PROFESSIONAL DEVELOPMENT OF TEACHERS USING CD-ROM TECHNOLOGY

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The need to provide professional development for teachers in statistics and probability arises because many teachers did not cover the topics in their preservice training. The need to use technology arises in countries like Australia because of the low density of teachers separated by vast distances. A government funded project entitled "Learning the Unlikely at Distance Delivered as an Information Technology Enterprise" (LUDDITE), explored various technologies and developed a CD-ROM as part of a professional development package. The CD-ROM included motivating curriculum material to complement a commercial text and video. The package of materials was trialed in several contexts and feedback from these trials will be discussed, as well as the difficulties associated with turning a pilot project into a commercial product.

INTRODUCTION

"Learning the Unlikely at Distance Delivered as an Information Technology Enterprise" or LUDDITE, was a three-year project funded by the Australian government to explore technologies for the delivery of professional development in probability and statistics to teachers separated by distance across the country. Beginning in 1994, the project, administered by the Australian Association of Mathematics Teachers, Inc (AAMT), entailed three stages of development and trailing. In the first year four live satellite television narrowcast programs were produced in the city of Melbourne for schools which had access to satellite technology in Victoria, eastern South Australia and southern New South Wales (Watson, Baxter, Olssen and Lovitt, 1996). The four programs highlighted issues associated with motivating chance and data in the curriculum, using technology for teaching, and assessing the new content. The programs were based on available resources and were not comprehensive in their coverage. The second stage of LUDDITE employed videoconferencing facilities in five states to introduce participants to a package of materials intended to provide a comprehensive coverage of all aspects of teaching chance and data in the middle school (Watson, 1996). The package consisted of a commercial text (Moore, 1991), a video (extracts of Moore, 1992) and locally produced linking material created on floppy disk in hypertext markup language (html). There was also a 383-page print version of the html material. This stage was trialed at six sites around Australia at the beginning of 1996.

The third phase of LUDDITE featured a consolidation of the locally produced

material and the creation of a CD-ROM to allow for access to more print-type material as well as digitised video material relevant to teaching chance and data. The package, including the CD-ROM, text and video, was trailed by teachers throughout Australia in 1996 and 1997. The results of these trails are discussed, along with the possibility of future commercial development.

"THE C and D PD CD"

The CD-ROM which was created in the final stage of the LUDDITE project was called *"The C and D PD CD"* as an abbreviation representing "The Chance and Data Professional Development CD-ROM". The resources on the CD-ROM were accessed through five sections, representing the five divisions of the curriculum. Within each of the sections there were 12 subsections looking at specific aspects related to the teaching and learning of the content. The structure of the CD-ROM is given in Figure 1 which also illustrates how to manoeuvre through the material and indicates the major resources accessed via the five sections and associated subsections. The resources include curriculum documents from Australia and the United States, a downloaded internet site created as part of the project with an Australian newspaper, digitised video clips from television broadcasts, extracts from Australian curriculum materials for teachers, digitised video clips of students discussing chance and data concepts, and software for probability simulation and data handling (Konold and Miller, 1992a, b). Discussion on the CD-ROM indicated which parts of the accompanying text and video were appropriate to each section of the material.

TRIALING OF THE PACKAGE

The initial trials of the professional development package took place with 35 teachers across Australia who responded to offers made through the AAMT. Teachers were asked to use the material in the package for at least 30 hours and to respond to a questionnaire, either in writing or electronically via email. Telephone, fax and email were available at all times if participants had technical difficulties or questions on the content. At the beginning there were quite a few technical questions, particularly about accessing the CD-ROM, but in general participants did not avail themselves of the opportunity to discuss content with the developer.

Those taking part in the trial had the additional opportunity to receive university accreditation for working through the professional development package. The University of Tasmania offered a Graduate Certificate in Statistics Education for those who completed a number of exercises from the text book and wrote the equivalent of three 3000-word essays on the implementation of the chance and data curriculum in their classrooms. This commitment required closer contact with the package developer and only three participants took this option. They, however, provided more detailed feedback on the package through their subsequent work.

During 1997, after the formal trial had finished, opportunities arose to demonstrate *The C and D PD CD* at two conferences for mathematics educators in New South Wales. One of the original participants, a consultant who had enrolled for the Graduate Certificate, joined the developer to present hour-long demonstrations of the CD-ROM. The consultant also conducted a day-long workshop for a group of local teachers. Participants in each of these sessions were given the opportunity to take away a CD-ROM for trialing with the promise of providing feedback.

EVALUATION

Of the 35 original teachers who took part in the trials, 19 provided detailed feedback. Generally this feedback was positive with an average of 14.2 hours spent on the text, 5.5 hours on the video, and 14.9 hours on the CD-ROM. Obviously some teachers had had more experience in using CD-ROM technology; others had trouble overcoming difficulties with the CD-ROM, despite assistance from the developers. Some found difficulty adjusting to the non-linear accessing potential provided by the choice of linkages on the CD-ROM, while others enjoyed the freedom to follow links and explore the material in whatever way they wished. Although a few disliked the American influence in the text and video compared to the CD-ROM, almost all appreciated the value of the content. More detailed reaction of these teachers is given in Watson and Moritz (1997).

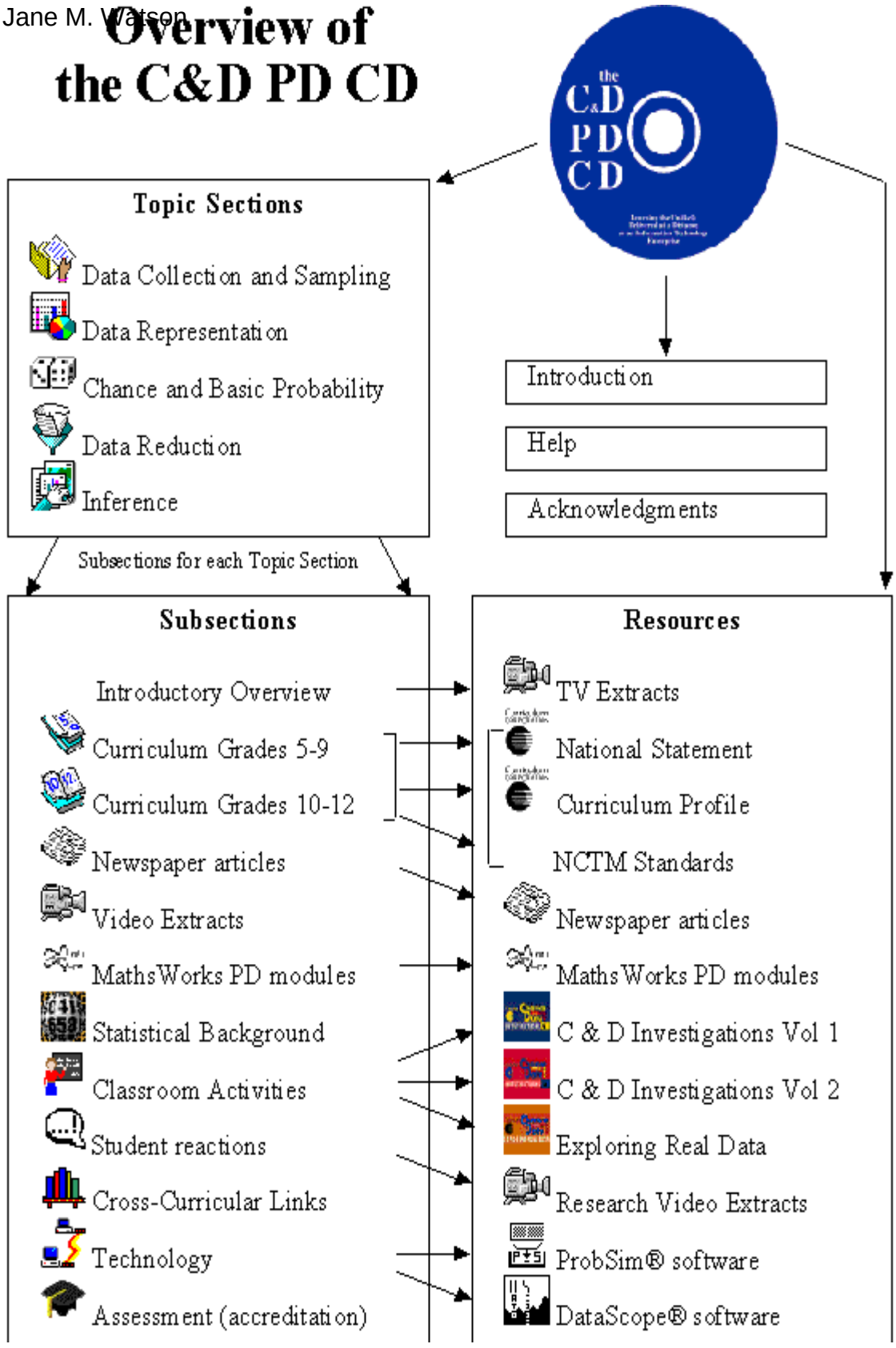

Figure 1. An overview of *The CandD PD CD*

Of the three teachers who enrolled for the Graduate Certificate in Statistics Education, two completed the work in 1997; the other partially completed the work and indicated the intension to finish in 1998. The two who completed, a classroom teacher and a regional mathematics consultant, provided valuable insights in the operation of a

distance education course based on a multimedia package. Both used all three means of communication - telephone, fax and email - to dialogue with the developer. Although there was the opportunity to communicate with each other, they chose not to do so and this was not forced by the developer. The teacher used fax and ordinary mail to submit assignments, while the consultant also used email document attachments. There were occasional problems with empty files but generally this worked well. On one occasion the developer prepared a document with screen dumps of the probability simulation software to illustrate a solution to a problem; this was sent by an email attachment within a few hours of the difficulty arising. Feedback to the students was sent by mail, fax or email and corrections returned for remarking. The essay work completed demonstrated the value of the package to the two student's environments. The teacher produced a grade 9 syllabus for probability at his school and discussed its implementation. He also implemented a grade 8 statistics unit and included examples of student work. Both were firsts for his district high school in rural Tasmania. The consultant was working in an environment where chance and data topics were themselves being trialed as part of his state's mathematics curriculum. For both "chance and basic probability" and "data representation," he worked with several teachers in schools in his region on units employing material from state draft documents and from *The C and D PD CD*. He then evaluated the outcomes of these trials. Further he worked on problems associated with the senior secondary syllabus in his state. The feedback from these two was overwhelmingly positive, indicating the professional growth which had taken place as a result of the extra commitment of enrolling for the Graduate Certificate.

Where the CD-ROM (without the book and video) was distributed at conferences, most teachers did not provide feedback. Those who did were those who were at ease with the technology and confident to learn in a new mode. The following comments of another regional consultant in New South Wales are typical.

Ease of Navigation

Utilising a Macintosh 6400 I was able to access the program by launching Netscape Navigator. All instructions were easy to follow and the general layout and connections within the program made movement between areas very easy.

Self-contained sections

These 5 sections are extremely well presented and user friendly. The *overview section* and *videos* give emphasis to the area to be investigated and motivate both staff member and students. The links to *5-8* and *senior curriculum* topics are clearly defined and would be easily incorporated into the individual school's programs. In terms of classroom work, the *newspaper section* is a wonderful resource with the discussion brief and follow-up links very valuable. I could see this section being the motivation for a number of cross curricular links such as critical reading in English KLA, etc. The *classroom activities* in each section were well explained and easy to implement - the no-nonsense comments give indications of the depth of the investigation and the work sheets are complimentary to the outlines. The *course details* for the Graduate Certificate of Education Studies are easy to follow and the assignments are able to be completed in the educational setting of the participant.

Overall I was very impressed with the program and would consider it a valuable adjunct to the day to day classroom program as well as an excellent vehicle for professional development for isolated rural staff members.

THE FUTURE

The LUDDITE project tested technologies which could be employed to deliver professional development to teachers in relation to all parts of the mathematics curriculum, or indeed other subject areas. Changes to curriculum and methodology foreshadowed by the very types of technology employed in this project suggest that upgrading will be required for all aspects of mathematics teaching. If resources are available to modify the LUDDITE package, it could provide a model of the coverage necessary for the rest of the mathematics curriculum. Further, there is potential to use the materials in the final LUDDITE package in preservice training for teachers who even today often feel insecure with the chance and data part of the curriculum. Building an expectation of a total package, providing more than a lesson plan for tomorrow's class, should start early in the preservice years and be supplemented as new technologies and associated content appear throughout a teacher's career.

The major difficulty associated with the commercial production of such a package is the capital investment required once the government pilot funding is exhausted. If the audience is limited then publishers are not likely to be interested; they might be interested in a package for school students, with a larger market, but not in a package for teachers.

The C and D PD CD contains Macintosh software which would require conversion to a multi-platform format at a not insignificant cost. There are minor royalty negotiations required to obtain permission to use extracts from television, the NCTM *Standards*, and books published by the Curriculum Corporation in Australia. Finally there are production costs which vary depending on the size of the run.

It is estimated that the package of text, video and CD-ROM could be made available in Australia through the AAMT for about $A120. Whether schools, systems or individual teachers would purchase a package at this price for 20% of the mathematics curriculum is unknown. An alternative of making the locally produced material from the CD-ROM available on the internet is unattractive for several reasons. Copyright problems with the digitised video material and Curriculum Corporation publications would eliminate them, greatly reducing the motivational value of the package. Speed of downloading information is also problematic. Finally an incomplete package, without text and video, would be detrimental to the full professional development objectives.

The LUDDITE project demonstrates that it is possible to create a successful multimedia professional development package. The question of producing a commercially viable package is another matter entirely, requiring forethought and expertise not necessarily the province of mathematics educators.

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