a certain amount of the course material, the researchers introduced review exercises. The study performance is assessed through review activities related to the learning outcomes of the course material. Questions in the review exercises are encompassed the topics covered by multimedia objects. Each question has a level of difficulty and therefore is assigned a particular weighting. Correctly answered harder question demonstrates a greater ability than correctly answering an easier question. The following formula was adopted [7] to calculate the score for comparing study performance of various e-students:

\[ \text{Score} = \sum_{i=1}^{N} \omega_i S_i \]  

Where N is the number of questions, \( \omega_i \) is the weight of the \( i \)th question with \( \sum_{i=1}^{N} \omega_i = 1 \), \( S_i \) is the score of the \( i \)th question. Students were asked to complete a multimedia presentation on a topic on which they did not have prior knowledge. It is very common in computing programmes that students taking the same course have very different IT skill levels, although all of them meet the prerequisites for the course. The flexible framework has generated two sets of multimedia learning objects. The first was designated to meet the needs of novice IT students and did not include introductory segments. The second set of multimedia objects was intended for students with more advanced IT backgrounds and did not include introductory segments. The second set was designated to meet the needs of novice IT students and included extra clips. The learning outcomes of the educational content covered in both presentations were the same, as well as the questions for the performance assessment.

Four groups of students have been formed for this evaluation: two groups of students with prior IT experience and two groups with less significant IT exposure. The students with advanced skills in both groups have taken the shorter version of the multimedia presentation. The first group of novice students has completed a more detailed presentation, and the last beginners group viewed the multimedia without the additional content. The study scores, their means and standard deviations for these four groups of students are shown in Figure 6.

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>STDEV= 8 AVERAGE=80</td>
<td>STDEV=8.4 AVERAGE=74.4</td>
</tr>
<tr>
<td>Group C</td>
<td>Group D</td>
</tr>
<tr>
<td>STDEV= 22 AVERAGE= 58</td>
<td>STDEV= 9.8 AVERAGE=75.6</td>
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</tbody>
</table>

Figure 6. Statistics of the Student Scores.

5. Discussion.

Our approach is enabled by a synergy of widely adopted technologies such as XML, JavaScript and Multimedia. XML provides the rich capabilities for data representation and integration and is easy to read for both humans and software. Multimedia offers visualisation capabilities and greatly supplements textual content. Multimedia based learning objects provide an effective and scalable way for practitioners to enrich learning processes.

Students engage in activities with resources and the multimedia with XML metadata gives practitioners opportunities to go beyond the one-size-fits-all learning scenario. Availability of the learning object metadata increases the value of educational content and standardisation of these descriptors provides better integration possibilities for e-learning practitioners. Some of the improvements on the learning cycle and resources offered by scalable learning objects are:

Customisation of online content.

By means of online technologies and XML it is possible to dynamically change and adapt online content for various audiences. Customisation of online content gives education practitioners extended opportunities for various learning styles. Personalisation Flexibility of online content benefits not only the instructors but others involved in online learning. Personalisation of learning resources can increase students’ engagement in education process and improve learning outcomes.

Cost-effective use of resources.

Comprehensive LO descriptors support decomposition of learning material and make content suitable for integration in a variety of educational programmes. LO with appropriate metadata becomes re-usable resources.

Portability. Due to the fact that XML is an open and widely adopted standard, XML metadata becomes portable across different software platforms. Our flexible framework is integratable into existing virtual learning environments such as WebCT and Blackboard,
eliminates the necessity to construct separate content for the same module or course.

6. Conclusion.

E-learning serves the purpose of large-scale and efficient education. While there is still much to be investigated in the e-learning arena, the current research suggests that to maximise the effectiveness of education under constrained resources for students with various cultural backgrounds and skill levels, the learning environment should be flexible and engaging. This may be done in a variety of ways as described by this paper. Attention should of course be given to various cultural differences of student and teacher groups. To ignore cultural variation might be to alienate some of the student population and discourage further education and exploration of current material. The choice of learning materials as shown by the student survey rests with visual aids. It is important to develop visual aids that are not only engaging for the student, but also useful in the learning process. In the online context, multimedia learning objects surveyed have been found to be effective. We propose streamlining the multimedia adaptation process to meet the needs of diverse students by introduction of a flexible framework. Such a framework would allow e-lecturers to develop learning materials and provide them with XML descriptors of their educational value. E-tutors can dynamically generate multimedia presentations using the framework and by relying on the descriptors.

Taken together, it is important to consider using multimedia in an effective and useful way. As e-learning advances, e-lecturers and e-tutors must stay current with the technology in order to enhance the learning environment. That, coupled with an eye towards cultural variation of the student body, especially as it becomes easier to transplant academic programmes from one culture to another, likely will increase academic satisfaction.

7. References.


