

Dissemination of scientific knowledge

Online classroom lectures involve a lot of technological challenges yet provide fabulous learning and interaction experiences for remote users



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Introduction

Lectures given in a classroom can be more complex in form than relatively simpler seminar presentations. They usually include the simultaneous use of a standard chalkboard, projected transparencies plus the display of PowerPoint (PPT) or Keynote presentations with the use of some pointers. All such features need to be considered when publishing these lectures online in order to recreate a learning experience that creates the closest possible classroom reality for remote audience without excluding any bit of information. This is still a technological challenge.

To produce such type of synchronised recordings, both the audience and their available computer/networking facilities need to be considered. For the production and delivery of open webcasting, it is necessary to adopt low-bandwidth compliant applications that keep the video and audio quality as high as possible and keep the size of all synchronised files (video, audio, slides) as small as possible. Also relevant to consider, is to automate as much as possible the recordings production and to reduce any manual post-processing and editing. The latter becomes especially relevant when carrying out massive recordings in different rooms across a large campus.

Enhance your audience

One concrete possibility to achieve a realistic 'virtual presence' in traditional classroom lectures is given by our recording system by named- 'Enhance your Audience' (EyA). This is an automated recording system in use at ICTP-Abdus Salam International Centre for Theoretical Physics in Trieste, Italy (www.ictp.it) to record mathematics and physics lectures, and international conferences and workshops. The automated

EyA is an innovative system developed to archive and share scientific webcastings carried out using either digital (PPT, PDF, etc.) presentations or the old and more traditional chalkboard lectures without any human intervention.

Video and audio are recorded in slots of one hour on a 'producer' computer with a webcam and USB microphone fixed on the wall. High quality photos (seven megapixels or higher) are taken every 15 seconds with a digital camera (controlled via software) and immediately downloaded from the camera to the computer via USB. Images are compared together to drop duplicates in order to decrease the space needed for storage and download of the recordings. By automatically synchronising the images with the audio/video recordings, the viewer can zoom in regions of a large screen, podium or chalkboard to visualise a presentation more effectively. EyA recordings also offer the benefit of seeing the physical gestures, body languages (of the people present before the camera) and the like which are inherent in classroom lectures.

Digitisation of course content

September 2007 onwards, all lectures given within the ICTP Diploma Course of the ICTP are being automatically recorded using the new automated EyA system. The access to this digital material is made freely available on the web (www.ictp.tv) to the public i.e., students at our Miramare Campus and beyond. The 'ICTP Diploma Course On-Line' project aims to enhance ICTP's mandate of transferring knowledge to scientists from developing countries. It is our hope that these public recordings will also be useful for lecturers beginning their teaching careers in science around the world.

It is possible to follow the open synchronised recordings (in Flash and/or QuickTime formats) from any computer connected to Internet and to download the compressed zip files within an hour of recordings or to watch it using any web browser, including those available on public cybercafés.

Till date, more than 1200 hours of recordings, which include more than 25 different courses, are being openly published on the web. ICTP publishes these lectures on the web and distributes them in digital form only for educational purposes. It does not endorse or sponsor any commercial product, service or activity, and does not permit the recorded material to be used for commercial purposes.



Open webcasting of a traditional mathematical lecture being watched in an Internet cybercafé.

Evaluation and assessment

ICTP has carried out a recent study of the assessment and evaluation of the EyA use in the ICTP Diploma Programme (for a whole Semester: Sept-Dec 2007). In the following, a students' survey was carried out to evaluate the EyA recording system when applied as an educational technology tool. This survey consisted of a questionnaire focusing on the use, assessment, divulgation and overview of the available recorded lectures for each of the five running Diploma Courses: i) Condensed Matter Physics (CMP), ii) High Energy Physics (HEP), iii) Earth System Physics (ESP), iv) Basic Physics (BP) and v) Mathematics (MTH). The number of compiled questionnaires received represents about 70 percent of the actual number of ICTP Diploma students.

When asked about the efficacy of recording system, 97.1 percent of the students replied 'helpful' or 'very useful'. Only one did reply 'not very useful' (because the person seldom watched the recordings).

The survey revealed that open webcastings are helping students to:

- review/revise missing points and concepts during a lecture (even after a long time)
- clarify handwritten notes misplaced (taken by the students themselves)
- reminisce a class (missed for good reasons such as administrative duties or illness)

- understand concepts when sometimes lecturers go fast
- prepare for exams (with the following percent of students): CMP: 100 percent, ESP: 100 percent, HEP: percent, MTH: 75 percent, BP: 63.6 percent
- relax when tired of reading
- adapt to an Anglophone environment
- review the class anytime wanted/needed at one's convenience and understand all details
- avoid writing lecture notes (enables to concentrate more on the Blackboard)
- mark it for possible long-term research

Conclusion

The maximum time dedicated to watch digital lectures is about 13 hours per week on average, especially in the field of Mathematics. Students from Basic Physics Diploma Course mainly review the most recent Digital Lectures, whereas those from the Condensed Matter Physics Course review those further back on time (more than a week). The open online publications are mainly accessed by students from the Earth System Physics Diploma Course. About 50 percent of the students have downloaded more than 25 zip files containing one hour of lecture each. The goodwill and 'word of mouth' approach passed down to inform colleagues seem to have applied for some Diploma courses. Accordingly, it was reported that sharing is indeed being done with Vietnam, Kenya, Philippines and Bangladesh.

In view of all these results it can be concluded that the adoption of EyA in the Diploma Course has been very rewarding as it stands. This project has only been possible because of the active participation between, and close collaboration of the multiple actors involved in the Diploma Programme. These include all Diploma Course Students and Lecturers, two Secretaries and the project ICTP Directorate - together with the Science Dissemination Unit (SDU) Team. It is also a matter of pride to state that the project undertaken by ICTP has been quite successful in its unique endeavour towards achieving the goal of transferring knowledge to scientists and educationists of developing countries. There is probably no such commendable effort around the world that attempts to carry out automatically low-cost, massive and complete recordings to disseminate high-quality, pre-PhD science programmes on the Internet. As a difference with, for example, the MIT Open Courseware, our EyA system does not require any video operator for recording and/or editing the on-line lectures.

Overall, the feedback and experiences with regard to online Diploma Course in the last couple of months, encourage ICTP to proceed further in this direction. It is foreseeable that some technical improvements (such as audio quality, rooms luminosity, DVD production, etc.) plus the addition of state-of-the-art developments for the automated EyA system are required. Finally, surprisingly enough it was found that nearly 50 percent of the total students are now following voluntarily even the complementary lectures which do not belong to their own Diploma Courses. This means that the recorded lectures 'also give the opportunity to Diploma students to follow parallel courses in other fields'. This opens a new era for Diploma Course for the science students across the globe and supports them with extra digital material and help. ■