Teaching Pre-cursor Clinical Skills Using an Online Audio-visual Tool: An Evaluation Using Student Responses.

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Abstract

The integration of multimedia and computer-assisted learning in the teaching of functional anatomy has been reported to be as effective as the more traditional tutor demonstration instructional design. However, the use of this instructional design for teaching the psychomotor skills of surface anatomy palpation and muscle length testing has not been reported. The purpose of this pilot study was to investigate the responses of first year physiotherapy students to the use of an on–line audio-visual (AV) / DVD aid. This new tool was used to replace more traditional in class tutor demonstration for teaching a section of surface anatomy palpation and muscle length testing, in a first year Biomechanics course. Students reported video previewing to be a helpful instructional tool. However, there were some difficulties experienced with online accessibility. Students also requested more direction in their study habits to maximize the benefits of this modified instructional design. This study highlights the need to begin training student lifelong learning study habits in the first year of University.

Keywords: Multimedia, DVD, Surface anatomy, palpation, online, audio-visual

Introduction

Several authors (Salyers, 2007; Elizando-Omana, et al 2004; Lewis 2003; Hallgren, Parkhurst , Monson & Crewe 2002; Bacro, Gilbertson & Coultas 2000; Kinney; Keskula & Perry, 1997; Barker, 1988) have identified the use of multimedia as an effective method of teaching cognitive skills to medical and allied health students. These reports from the literature also suggest that students perform as well, if not better, in assessments following multimedia instruction. Interactive programs have been identified as positive adjuncts for medical students learning functional anatomy and osteology (Sinav & Ambron 2004; Van Sint et al, 2003)

The prime driver for this mode of instruction has been the perceived need to provide increased accessibility to learning materials for students. It has been suggested that the education of generation Y (those born after 1982) should include the instructional mode that they are more familiar with (Oblinger, 2006). In a study reviewing medical students' use of instructional resources placed on the web, Neider and Nagy (2002) reported a positive response measured by the timing and the number of times students accessed the site during the instructional period.

Kinney, Keskula and Perry (1997) reported improvements in learning times using a CAI simulation program compared with lecture and discussion for the learning of the more cognitive task of assessment and treatment skills for a specific syndrome (Carpal tunnel). Barker (1988) reported on the use of a

videodisc to teach the psychomotor skill of a sliding board transfer. Comparisons were made between the use of an instructional videodisc compared with a lecture and demonstration format for 45 pre-professional students. Outcomes were measured quantitatively from written examination results and performance analyses. No difference between the two methods was observed. In a recent qualitative study Coffee (2007) reported a positive student response from the trial of on–line Capture CAM ™-PRO audio-visual (AV) in the teaching of clinical reasoning to a group of first year physiotherapy students.

Objectives of tertiary education include the teaching of life-long, self-directed learning and reflection skills in graduating students. Enhancing student engagement in the learning experience is a challenge faced by all academics (Krause 2005). First year students commence University with a variety of learning styles and experiences. The authors have observed the predominance of a more passive teacher-directed approach to learning in many of the first year physiotherapy students. These students arrive at Biomechanics practical classes unprepared for the task ahead and much precious teaching and learning time is lost as they orient themselves to the tasks involved. The traditional in-class tutor demonstration instructional design may be promoting this more passive style.

Traditionally the teaching of surface anatomy and muscle length testing at this University has occurred in a practical class where demonstration of the palpation or length test is given by an educator followed by supervised student practice. The size of the curriculum combined with time constraints necessitate that more than one skill is taught in each session. Students are able to make notes of the skills demonstrated during the class and ask questions of the tutor during the demonstration. Between 15-20 minutes are spent on the demonstration with the remainder of the 50 minute session spent on supervised practice. From an instructional design perspective, given the number of things that must be demonstrated by the tutor and practised by the student in each session, it could be suggested that many students would exceed the cognitive load of their working memory in a session (Sweller, van Merrienboer & Paas, 1997) and diminish the quality of their learning opportunity.

The use of multimedia has been demonstrated to assist psychomotor learning (Barker 1988; Salyers 2007). This format may provide more accessible and effective learning tools that will assist students in the development of not only psychomotor skills but also the life long learning skills of self direction and reflection. An online audio-visual format would enable students to access the skill demonstration at home, repeatedly, with consistent information delivered each time. It is believed this will assist with learning, allowing time for more gradual assimilation of knowledge and promote reflective skill in the students, and lead to improved learning outcomes and student engagement (Laurillard 2002, Krause 2005). Studies by Schwan and Riempp (2004) and Mayer (2003) have reported deeper learning outcomes from the use of a multimedia format such as video. The flexibility of access promotes the preferred student –centered approach to learning (Biggs 1999) with the timing of learning occurring when the student is potentially more amenable. It is also proposed that with such formats, student learning outcomes can be improved, with more efficient use of the formal practical time by students by maximising the effectiveness of tutor teaching time.

The literature suggests that using a multimedia approach does not have an adverse affect on learning outcomes but the particular benefits and difficulties experienced by the students using this format for the learning of psychomotor skills have not been highlighted. To explore the effectiveness of this mode of instructional delivery, a qualitative analysis of students' response to the introduction of this method of teaching is needed. Evaluating the student response to these new tools will provide useful information to inform teaching practice and instructional design in this and other courses.

This research sought to determine the benefits and problems students experienced from two different methods of teaching using an online audio-visual and DVD format for the visual demonstration and application of the skills of identifying specific surface anatomy structures and muscle length testing.

Method

Participants

All students enrolled in first year biomechanics as part of their undergraduate Physiotherapy program were invited to participate in the evaluation of the use of different learning methods.

Tool

Individual digitised audio-video clips of relevant surface anatomy and muscle length testing skills were scripted, filmed by the authors, and then compiled into a DVD with the assistance of technical support. The DVD was designed using a menu to enable navigation. The format enabled the viewer to select areas of surface anatomy palpation and specific muscle length tests to view. The content of the video clips was the same as that delivered in traditional class demonstrations. Additional viewing angles were presented and emphasis made of important landmarks and hand holds. Several copies of the DVD were made available in the library on short term loan. The digitised audio-video clips were also streamed via the online course home page, using menu based format similar to the DVD for students to access via computer. All students enrolled in the Biomechanics course had access to the online web-based videos and library loans.

Teaching methods (Instructional design)

The instructors were two experienced educators (JC and SH), who had been teaching the psychomotor skills of specific surface anatomy structure identification and muscle length testing in this course for more than 5 years.

Two main areas of teaching content were selected for the purpose of the research project, the lower limb and upper limb. Different instructional designs were applied to each content area.

Method 1

The first instructional design (lower limb content) utilised the traditional classroom demonstration method followed by supervised student practice. The online A-V material was also available for students to access during this period.

Method 2

In the second instructional design (upper limb content) students were taught without the traditional class room demonstration method. Students were encouraged to prepare for the classroom session by previewing the online A-V material or DVD. Supervised student practice was provided during the practical sessions. No tutor demonstrations were given.

Information on the students' experiences was collected via an anonymous on–line survey (TellUs2) and focus groups. All students enrolled in the Biomechanics course had access to the online survey and received email and verbal prompts to complete this. An emailed invitation to attend one of two focus groups was also sent to all eligible students. The focus group facilitator asked the students open ended question about the use of the A-V aids in the course that were based around the research questions. The focus groups were audio-taped and transcribed for analysis by the researchers. To determine if there were any overall changes in assessment outcomes following the introduction of the altered teaching format student results for the end of semester practical viva were collated from this period and compared to previous years.

Results

Survey data

Thirty-five (37.6%) out of ninety-three students enrolled in the biomechanics course completed the survey. Of these, 91.5% were local students and the remainder were international enrolments, with 94% reporting that English was their preferred language. The majority were aged 17-19 years (71.4%), with 12% being over 30years. Seventy-one per cent were female.

All students reported having internet access in their home environment (Table 1): 17% had dial-up, 57% had Broadband ADSL and 26% Broadband ADSL2. The majority also had a DVD player in their home (97%). Of all the respondents, 28.6% indicated they accessed the audio-visual tool on line at the university computer pools, 68.6% accessed the online version at home, 3% used the library loan DVD version at home and no students viewed the DVD on campus. The majority of respondents reported accessing the audio-visual clips 2-3 times (63%), 31% accessed them 4 or more times and only 6% reported accessing them once.

Open ended response questions were also included in the survey (Table 2). In response to the first open

ended question 68% of students preferred a combination of pre/viewing the AV clips combined with an in-class demonstration, 22.8% preferred using the preview of the AV tool only (no demo), and 8.5% preferred the in-class demonstration only. Many commented on why they had this preference. The students who preferred the combination of in-class demonstration and use of the videos used the latter primarily for revision closer to exam time – this was seen as the strength of the videos, that they could be viewed multiple times, stopped for note taking and reviewed later again. They cited reasons of reinforcement (the two modalities reinforced each other), finding a live demonstration more informative initially, making for easier "copying", or that they had poor planning/timing and didn't access the videos for previewing. Those that used and preferred to preview the videos found it consolidated their learning and made it more efficient – they came to sessions with prepared questions and received important feedback on their performance. They also noted this shortened the time needed in class as a further benefit. Interestingly students also noted that they needed to be "forced" to preview the videos. If they knew there was NOT going to be a demonstration then they planned and previewed accordingly (with the above benefits). However they did not organise to preview when there was no absolute requirement.

Table 1. Student access and use of online or DVD format

How did you view the video clips?		
	Number	Percent
Online in the University computer pools	10	28.6
On-line at home	24	68.6
DVD at the University	0	0.0
DVD at home	1	2.9
Total	35	100.0
What type of internet access do you have at home?		
	Number	Percent
None	0	0.0
Dial up	6	17.1
ADSL	20	57.1
ADSL2	9	25.7
Total	35	100.0
How many times have you viewed the video clips either via DVD or On-line?		
	Number	Percent
Once	2	5.7
2 – 3 times	22	62.9
4 or more	11	31.4
Total	35	100.0

The students were asked to identify any difficulties they experienced in using the AV learning tool. The

majority of issues centered around technical difficulties like access to computers that could play the clips, i.e. computers were not compatible, were not always available or had long download times. Two respondents noted difficulties in remembering to schedule time before class to preview the clips or being "too lazy" to organise questions to aid their learning.

Table 2. Open-ended response questions

Different methods were used in the teaching of the lower limb and upper limb functional anatomy sessions of this course. Of the two methods you experienced which do you think assisted your learning more?
Please outline any difficulties you experienced in using this learning tool.
Please include any suggestions you have for improvements to this learning tool.

Respondents were asked to offer suggestions to improve this learning tool. There were a few specific content suggestions for the actual techniques (to ensure consistency and full coverage of expected content) and for a clearer recording environment (less ambient noise and greater field of view). One suggestion was to make the DVD's purchasable to ensure easier access, or to change the format for easier downloading. A further suggestion was to make it more explicit that previewing the tool was a requirement in the Method 2 teaching period.

Focus group data

The responses from the focus groups confirmed the information obtained from the written survey. The strengths of the videos as a teaching tool were that they could be accessed at any time, repeated and paused to allow for note taking/question formation and confirmation of aspects missed first time around. These were all features felt not to be available with an in-class demonstration. It was also felt that, generally, the videos offered better line of sight than occurred in-class (particularly for those students standing at the back of the group).

Knowing the in-class demonstrations were not going to occur in method 2 disciplined the students to make better use of the video tools as a preview. When they knew an in-class demonstration would occur (method 1) they were less likely to preview the videos and only used them as a revision tool after class. Students commenting on the method 2 delivery appreciated being able to have more time for direct feedback in class (no time was devoted to demonstration) commenting they could get specific information and then leave early once they were satisfied they had the techniques correctly. A further benefit of method 2 was that no-one had to volunteer to be the "demo-person" and therefore have to get undressed!

The negative aspects of method 2 reported were that it took time and organisation to preview the videos, whereas with in-class demonstrations "you could just rock up and they'd do it for you". Students also confirmed that there should be easier download options or DVD's should be available to take away. Some were reluctant to purchase DVD's (for $5-10) and would prefer the extant streaming option over payment.

There was also strong confirmation that students needed to be "scared into" previewing the videos with a clear expectation that if they weren't prepared, the teachers would not assist them. The students were asked how they felt about being prepared (having previewed the videos) in a practical session with students who had not prepared. Their response was that this could still work as they (the prepared students) could assist the latter group. Some students reported this a positive learning experience, so long as it wasn't always like this. They felt peer pressure/friendship would prevent this occurring often.

Assessment data

There was no significant difference in the student grades obtained in 2007 compared with 2005 and 2006, following the introduction of the altered instructional method (Table 3).

Table 3. Student grades 2005-2007

Grade	2005	2006	2007
Fail	3%	1%	3%
P2	0%	0%	0%
P1	7%	0%	5%
C	7%	13%	9%
D	23%	31%	27%
HD	60%	55%	56%

Discussion

This study was a pilot investigation into the feasibility, utility and perceived effectiveness of audio-visual teaching aids within a first year physiotherapy course. The skills of surface anatomy palpation and muscle length testing were taught either via the traditional in-class demonstration or audio-visual clips (access either online or via loan DVDs). The video clips were used either as an adjunct (method 1) or as the sole method of instruction (method 2).

The students overwhelmingly preferred a combination of the two. It was clear from their responses that the traditional method suited students who reported themselves as more lazy or poorly prepared – what educators would see as “passive” learner behaviour. The students who reported benefits from the video clips, as a preview combined with practice/feedback sessions, clearly elucidated the positive aspects of a more ”active” and engaged learner. Whilst some students adopted these active behaviours spontaneously, others reported they needed to be forced into this pattern of learning. Either method appeared equally effective and had pros and cons with regards to feasibility and utility for the students. There were no detrimental effects on standardised assessment tasks.

From the educators’ point of view, the reduction in time spent demonstrating and the increased time available for student-directed practice and feedback was more satisfying. However both educators noted that whilst the number of students attending the 2 hour practical classes did not change there was a reduction in overall time student’s spent in supervised practise by about 50%. This may be a desirable outcome for the students if the time not spent with the tutors has been effectively used in preparation and preview of the material. Although it was not formally measured it appeared that the majority of the students were more engaged in the process of learning the material having reflected on the deficiencies in their understandings and were able to identify areas where they needed assistance. Working with better prepared students is also more rewarding for educators.

Technical access issues need to be addressed before any changes to alternate online teaching methods are instituted. From the results of this study we would advocate multiple access options including rapidly downloadable clips (meaning there is a potential loss of copyright control), plus loan and purchasable DVD copies.

It would appear that to change student learning behaviour expectations need to be explicitly stated and the consequences highlighted if the required behaviour does not occur.

Conclusion

To promote the life long learning and reflection skills and improve student engagement in our students we should be using instructional designs that intrinsically promote these skills. These changes in design

should commence in the first year of the program to promote these practices before less effective teacher centred behaviour becomes entrenched. There may be no difference in the educational outcome for student learning but teaching time is more effectively utilised and students are positive about the changes for their learning. We suggest this mode of instructional design could be applied to other areas of psychomotor skill teaching and whilst it does not replace tutor supervision (for clarification and feedback) it can enhance teaching and learning experiences.

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