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# Comparison of Approaches to a Multimedia Presentation

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**Key words:** *Multimedia, distance learning, computer-based learning*

## Abstract

*Two computer-based multimedia lecture presentations were developed using the same software but using two different approaches. Similar lecture material was used for both lecture presentations. Students found that there were considerable differences between the two lecture presentations. One lecture presentation was found to be very dynamic and interesting compared to the other. However, when videos showing applications of theory were supplied with the less interesting lecture presentation, students found that this package had more value than the more interesting lecture presentation.*

## 1 Introduction

This study investigates the students' reception of two computer-simulated multimedia lecture presentations, which have been developed using two different approaches, to use as distance learning study material in the Automotive Systems Engineering masters programme at Loughborough University [1, 2]. The time taken to develop one lecture presentation was twice as that of the other. The aim of this study was to investigate whether the approach taken for the development process has influenced the effectiveness of the computer-simulated lecture presentations significantly so that development resources can be utilised more effectively in the future. 'Mechanical Vibration' and 'Vehicle Dynamics' were the chosen subject topics for this study. Even though the subject expert lecturers were different, both lecture materials were somewhat similar. Macromedia Authorware was used to develop both computer-simulated lecture presentations. Also, the same software template was used for both presentations in order to have the same navigation facilities. Furthermore, the same multimedia material developer developed both the mechanical vibrations and vehicle dynamics presentations.

## 2 Designing a template for the multimedia presentation

The multimedia authoring package, Macromedia Authorware was used to develop both lecture presentations. Authorware provides tools for creating multimedia presentations that use text, graphics, sound, animation and digital movies. A template to integrate lecture material was constructed after considering several issues. In order to make it easier to use, it was necessary to decide which navigation facilities needed to be included in the teaching package. It was also decided to provide the facility for a smooth flow of continuous lecture presentation for a given section of the lecture material without the user entering data from the mouse or the keyboard. On the other hand the user may need flexibility to control the flow of the lecture material in order to study at his/her own pace. Therefore, a facility to select either the 'continuous' play mode or the 'manual' mode was included. The multimedia teaching packages should also cater for students learning the lecture material for the first time as well

as for students revising the subject. Therefore, a facility was needed to jump to certain sections of the lecture without going through all the stages in between. In addition, the facility was included to automatically display page numbers together with the section number of the presentation to indicate to the learner where he/she is in the presentation.

### **3 Development of computer-simulated multimedia presentations**

#### ***3.1 Approach 1 – development of the mechanical vibration lecture presentation***

##### ***3.1.1 Development of the screen presentation***

Three hours of classroom lectures were video recorded first. Then the audio track of the video taped lectures was transcribed onto paper to obtain a written record of the spoken lecture. This proved very useful in building the storyboard. A 'storyboard', or frame by frame sketch, was prepared in order to assist the development of the multimedia presentation. The video tapes were referred to frequently in deciding where to apply computer animation in the lecture presentation. The amount of material which can be presented on one 'page' of the multimedia presentation is dependent upon the size of the presentation window which is set by selecting the screen size in the Authorware file set-up. Enough space was left at the top and the bottom of each presentation window to display the 'where am I' indication bar and the navigation button bar. A style guide was prepared specifying a preferred format for items such as font size, font type and background colour etc. in order to maintain a similar look and feel throughout the presentation.

Once the storyboard was developed, the next task was to develop the screen presentation by integrating various elements of the lecture material into the template using Authorware. This was achieved by gradually adding the text and graphics into consecutive presentation windows. Pauses were introduced into the Authorware flowline between presentation icons so that the text and graphics appeared on the screen at a similar pace to that of the classroom lecture. The wait icons provided in Authorware were used to introduce pauses. A completed presentation window is known as a 'page'. Text and graphics were added to the consecutive presentation windows as before in order to complete the next 'page'. Using this method the entire lecture presentation on mechanical vibrations was constructed.

##### ***3.1.2 Adding audio files to the presentation***

The previously transcribed audio track from the video recording of the lecture material was used as a basis for writing the voice scripts. The lecturer was asked to re-record the relevant voice scripts onto an audio tape. These were then captured into a computer and saved as digital sound files. Each sentence was treated as a separate voice file. The sound files were edited to remove long pauses and unwanted noises before integrating into the Authorware presentation flowlines. Audio visual synchronisation was done manually by adding wait icons into the flowlines and by adjusting the wait time of existing wait icons. The wait time for each wait icon was determined by the trial and error method of playing a very small section of the audio-visual presentation while adjusting the wait time until the visual screen presentation was synchronised with the voice.

### ***3.1.3 Trial evaluation of the mechanical vibration material***

The multimedia presentation was provisionally evaluated using staff and Ph.D. students in two separate stages, and the necessary modifications to the presentation were carried out accordingly. In the first stage a small number of staff members from non-engineering backgrounds but who were familiar with the development of distance learning material were asked to check the lecture presentation for consistency and the appropriateness of the style. They were also asked to comment on the general appearance and the pace of the presentation. After the modifications were carried out based on the first stage of evaluation, subject specific evaluation was carried out by three Ph.D. students studying mechanical vibration at the University, as the second stage of evaluation. They were asked to comment on the appropriateness of the subject matter and to proof read the contents of the presentation. Again, modifications were carried out accordingly as a result of the second stage of evaluation.

## ***3.2 Approach 2 – development of the vehicle dynamics lecture presentation***

### ***3.2.1 Development of the screen presentation***

Unlike the previous case, three hours of live lectures on vehicle dynamics were audio recorded and this was used to develop the voice scripts for the multimedia presentation. Therefore, the screen presentation has to be developed to tally with the lecturers' commentary. Because of that, the development process of this screen presentation was time consuming compared to that of the mechanical vibration presentation. It took almost twice the time of the mechanical vibration material. The purpose of using this approach was to develop the vehicle dynamics multimedia lecture presentation as closely as possible to that of a live lecture by the incorporation of screen animations designed to enhance the lecturer's commentary. The recorded audio track was down loaded into a computer by dividing it into manageable size files. These audio files were transcribed to aid the development of the screen presentation, as in the previous case. However, a considerable time was spent editing the audio scripts to remove undesired noise and long pauses which were a result of using a recording of a live lecture. Based on both the printed lecture notes and the transcribed voice files, the storyboard for the visual presentations was developed. The same headings and section names as the printed lecture notes were used for the computer presentation to make easy referencing for the students.

Once the storyboard was developed, Authorware software was used to develop the teaching material. As in the previous case, an individual 'page' of the multimedia presentation was created by gradually adding the text and graphics into consecutive presentation windows. Overall, the development time of vehicle dynamics presentation, together with the preparation of audio scripts took almost twice the time of that of the mechanical vibration presentation.

### ***3.3.2 Adding sound to the presentation***

The next step was to integrate synchronised sound files into the presentation and this process was similar to the mechanical vibration presentation. Sound files were broken into very small sound files in order to synchronise with the screen animations when integrating into the Authorware flow line. It is advisable to use small size sound files to preserve the synchronisation of sound with screen animations when students run the multimedia package on computers having differing specifications.

### ***3.2.3 Trial evaluation of the vehicle dynamics material***

As before, the multimedia presentation was provisionally evaluated using staff and M.Sc. students and necessary modifications were carried out accordingly. The evaluation was carried out in two stages; in the first stage a staff member checked the presentation and proof read the content. Since general style, colour schemes, speed of appearance of animations and navigation features were considered during the mechanical vibration material evaluation, these were not considered during the evaluation. In the second stage, a small group of second year part time MSc students evaluated the package. Since they had already studied the subject content in their first year, they were able to provide constructive feedback. Necessary modifications to the multimedia presentation were carried out based on the feedback received from both staff and student evaluators.

## **4. Student feedback and comparison of the teaching packages**

Both mechanical vibration and vehicle dynamics computer-simulated multimedia lecture presentations were packaged as separate CD ROMs in order to distribute to students on the M.Sc. programme in Automotive Systems Engineering at Loughborough University. The mechanical vibration CD ROM is distributed as distance learning material for the third mandatory module whilst the vehicle dynamics CD ROM material is distributed as distance learning material for an optional module. Both CD ROM materials are distributed with the accompanying text-based material. However, since vehicle dynamics material is taught as face-to-face lectures during the first mandatory module, for the comparison purposes, the same group of students were given the vehicle dynamics CD ROM material during their first module as revision material.

Oral feedback was collected over two consecutive years from twenty students approximately by asking open questions of individual students. Students found that both multimedia packages were very useful compared to text-based material due to the animations and voice-overs. This was mainly because of the learner autonomy such as replaying the same page if they require, the ability to pause the presentation, and jumping forward and backward within the lecture presentation. A student commented that 'we can't ask the lecturer to repeat the same section'. Students also found that the animation used to explain engineering concepts in the vehicle dynamics presentation was extremely useful. Since mechanical vibration is delivered only as distance learning material, students did not make such comparisons. Students reported that use of the multimedia packages with voice-overs made them study the material more quickly and motivated them to study. This is understandable as most of these students are studying part time whilst in full time employment. Students also reported that the multimedia package helped them engage in the learning process compared to that of the stand-alone printed material.

Students followed the computer-simulated lecture material together with the printed material and they made notes whilst listening to the commentary. Consistency of the computer presentation with the printed material of vehicle dynamics helped them to follow the printed material simultaneously with the multimedia presentation. This helped them to write down notes as they usually do in a classroom situation. Although the mechanical vibration lecture presentation did not follow the printed text-based lecture material closely, students still tried to follow the printed notes together with the computer-simulated lecture presentation. Some students felt strongly that the multimedia lecture presentations were more effective if they worked in pairs or small groups. This was because they can conduct discussions if they wanted by pausing the presentation. This finding is similar to the students' experience

discussed in [3]. A student commented that the printed material was effective when studying alone but the multimedia presentation was very effective for group study.

Despite the considerable differences of the production processes and of the finished products, when asked for a comparison, students reported that both CDs to be very useful and effective as distance learning material. However, they suggested that the computer simulation of the vehicle dynamics lecture presentation was more dynamic and felt like it was closer to a live lecture compared to the computer simulation of the mechanical vibration lecture presentation. They also felt that the vehicle dynamics lecture simulation had a better flow of material than that of the mechanical vibration lecture simulation. The reason for these differences were related entirely to the two different approaches taken during the development of the computer simulations and had no relation to the subject lecturers or the lecture content. Nevertheless, the development time for the vehicle dynamics lecture presentation was almost twice that of the mechanical vibration lecture presentation. However, when videos showing applications of the theory, such as demonstrations of laboratory experiments showing possible modes of motion of a vibrating spring-mass system and nodal lines of a vibrating aircraft wing at different frequencies, were supplied along with the CD with the less interesting mechanical vibration lecture presentation, students found that this package was very interesting and was of more value to their learning compared to the vehicle dynamics presentation. This suggests that the effectiveness of the teaching material can be enhanced successfully by adding appropriate multimedia applications such as digital videos. Therefore, the approach used to develop the mechanical vibration multimedia lecture presentation will be more beneficial for the future developments as it takes almost half the development time compared to that of the approach used to develop the vehicle dynamics presentation.

## **5 Summary**

This paper describes and compares two approaches used to develop computer-based simulated lecture presentations as distance learning material. When developing the mechanical vibration lecture presentation, the screen simulation was developed first based on the printed notes and then the voice scripts were written according to the screen simulation. In contrast to this approach, the screen simulation for the vehicle dynamics lecture presentation was developed based on a recorded audio lecture. The screen simulations were developed to incorporate the lecturer's commentary. This approach helped to create a more dynamic simulation of the lecture with a good flow compared to the other approach. The main disadvantage was that it took nearly twice the time of the mechanical vibration material development process. However, it was found that providing additional material such as digital videos can enhance the students' learning and increase the effectiveness of the mechanical vibration lecture presentation. The lessons learnt from this exercise can be used during future developments for allocating development resources.

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