The Development and Evaluation of an Integrated CD-ROM / Workbook Package as Part of a Vocational Degree Programme

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Abstract

A self-directed, flexible CD-ROM / Workbook package was developed to supplement current teaching resources to enhance students' learning within the vocational degree programme of Physiotherapy. This was developed with particular reference to neurological assessment and bridging the gap between University and practice-based learning, as well as improving the student's preparation for module assessment. The package was piloted with both Full-time (n = 70) and Part-Time (n = 28) cohorts of students. Evaluation of the new teaching resource via a structured questionnaire proved very positive and demonstrated the benefit of the package.   Areas were identified for improvement and how it could be further developed to meet the needs of a vocational degree programme.

Background

Students attending vocational degree programmes such as physiotherapy undertake a variety of work-based placements. These placements are aimed at transferring skills gained within the University setting into clinical or work-based practice. Traditionally students studying within physiotherapy programmes have found it difficult to make the links between university and practice-based learning. The transference of these practical and clinical reasoning skills is often problematic due to the sparsity of patient contact prior to their placement. Students find it difficult to visualise techniques and examples of problems that they might encounter in the future. Patient analysis also comprises part of the assessment package for the neurology module to ensure curriculum alignment and clinical relevancy. Video is one medium that has been used within existing tutorial and practical sessions and has been found to be beneficial on the current programme. No facility was available for the students to use this medium outside of lectures or in association with any self-directed learning.

Use of video within healthcare professions has been utilised to enhance and contextualise student's knowledge and skills (Bernhardt et al, 2001, Moss, 2000, Papa, 2000, Taverner et al, 2000, Minardi & Ritter, 1999, English et al, 1998, Birdsall et al, 1995, Stringfield, 1995). Other professions, primarily nursing and medicine have utilised videos to improve clinical performance (Ram et al, 1999, Bersky, 1987, Matthews & Viens, 1985), and some interactive CD-ROMS have been developed (Moss, 2000). Technology is increasingly being used as an aid to learning (Sultana et al 2001, Bowser 1997, Anderson & Hrycak 1986). On reviewing the literature there were no studies that examined the use of video as a self-directed resource package within physiotherapy programmes.

A grant was obtained from the University of Salford Teaching and Learning Quality Improvement Scheme to develop two CD-ROM / Workbook packages to enhance students' learning and skill acquisition within two core areas of the BSc (Hons) Physiotherapy degree. This study relates to the development of one of these packages focusing on assessment of neurological patients.

From initial discussions, the project team identified 3 key areas that they wanted to address and developed three aims for the study. They were to:

- Produce a CD-ROM / workbook package to enhance student learning, with particular reference to bridging the gap between University and practice-based learning
- To improve the students' preparation for the assessment process by offering a learning resource that is not currently available, and which meets the needs of the current module assessment.
- To provide a flexible, self-paced learning tool to supplement teaching mechanisms which will allow for individual learning styles

The aim of this paper is to show how the CD-ROM / workbook package was developed. This included an initial student evaluation for appropriateness with regard to ease of use and relevant content, in order to facilitate preparation for modular and practice-based assessment

Methodology
Design
Based on the study aims a survey design was deemed the most appropriate. Quantitative and qualitative data was obtained using a questionnaire (Brady-Boyce & Winne, 2000) which was modified to meet the needs of the study. This was peer reviewed prior to being used in the study by educators working within the field of neurology. Further modification of the questionnaire was made at this stage.

Participants
Questionnaires were distributed to 59 physiotherapy students from the full-time cohort and 15 of the part-time cohort on the BSc (Hons) Physiotherapy programme in semester 2, 2003. The ages of the students ranged from 19 to 45, with a ratio of females to males being 3:2. Participants were selected on a convenience sample basis via attendance at a modular session.

Apparatus / Materials
As previously documented a modified questionnaire was used. This consisted of domains (see Figure 1 for example) which looked at the student's level of satisfaction in relation to CD design, content, navigation, assessment resource and workbook design and content. A domain was also included that related specifically to the second and third aims of the study. Following each domain, space was left for individual comments. Other individual questions were asked such as marketability, type of format preferred and other additional resources required.

Please tick the box for each item that best describes your rating of the CD-ROM and workbook.   Please add any additional comments at the bottom of each table.

SA = strongly agree; A = agree; D = disagree; SD = strongly disagree; NA = not applicable.

CD-ROMs

CONTENT	SA	A	D	SD	NA
1. Content of CD is relevant to the neurology module learning outcomes.					
2. Content is structured in an appropriate manner.					
3. Content is appropriate for the level of learner.					
4. CD-ROM allows for individualised flexibility of study.					
5. Content flows in a logical fashion.					
6. Outcome measures chosen are appropriate and useful.					
7. Movement comparison video clips are a useful revision tool.					
8. It held my attention					
9. It motivated me to use this as a learning resource					

Please make comments to clarify your responses…………………………………………………………………………….…………
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Figure 1

Initial development of the CD-ROM / Workbook package was undertaken by the project team. Two CD-ROMs were developed based on the assessment of a neurological patient. The first CD-ROM consisted of video footage of a full patient assessment. The second CD then broke the assessment down into individual components. This was designed to take the student through a structured process of observation of video footage, documentation of their findings and development of problem lists and treatment plans, including selection of appropriate outcome measures. By the end of the process, the student would then have a fully documented assessment which they could use as a template, both during the module and whilst on clinical placement. The interactive nature of the CD-ROMs allowed the package to be used as a flexible resource that could be used in its entirety or in stand alone sections. The workbook was developed to provide a self-directed format that complemented the CD-ROMs. Features such as 'handy hints' to facilitate problem-solving and links to other sources of information were included. Each screen within the CD-ROM contained page numbers that equated to specific areas within the workbook and questions to facilitate clinical reasoning.

The videoing of the patient took place at the Physiotherapy Department, Queens Park Hospital, Blackburn. Ethical consent was obtained from the hospital trust and informed consent from the patient prior to filming.

Procedure

The students received the package halfway through the module and instruction was given in its use. This was in addition to attending existing sessions on neurological assessment. This was then followed by two further sessions on assessment that utilised the package. The questionnaire was distributed at the end of the module.

Data Analysis

The analysis of the questionnaire data was completed in two ways. Quantitative analysis of the domain responses was undertaken to establish if there were any differences with the student's satisfaction between cohorts and whether there were any differences within cohorts across the 7 identified domains. This was done by allocating the responses a numerical value i.e. Strongly Agree (SA) – 4, Agree (A) – 3, Disagree (D) – 2, Strongly Disagree – 1, Not Applicable – 0. Each domain therefore received a numerical total. Because of the large difference in cohort sizes, 20 of the full-time responses were randomly selected by taking every third questionnaire from the total. These were then compared with the 15 part-time responses.

As well as evaluating the 7 domains, overall satisfaction with the package and the domain relating to aims two and three was quantified by using percentages. Qualitative thematic analysis of the associated comments was also undertaken to evaluate individual student responses. Analysis was then undertaken comparing the scores generated from each domain to compare the level of satisfaction between both cohorts. Unpaired t-tests were used to analyse the normally distributed data

Results

Quantitative Analysis

To gain a general impression of the students' level of satisfaction regarding the package, students were asked to rate it as a learning resource. Responses mainly fell within the Excellent and Good bands (Figure 2).
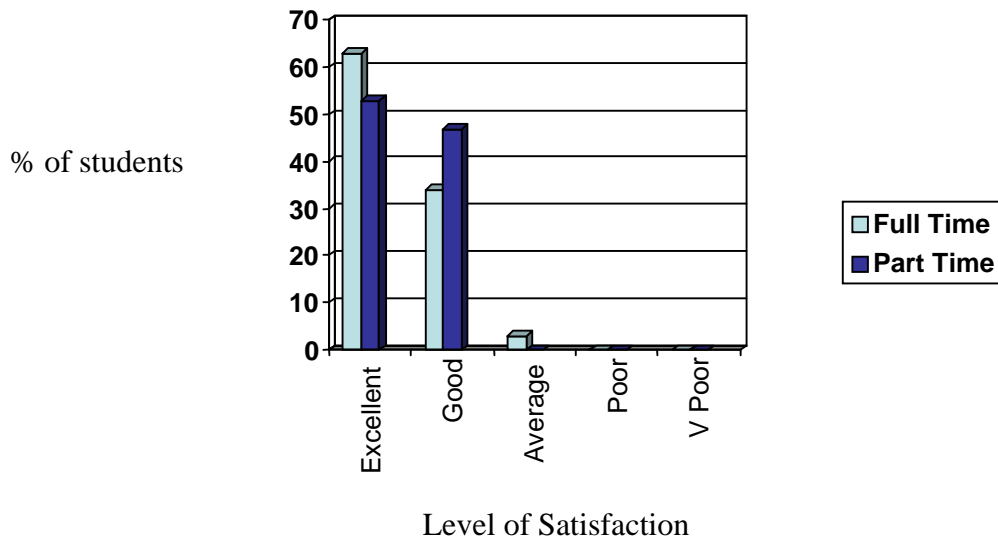
% of students

Level of Satisfaction

Figure 2

Comparison of Students level of satisfaction within domains between Full and Part-time cohorts (p≤ 0.05) 95% CI	
Workbook Design	p = 0.715
Content	p = 0.163
CD ROM Design	p = 0.610
Content	p = 0.561
Navigation	p = 0.932
Assessment Resource	p = 0.417

Full-time (n = 20) Part-Time (n = 15)

Figure 3

The results showed that there was no significant difference with the students' level of satisfaction between both cohorts within any of the domains. Students demonstrated a high level of satisfaction across both cohorts in relation to the domains.

Analysis within the same cohort also showed that there were no significant differences between the students' levels of satisfaction between the domains. Data was analysed

using a one-way analysis of variance and post hoc using Scheffe's test. P-values obtained for both cohorts ranged from 0.525 – 1.00. Percentages of the domain scores were used for comparison as there were a different number of questions within each domain.

Questions relating to aims two and three produced results presented within Figure 4a for the full-time cohort and Fig 4b for the part-time cohort. The questions asked were related to the aims of the study looking at how useful the resource was as:

1. An additional learning resource for the neurology module;
2. Preparation for clinical education placements;
3. Part of preparation for the neurology exam;
4. To enhance your critical thinking;
5. For developing your movement analysis skills;
6. For enhancing your general patient assessment skills.

Figure 4a
Full-time Responses
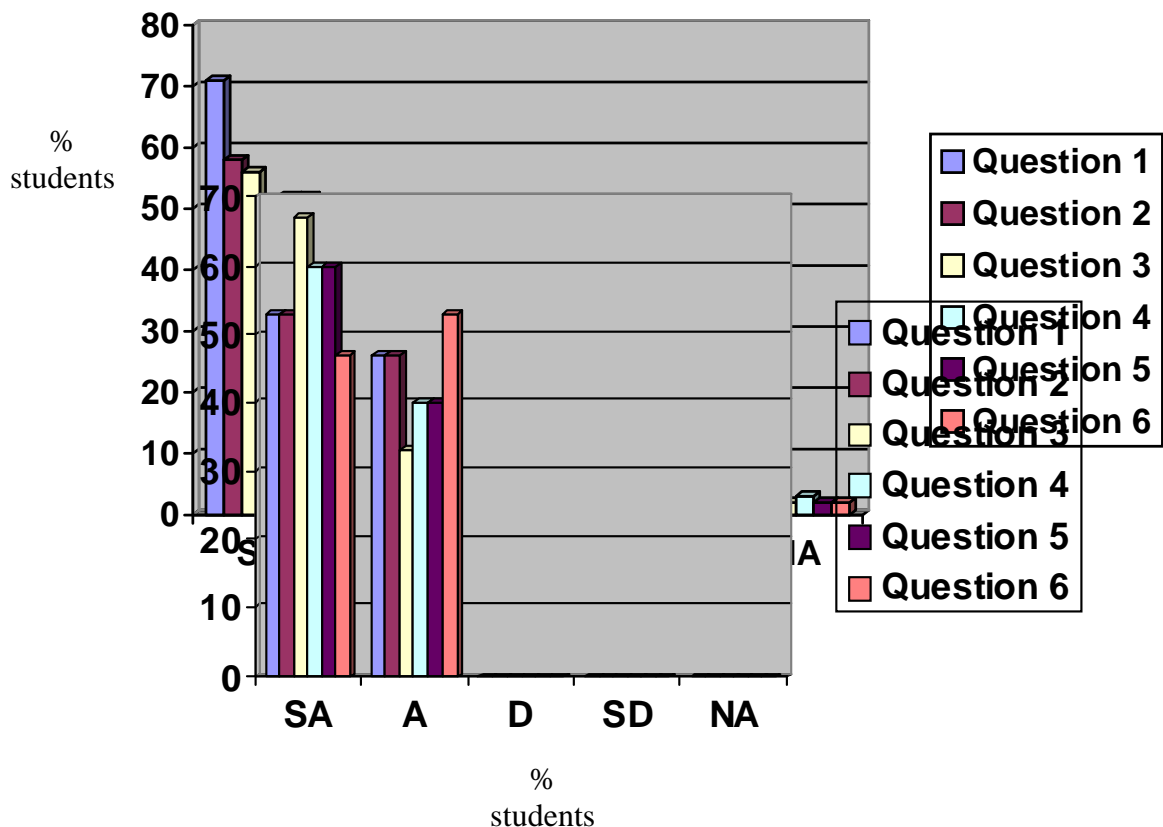Level of satisfaction

Figure 4b

Part-time Responses

Qualitative Analysis
Written comments were copied verbatim and grouped within their respective questionnaire domains, separately for both cohorts. It was clear on closer inspection that comments made did not exclusively relate to the domain as laid out on the questionnaire. For clarity of interpretation therefore, students' comments were amalgamated and analysed for emergent themes as related to the CD-ROM or Workbook respectively. The comments were grouped under the following three broad headings: compliments, criticisms and recommendations. Sample comment extracts are included to illustrate some points raised.

CD-ROM
Compliments
Students appreciated the ease of use and flexibility that the CD-ROM structure and content afforded, allowing them to individualise its use with their own learning preference. The format was _____ ____ _____ :e in 'bringing everything together' in a novel and interesting way Level of satisfaction ie video and simultaneously compare movement strategies with a video of an unimpaired model were seen by several as 'invaluable':

> *It was helpful in gaining an idea of structured assessments as neurology assessments seemed very daunting at first.*

Criticisms
Technical difficulties dominated the feedback with just over half the students experiencing problems. Navigation around the second CD was generally seen as good. Lack of fast-forward/re-wind capability together with some long video sequences caused quite widespread frustration. Other comments reported more general playback problems ranging from a lack of 'auto start' facility, through to the screen 'freezing' with the first CD. Quiet sound amplification with respect of the patient, combined with his Scottish accent made hearing and understanding of his responses quite difficult:

> *Sometimes if I paused [the footage] for too long the video would stop & I'd have to start again!*

Recommendations
A more severely disabled patient with more overt problems or indeed several patients with differing conditions/presentations were suggested, to further enhance observation skills and clinical reasoning. Some students would have appreciated seeing more of the interview related to subjective information rather than having it already documented in the workbook. A general request was for more guidance both on the use of the CD-ROM / workbook package and also regarding interpretation. A more 'interactive' style including suggestions such as multiple choice questions and/or an 'answers booklet' as well as extra, dedicated tutorial sessions, were suggested to enhance the package. This suggestion was reflected in the responses to a specific question posed regarding CD-ROM support. Half of the cohorts' evaluations rated the support as merely adequate or not enough. Half of the cohorts felt alternative playback media

should be available with VHS-video format out voting DVD by 2:1. Greater playback flexibility including FF/RW/Slow-motion facility were identified as the major technical recommendations:

> *Could use actual narration by 3rd party by way of explanation – sometimes didn't know if I was on the right lines; therefore need a guide as to the general 'answers'.*

Workbook
Compliments
The workbook was found to relate well to the CD-ROM helping to break down the assessment process and document it. 'Handy-hints' were identified as a useful aid to 'get you thinking':

> *Liked the structured way the workbook followed the CD...the questions asked got you thinking.*

Criticisms
The workbook was seen by many as repetitive in layout and content. Indeed several people commented on both the length of the neuro-assessment process (video footage overall) and the length of time it took to complete the workbook:

> *All sections need to be completed, does not allow individual to concentrate on aspect they would like to.*

Recommendations
As mentioned above the presence of more guidance notes/quiz/answers sections were suggested. Greater space for writing responses, together with an overall 'flashier' look to the package was also recommended:

> *Maybe a few more clues along the way to structure thinking – prompts.*

General Comments
Responses related to the timing of when the package should be issued in the module was split equally between mid-way through the module (as had been issued this time), and at the beginning. An overwhelming majority of respondents would recommend purchase of the package confirming the overall positive regard in which it was held.

No appreciable difference in tenor was observed between the part-time and full-time cohort responses hence a combined report has been given.

Discussion
Broadly speaking the CD-ROM and Workbook package was very well received by both the full-time and part-time cohort of students. No significant difference was detected between the two groups' levels of satisfaction with each domain, which indicated that the package was an equally valuable resource for students on programmes necessitating different types of attendance. A similar result was apparent when the levels of satisfaction were compared within cohorts, indicating that there was no particular part of the package that proved either weaker or stronger than the rest.

One of the perceived strengths was the flexibility of the package, which enabled the students to take the package home thus allowing them to work through it at their own pace. Feedback confirmed the interactive nature of the package as being of great benefit, confirming the findings of similar studies that used interactive media (Sultana et al, 2001). Students across cohorts however, highlighted a desire for more tutorial based guidance in interpreting and validating their findings. The perceived lack of feedback regarding clinical reasoning could be due either to a deficiency in the package design or to a psychological need for tutorial style debriefs. Whether interactive self-directed packages can ever 'stand alone' in terms of feedback, remains to be established (Taverner et al, 2000).

Format and technical issues hampered the use of the first CD-ROM and highlighted difficulties some students had in accessing the video footage. The use of the CD-ROM necessitated reasonably high specification IT equipment. Having the package available in other formats including video, DVD and access via the web would help this and also increase its flexibility and equity of use amongst students (Bowser, 1997).

The development of the package has been a lengthy process. The project development, as well as being costly in terms of time, has also stretched existing technical abilities and resources. As reflected in studies, these factors need to be considered before embarking on a similar project. Studies have highlighted the need for up-front equipment, training and ongoing technical support (Bowser, 1997). Following this initial resource investment, changes can now be made to enhance the existing package in light of student feedback, and in the development of future projects.

The study substantiates the educational value of the package as a flexible, self-paced, self-directed additional teaching and learning resource. The use of video footage lends itself to vocational programmes showing it to be a mechanism by which students can enhance their learning (Sultana et al, 2001, Taverner et al, 2000, Minardi & Ritter, 1999, Bowser, 1997). It is inherently difficult during vocational programmes to provide students with a true representation of what they are likely to encounter, especially in the area of neurological assessment. However, the students' responses indicate that the package does go some way to meeting this aim.

Students' comments appear to highlight the view that technology-enhanced learning would never replace true 'hands on' experience, but could be used to initiate students' learning in the areas of clinical reasoning, problem-solving and assessment skills. Gibbs (1990) advocates the use of contextually relevant learning resources in providing 'substitute experiences', for the student to reflect and theorise on. This provides a mechanism for 'deeper learning' as advocated by Marton and Saljo (1976) which can be seen as an essential pre-requisite to clinical reasoning. Most vocational programmes have similar difficulties and a resource such as the one developed during the study could be adapted to provide a useful adjunct to traditional teaching and learning resources.

With reference to the first aim for the study, the package was deemed to be effective in 'bridging the gap' between the university and practice-based learning. The extent of this cannot be confirmed until the students have completed a subsequent clinical placement in neurology. Evaluation of the students' perceptions following a clinical placement would provide additional insight into the degree to which the package had aided their development. The package will also require further evaluation by clinical educators of physiotherapy students in order to further validate the relevance and currency of the package. Analysis of the qualitative data indicated that aims two and three had been met. However, further quantifiable data would need to be collected in order to further substantiate this claim.

Conclusion

In summary, the CD-ROM / Workbook package has been well received by both full-time and part-time cohorts. Evaluation of student questionnaires has demonstrated a high degree of satisfaction with the package as a useful and novel learning resource. The package was originally distributed to the students half way through the Neurology module. Student opinion was equally split regarding when the package should have been issued. Half favoured the beginning of the module whilst the remainder felt that half way through the module was most appropriate to avoid information overload.

A significant proportion of students recommended greater interactivity and guidance in relation to their clinical analysis. This could be addressed via more overt signposting within the package or within a tutorial setting. Initial modification of the package alone and subsequent re-evaluation should then determine whether it can be utilised as a pure self-directed learning tool.

With reference to the first aim of the study future quantitative research aiming to evaluate the impact of the package on students' learning is postulated. This could be achieved by splitting a cohort into two groups. One group would be provided with the package early in the module, followed by testing of the whole cohort's ability to assess a neurological patient at the modular mid point. The package would then be made available to the other group, as distributed in the present study, to satisfy equity of provision. The cohort would then be retested at the end of the module and the groups' results compared. Recommendations for future studies include further evaluation of students' learning in light of completing a clinical placement in neurology.

It is intended to improve the CD-ROM / Workbook in light of student feedback. Existing resources within the University are being explored to assist with these developments. Examples include collaborative working to redesign the workbook and technical improvements regarding video sequence navigation.

The development of the CD-ROM / Workbook has proved to be a flexible, self directed learning resource for students irrespective of mode of undergraduate study. Despite an initial resource intensive period, a framework for enhancements has now been established that could be transferred to similar projects in this and other vocational programmes.

Acknowledgements

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