

Use of Imagery in Teaching *via* Video conferencing

Kieran Lim (林百君), Richard Russell and Gordon Elsey
School of Biological and Chemical Sciences, Deakin University
lim@deakin.edu.au

Introduction

Network regional universities often have small classes on each of several campuses. Hence either students at some campuses were disenfranchised by having fewer unit offerings, or classes repeated, at great inefficiency, on each of many campuses. Video conferencing has provided one possible method of teaching classes to several campuses more efficiently. The School of Biological and Chemical Sciences at Deakin University has used both room-based and desk-top video conferencing. This paper outlines how we have used video conference lectures in two of our third-year organic chemistry units.

The teaching of chemistry requires the use of detailed chemical and technical imagery to depict the 3-dimensional structure of molecules, reaction schemes, and other chemical concepts. Normal (room-based) video conferencing provides a low-resolution visual link that is unsuitable for the transmission of such imagery [1, 2].

The Deakin University BCS Model

There are many possible solutions for overcoming the deficiencies of video conferencing. At Deakin University, the School of Biological and Chemical Sciences is using video conferencing links to provide real-time teacher-student and student-student audio-visual interactions. We have chosen to supplement the video conferencing link by high-resolution computer-assisted presentation of visual images.

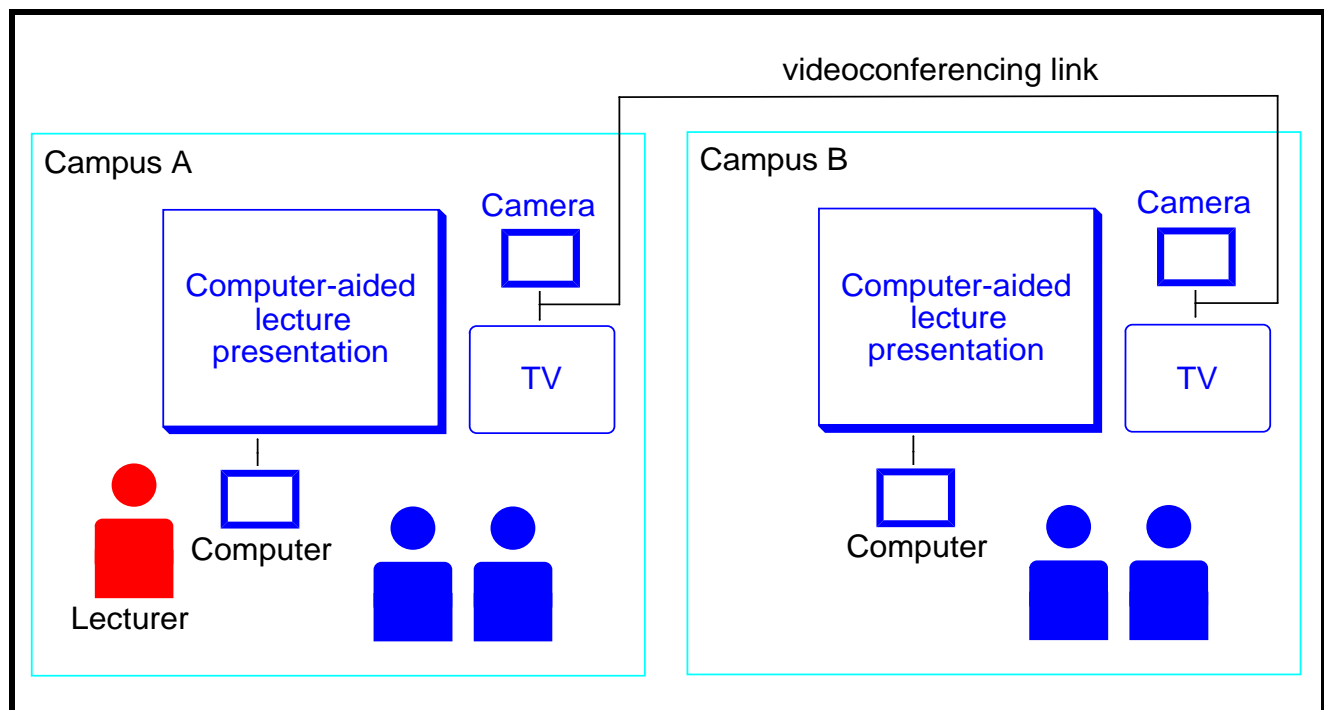


Figure 1. Schematic diagram showing how computer-aided lecture presentations are used to supplement the video conferencing link.

Figure 1 is a schematic diagram showing the use of video conferencing in the teaching of third-year chemistry units.

- The **video conferencing link** provides **visual and audio interaction** between lecturer and students on one campus (e.g. Geelong) with students on a second campus (e.g. Rusden). In practise, half the lectures are taught from Geelong while the remaining lectures are taught from the Rusden campus.
- High-resolution imagery (chemical structures, equations, etc.: e.g. see Figures 2 and 3) are presented on a second screen in a computer-aided presentation. Students are either given or purchase black-and-white hardcopies of the computer-aided presentation, but can view and download colour copies (in non-editable PDF format [3]) of the computer-aided presentation from a password-protected WWW site.
- The lecturer elaborates on any point by writing on a piece of paper which is viewed by students at all sites by the use of a document camera via the link. Students also use the document camera either to clarify a question they wish to pose to the lecturer, or to answer a question posed by the lecturer. However, one unsatisfactory aspect is that use of the document camera results in loss of the face-to-face visual link.

Images

All images for the third-year units taught by video conferencing were prepared to maximise legibility and clarity. These are the same principles that should apply to the generation/production of any diagram used in teaching. Specifically,

1. All diagrams were prepared using:

- **mathematical equation typesetting software** (Expressionist [4]);
- **graphical software packages** (DeltaGraph Pro [5] and Excel [6]); or
- **chemical structure drawing software** (ChemDraw Pro and Chem3D Pro [7]).

A minimum font size of 18 point was used for all diagrams.

2. **Optical chemical-structure recognition software** (Kekulé [8]) was used to convert scanned (TIFF) chemical structures into ChemDraw files [6; also see Figure 3]

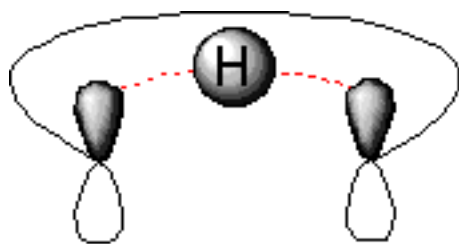
3. **Presentation software package** (PowerPoint [6]) was used to give a consistent "look-and-feel" for all layouts, images and text. Helvetica font [9] (with minimum size 24 point) was used for maximum legibility and clarity. Colours were used to highlight important points, but the number of colours kept to a minimum [9]: see Figures 2 and 3. (*Editor's note: slides slightly distorted due to adjustment for publishing*).

The Future of video conferencing at Deakin University

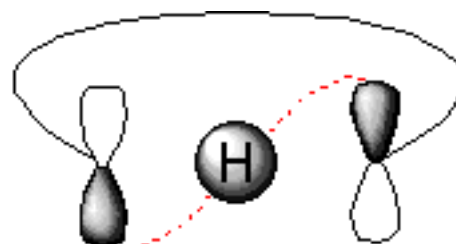
Deakin University intends installing computer-network ports in all video conferencing classrooms. Simultaneous video conferencing and computer-network links will provide multiple-media presentation and transmission of high-resolution imagery, combined with real-time teacher-student and student-student interactions. The use of graphics tablets [10] as computer-input devices, coupled with the network program Timbuktu Pro [11] will use the computer network as an **interactive electronic whiteboard** facility **without** the loss of the face-to-face visual link. Furthermore, the lecturer, on one campus, will have real-time, interactive control of the computer-aided teaching **on all campuses**. We call this **simultaneous multiple** (telecommunication) **media** teaching.

Transition state

- ignore details of π system
 - hydrogen s orbital
 - carbon p_z orbitals
- symmetry of π system
 - determines suprafacial or antarafacial



suprafacial



antarafacial

difficult for [1,3] or [1,5] shift

Figure 2. Pericyclic Reactions: Sigmatropic

- ... synthesis of lysergic acid ester

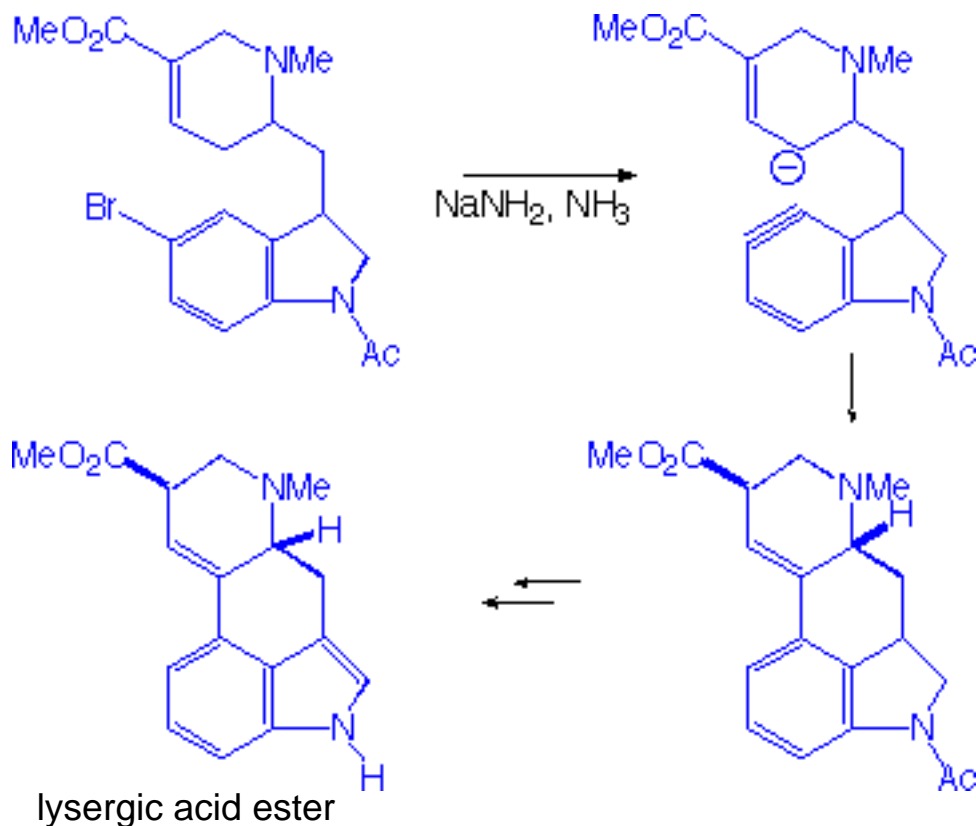


Figure 3. Arynes - ... organic synthesis

Other initiatives within the Deakin University, School of Biological and Chemical Sciences include:

1. Use of **desktop-based video conferencing** for tutorials on the use of computational chemistry software;
2. Use of **cable- and satellite-television** (Optus Vision) for delivery of teaching from one campus to several locations [12]; and
3. Video conferencing lectures involving multiple campuses within Deakin University and other interstate universities.

In an ideal world, there would be sufficient resources for all students to be taught by a “live” lecturer, but this is not always possible. Video conferencing can be used to bring together students on one campus with a lecturer on another campus in a “live”, interactive lecture. Computer-aided instruction can be used with video conferencing in a simultaneous multiple-telecommunication-media environment where each technology is used in a synergistic manner.

Acknowledgments

The work described in this paper has received financial support from Quality-Funded Project (DEETYA), National Priority (Reserve) Fund for an Electronic Facilities Enhancement Program (Deakin University Desktop Video conferencing Project), and CUTSD (formerly CAUT). The authors wish to thank the staff of the Deakin Teleconferencing Centre, the Deakin Campus AV Services, and the Deakin Centre for Academic Development. KFL especially thanks Ms Jeanne Lee (ICI Polyurethanes and ICI Adhesives and Resins) for encouraging and helpful discussions.

References

- [1] Eg C. Driver, paper presented at IUPAC Conference on Chemical Education (July, 1996).
- [2] K. MacIver, *Information Age*, pp 28–33 (August 1996).
- [3] Acrobat is produced by Adobe [URL: www.adobe.com].
- [4] Expressionist is produced by Waterloo Maple Software, Canada.
- [5] DeltaGraph Pro is produced by DeltaPoint, Monterey, CA, USA.
- [6] Excel and PowerPoint are produced by Microsoft Corporation [URL: www.microsoft.com].
- [7] ChemDraw Pro and Chem3D Pro are produced by Cambridge Soft Corporation [URL: www.camsoft.com].
- [8] A. Rogers, *J. Chem. Info. Comput. Sci.*, **34**, 1225 (1994); Kekulé is produced by Oxford Molecular Group (PSI International Inc.).
- [9] R. Vetter, C. Ward, and S. Shapiro, *IEEE Multimedia*, **2** (4), 46 (Winter, 1995).
- [10] Artz-II graphics tablets are produced by Wacom Co Ltd.[URL: www.wacom.com].
- [11] Timbuktu Pro is produced by Farallon Communication [URL: www.farallon.com].
- [12] D. Clift, paper presented at the UniServe Workshop on the Use of Imagery “Putting You in the Picture”, University of Newcastle, July 1997.