"Mirror, mirror on the wall": The power of video feedback to enable students to prepare for clinical practice

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Abstract This project explored the use of video analysis of self and peer-recorded skill performance to better prepare nursing students for clinical practice. Video technology has been used as an educational tool to prepare skill development for a variety of professions. This Curtin University eScholar project enabled the use of *CRITIQUE*, a video-analysis learning tool, for the development of psychomotor skills for clinical practice. This quasi-experimental pilot study involved a convenience sample of second year nursing students. A control group experienced the traditional learning experience, whilst the intervention group combined the traditional experience with *CRITIQUE*. Pre and post-test questionnaires were used to obtain data on student characteristics, self-efficacy, impact on learning processes and usability of the program. Self-efficacy was not statistically significant between the groups; however, the intervention group showed a trend towards greater confidence and perceived ability than the control group, who trended downwards. The *CRITIQUE* experience positively influenced processes of learning, including reflective practice and 72.8% rated the experience enjoyable and beneficial. These preliminary findings are promising and a larger-scale study is warranted.

Introduction

Nursing education prepares students for entry into the professional practice domain. This preparation involves learning a combination of theoretical principles and clinical skills, as well as the development of key attributes such as critical thinking, self-efficacy and reflective practice. An essential outcome of undergraduate nursing programs is the transfer of psychomotor skills learnt in a teaching laboratory into clinical practice. Video has been used extensively in sports coaching for many years for the development of sporting and coaching skills. This project explored video analysis technology – *CRITIQUE* to develop nursing students' clinical skills; in particular it examined the impact of video analysis on students' perception of the learning experience, their self-reflection on performance and their preparation for clinical practice. This type of learning has been promoted in the education and professional development of teachers for many years, allowing for self-confrontation and reflection on practice (Rich & Hannafin, 2009).

The study used the principles of authentic learning, incorporating learning activities that have real life meaning to the student (Herrington, Oliver & Reeves, 2003).

Literature review

Transferring nursing knowledge into professional practice is the foundation of nursing education. Supporting knowledge transfer from the academic setting to the clinical setting aims to prepare the student to be a confident and competent practitioner (Cheraghi, Hassani, Yaghmaei & Alavi-Majed, 2009). Educational institutes are required to produce nursing graduates who are able to enter the clinical environment with clinical skills and the ability to demonstrate independent thinking and decision making (Kuiper, Murdoch & Grant, 2010). Kuiper et al. suggest that educators can meet industry demands for competent nursing graduates by maximizing the opportunity for students to practice clinical skills in the safety of a supervised clinical simulated environment.

For authentic simulated learning activities to be effective, regular feedback throughout the learning process is imperative. Feedback forms an essential component of formal assessment in education. Students are assessed at regular intervals throughout undergraduate studies to appraise skill level and competency to practice. Regular assessment of performance, both of individuals and groups, with constructive feedback from the assessor offers the student opportunities to take corrective measures to improve practice (Guskey, 1990). Guskey describes how regular evaluation and feedback, combined with encouraging student engagement, results in improved student learning outcomes. This is also supported by Ladouceur et al. (2004) who add that regular assessment and feedback is imperative to give students an opportunity to correct and develop skills. Similarly, Tanner (2006) suggests that feedback given after a simulated or actual clinical experience may encourage a student to reflect on their practice. Furthermore, this feedback need not be from educators only. Vicarious experience, obtained through observing others, assessing their practice and providing peer feedback, can be a useful strategy in assisting students to develop competence in clinical skills (Zulkosky, 2009). Kearney and Schuck (2006) reported that not only did peer evaluation result in a shared experience, student motivation was noted to be higher and they demonstrated a greater interest in the activity. This process promoted a student's self-belief in their ability to perform the same skill – the belief that "if they can do it so can I" (McConville & Lane, 2006).

Students who are engaged in a task that combines practice and feedback, are more likely to develop self-efficacy of their own practice (Manojlovich, 2005). Self-efficacy refers to the conscious awareness of self-ability that a student possesses (Bandura, 1977). Self-efficacy can be promoted with personal experience of a situation or task and can be enhanced with training and repetition (McConville & Lane, 2006). Zulkosky (2009) expressed how demonstration followed by the opportunity for practice can enhance self-efficacy. Cheraghi et al. (2009) believed that measuring a student's self-efficacy can assist in predicting clinical performance, as poor clinical performance may be indicative of low

levels of self-efficacy and not just poor clinical skills. Evidence to support this is provided by Manajilovich (2005) who links high levels of self-efficacy to more advanced professional standards and practice, and Zulkosky (2009) who believes self-efficacy is associated with the ability to tackle challenges and demonstrate confidence in decision making.

The literature is replete with information on diverse instructional approaches designed to optimize student learning and its transfer to other settings. Technology has extended the possible approaches, in particular the affordances of video technology shows promise (Das & Alliex, 2010a; Hands et al., 2010; Kearney & Schuck, 2006; McConville & Lane, 2006; Preston, 2008; Rich & Hannafin, 2009).

An advantageous feature of video medium is its ability to provide a life-like learning experience. Kearney and Schuck (2006) encourage the use of digital video as a means of providing an authentic learning experience, where classroom experiences have real life relevance to the student. The possibility of authentic video experiences to engage students more effectively in their learning has been shown by Kearney and Schuck (2006) who suggest that students become more enthusiastic learners than evident in standard class tasks. It seems that video analysis can be a potent learning tool in transforming the learning experience from passive to interactive, and thereby maximising the engagement of students (Preston, 2008). Furthermore, this may occur because video recorded performances can be less daunting than practicing in front of a large peer group (McConville & Lane, 2006). In particular, a study by Das and Alliex (2010b) involving nursing students showed that video analysis provided a learning strategy that was less anxiety provoking than classroom demonstration of clinical skills. Likewise, Hands et al. (2010) supported these findings in studies evaluating video technology with sports science students.

The reduction of stress in the learning environment through the use of video technology may facilitate processes of learning. McConville and Lane (2006) identify that the availability of a video recording means students can view the performance on several occasions in order to assess and evaluate a task, particularly if the task is complicated. The time to review a video supports a student's reflection on their performance or that of others (Hands et al., 2010; Rich & Hannafin, 2009).

The promotion of reflection is a key component of authentic learning (Herrington, Oliver & Reeves, 2003). Rich and Hannafin (2009) reviewed the use of video analysis in teacher education and concluded that there was potential for the process to encourage reflection, and provide a means of measuring the impact of self-reflection on development. Likewise also in teacher education, video was used by Preston (2008) as a stimulus for reflection on performance and to evaluate if the opportunity to self-reflect leads to an improvement in the student's confidence in the skill level. The findings suggested that students are more thoughtful in their critique of their performance when

using video for reflection. In nurse education, Gordon and Buckley (2009) demonstrated the effectiveness of videoed simulation sessions in improving skill level in clinical care. Study participants positively rated the experience of being able to review their performance via video and found the reflection encouraged debriefing, a finding supported by Rich and Hannafin (2009) who reported that collaborative discussion had great benefit to students. Hands et al. (2010) found that students learnt through the feedback that emerged through using video technology with their peers.

There is considerable support for the use of video analysis in the learning environment, particularly to develop clinical skills, yet there is little empirical evidence to determine if video analysis has any impact upon a student's self-efficacy and their ability to transfer this knowledge to the clinical area. Whilst Das and Alliex (2010b) claimed that video review led to reduced student anxiety and increased confidence in the students perceived competence level, there is little on the use of video as a vicarious, interactive process to enable a student to develop their self-efficacy.

This pilot study within the School of Nursing and Midwifery at Curtin University sought to determine if video analysis can be used to develop and enhance self-efficacy, whilst exploring its impact on the learning process and student satisfaction. Specifically the use of video technology was applied to the learning of a clinical based psychomotor skill requiring its later application in the clinical setting by nursing students. The video analysis technology utilised in the study is *CRITIQUE*, described later.

Context

This project introduced and evaluated the use of a video analysis learning strategy for second year undergraduate nursing students or equivalent graduate students enrolled in a nursing practice clinical preparation unit. The students were practicing clinical skills for application in their first hospital based clinical placement. Prior to this project, the learning strategy employed to prepare students for clinical practice included the demonstration of skills by a nurse academic in a clinical laboratory setting followed immediately by supervised rehearsal and practice by the student. Further opportunity to rehearse skills prior to clinical practice was not provided. Assessment of skill performance occurred within the clinical practice setting under the supervision of clinical educators.

The pilot study intervention included the traditional preparation in conjunction with an additional learning strategy prior to the commencement of clinical practice. This strategy involved an opportunity for skill practice in a second laboratory with the difference that the intervention group were required to digitally record themselves or their peer performing a clinical skill in the laboratory setting. Once the skill was recorded, the students constructively analysed the performance using a video analysing program called *CRITIQUE*.

Research questions

The project was guided by the following research questions:

- What impact does video reflective learning analysis have on students' self-efficacy for performing a psychomotor clinical skill?
- Is video reflective learning technology an effective learning strategy?
- Is a video reflective learning experience sustainable for large group teaching in undergraduate university courses?

Technology

The software program *CRITIQUE* was used in this study. This program is a video critiquing application that was developed for application in university teaching in the Health and Sports Science areas (Hands et al., 2009). *CRITIQUE* requires a recorded video to be stored on the Web as the program uses the Web address to access and import the footage into the program. Students 'bookmark' sections of the recorded footage using numbered 'buttons'. Bookmarking inserts markers on the digital video that permits the identification of a particular section of the recording. This section can then be assigned an analysis code and played back at will. *CRITIQUE* places markers on the video by clicking on 'buttons' to mark the start and end of the segment of interest. Once the markers are assigned, the program allows the insertion of text comments adjacent to the assigned section. Students were encouraged to reflect on the recorded skills performance and provide both positive and critical feedback on performance in the text related to bookmarked sections of video footage. Once the student has finished their analysis and coding of the video they were requested to share it with others. This allowed them to review both the recording and their peers' feedback. The end result after coding is a video with numerous markers placed within it, and a text based code to explain their placement, see Figure 1.

Figure 1: *CRITIQUE* Platform, illustrates the video footage on the left of screen, the coloured marker buttons on the right of screen and the student comments assigned to each bookmarked section below the video footage

Uploading student videos to the Web poses problems with regards to privacy and security. The use of readily available means of uploading via *YouTube* was deemed

unsuitable due to the public availability of the recorded video. These concerns were overcome at the University by use of the Curtin iLecture system to upload the video recordings. This password controlled environment is Curtin University's digital audio and video storage and retrieval system, used for the recording, compressing, storing and accessing of lectures.

Once the clinical skill recording is manually set to upload by the tutor into the iLecture system, the Web link is automatically emailed to the tutor. This Web address was then forwarded to students who inserted it into the *CRITIQUE* program. Students were provided with a step by step guide using computer screenshots to demonstrate the insertion of the Web address into the *CRITIQUE* program. Once the address was inserted the students were able to view their video and commence analysis.

Project methodology

The project used a quasi-experimental study design, involving a convenience sample of pre-registration nursing students ($N = 90$) to determine the impact of the video learning experience. All students were enrolled in a unit of study where instructional strategies are designed to support specific nursing clinical skill development. One skill set was selected from those in the unit syllabus for review in this study; the aseptic set up of a dressing pack was selected due to the relative simplicity of the skill and ease of recording for trailing the technology.

A two group pre-test/post-test design used random sampling based on students' pre-programmed laboratory attendance for the unit. Equivalent intervention (I) and control (C) groups were formed ($n = 45$) and the study conducted between July and November, 2010. Participation was voluntary and non-participation did not affect the student's progress in the unit. Ethical approval was granted by the University Human Research Ethics Committee.

Students were required to attend the regular two hour laboratory session, which involved modelling of the skill by a nurse academic followed by coaching, as students rehearsed the aseptic dressing set up. At the end of the laboratory all students were asked to complete a pre-questionnaire, which was then posted anonymously into a secure University internal mailbox. Questionnaires administered to the intervention group were marked with an "I" for linking pre-data to post-data.

Four weeks after completion of the laboratory session all students were invited to attend a second practice laboratory. The control group repeated the experience encountered in the first laboratory session, whilst the intervention group were required to record their performance whilst practicing the skill. The intervention group were assigned to a group comprised of three students; one student elected to perform the skill, another to record and a third to offer constructive advice on the skill performance. Students used their own

recording devices, including mobile phones and digital cameras. Recordings were supplied to the academic staff for uploading onto *CRITIQUE* via the iLecture system.

Within two weeks the intervention student groups were provided access to their respective video footage on *CRITIQUE*. Once accessed, the groups were required to engage in reflection whilst critiquing the performance. To guide the reflective practice students were provided with a purpose designed rubric identifying key elements of the skill; in particular, hand washing, coordination of performance, maintenance of asepsis and duration of procedure. During the reflective process the identification of strong and weaker aspects of the performance were encouraged and students entered comments describing these aspects directly into the video critique programme. The groups were allowed two weeks to complete this reflective learning activity, whereupon it was submitted to the academic for review. Following the reflective activity, students in both study groups were asked to complete a post-questionnaire, which again was posted anonymously into a secure internal mailbox.

Purpose designed pre and post questionnaires were developed for the study. The pre questionnaire consisted of two parts, Part A collected demographical data, including the student's age, gender and student residency status (domestic or international). Students were also asked what lab preparation they had undertaken: lecture, laboratory information available on the unit's Blackboard site, other or no preparation. No identifiable data was collected. Part B assessed self-efficacy and comprised two questions: self-confidence and perceived ability to perform the skill; it used a 6-point Likert scale from '0' strongly disagree to '5' strongly agree. The post questionnaire duplicated Part A, with the exception of the preparation question and Part B, with the addition of a third Likert scale item assessing perceived improvement in the skill. In addition, two other parts were included for completion by the intervention group only: Part C consisted of items using the same 6-point Likert scale and assessed the learning affordances of *CRITIQUE*, these were support of: learning processes (4 items), reflective practice (3 items) and application to clinical practice (1 item), and overall satisfaction with learning experience (3 items). In addition, the platform's capabilities assessed were user's information technology (IT) skills (2 items) and time commitment (1 item) to manage *CRITIQUE*. Part D included four questions; one question used categorical data to estimate time spent using the learning strategy and three open-ended responses to ascertain students' opinions of advantageous and disadvantageous features of using the video learning experience and additional feedback. Part C and D were informed from a survey used in previous related studies using technological aids in teaching and learning (Lee et al., 2010).

Results

Of the 90 students invited to participate in the study, 58 completed the pre questionnaire (C = 17, I = 41) and 25 the post questionnaire (C = 14, I = 11); the response rate being 64.4% and 27.8% for the control and intervention groups respectively. The lower

response rate post-intervention needs to be taken into account in the interpretation of the findings.

Table 1 details the characteristics of the study participants. To establish equivalency of the groups parametric (*t*-test) and non-parametric (Pearson's Chi-square) tests were conducted; there were no statistical differences between the control and intervention pre-groups and post-groups on age, gender, course level and student status. Given the respondents in the pre and post phase could be different subjects, equivalency testing was repeated to identify if demographical differences existed in the pre and post groups; no statistical differences were noted: age (p = .382), gender (p = .590), course level (p = .374) and student status (p = .876).

Table 1: CRITIQUE's Learning Capabilities

	Pre-groups (*n*, %)			Post-groups (*n*, %)		
	Control	Intervention	P value	Control	Intervention	P value
Age	*M* = 24	*M* = 23	0.786	*M* = 24	*M* = 20	0.750
Gender						
Males	3 (17.6%)	4 (9.8%)	0.401	1 (7.1%)	1 (9.1%)	0.859
Females	14 (82.4%)	37 (90.2%)		13 (92.9%)	10 (90.9%)	
Course level						
Undergraduate	12 (70.6%)	30 (76.9%)	0.615	12 (85.7%)	9 (81.8%)	0.792
Graduate	5 (29.4%)	9 (23.1%)		2 (14.3%)	2 (18.2%)	
Status						
Domestic	11 (64.7%)	34 (82.9%)	0.130	10 (71.4%)	9 (81.8%)	0.546
International	6 (35.3%)	7 (17.1%)		4 (28.6%)	2 (18.2%)	

Note: Pre-groups demographics - 2 students did not record their course level.

Impact on perceived self-efficacy

Following the first laboratory session, where the skill was taught, students in both the control and intervention group felt reasonably confident and believed they were equipped with the skills to perform a dressing set up procedure, see Table 2. Although the control group was more confident and the intervention group believed they had greater skills, neither difference was statistically proven using *t*-test analysis. Post intervention the ratings for confidence and belief in skill performance were also lower for both groups. Whilst the intervention had slightly higher ratings than the control group on both of these items no statistical differences were evident.

Table 2: CRITIQUE's impact on self-efficacy

	PRE-GROUPS M (SD)			POST-GROUPS M (SD)		
	Control	**Intervention**	***P value***	**Control**	**Intervention**	***P value***
Self-confidence	4.06 (.83)	3.93 (1.06)	0.648	3.71 (1.20)	3.73 (.78)	0.976
Perceived skills	3.29 (1.05)	3.38 (1.06)	0.792	3.07 (1.44)	3.18 (.60)	0.814

The findings for perceived confidence and ability to perform the skill were explored further using percentage from the students' agreement ratings on the Likert scale. It was seen that data from the intervention group trended towards improvements in confidence and perception in skills ability. Conversely, the ratings declined for the control group, see Figures 2 and 3.

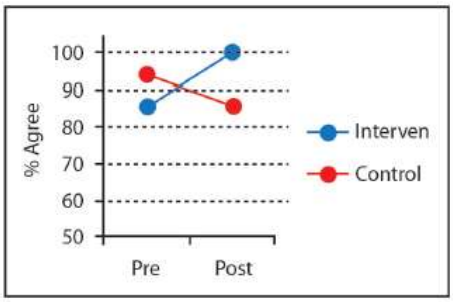

Figure 2: Students self-confidence ratings

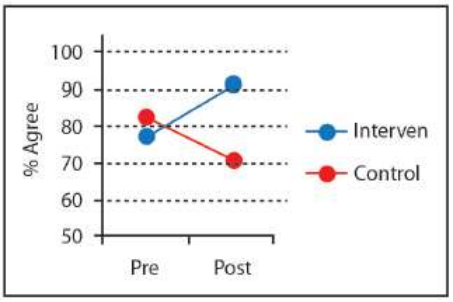

Figure 3: Students perceived skills ratings

Effectiveness of learning strategy

As can be seen in Figure 4 the use of *CRITIQUE* had a favourable impact on learning. The overall satisfaction rating for this method of developing clinical skills was high (M = 4.03, SD = .67) and users' felt it supported reflective practice (M = 3.88, SD = .97). The higher ratings of 4 or 5 on the Likert scale indicated strongest agreement and were particularly evident for the three items used to assess reflective practice; these items provided insight into the influence of the video learning experience on: evaluating personal skills (63.5%), determining strengths and opportunities for development (72.8%) and ability to perform the clinical skill (54.6%). Although the reflection on clinical skills is lower than the other two aspects, overall this item was rated agree to strongly agree by 100% of the students.

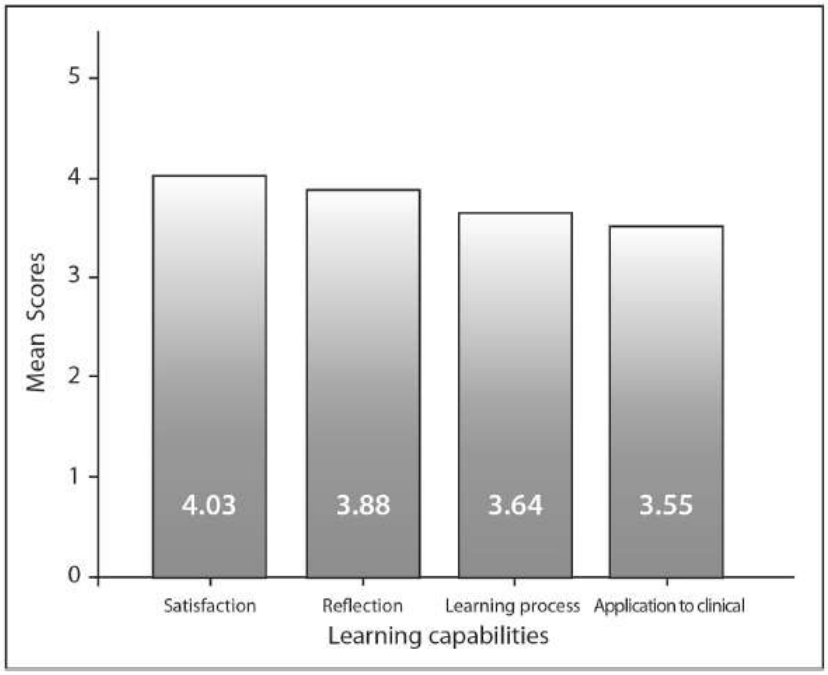

Figure 4: *CRITIQUE's* Learning Capabilities, assessed using a Likert scale of 0 "strongly disagree" to 6 "strongly agree"

The learning processes category included four items (M = 3.64, SD = .66); all performed well: effective learning (72.8%), motivation (63.7%), independent learner (63.7%) and understanding (54.6%). Although the impact of the technology on perceived support in preparing for clinical practice (M = 3.55, SD = 1.12) rated lower than the other 3 categories, it was still regarded positively. In summary, the intervention group reported greater perceived skills in the technical performance of this skill (M = 4.00, SD = .89) compared to the control group (M = 3.86, SD = 1.23); however, this was not statistically different (p = 0.75).

Qualitative responses provide insight into why students viewed *CRITIQUE* positively. In particular students indicated their learning was enhanced because *CRITIQUE* allowed them to repeatedly review the video, objectively assess a peer's work and review the reflection of other peers. Despite this students felt that an exemplar recording showing the correct application of the technique would facilitate learning, allowing students to reflect on their own performance in comparison to the exemplar.

Sustainability of CRITIQUE

The student users perceived that the level of technical skills required to use *CRITIQUE* (M = 3.32, SD = 1.33) was reasonable and generally within their capability. Further, its use was not arduous, with students indicating the time commitment required to use *CRITIQUE* manageable (M = 3.82, SD = .98). However, qualitative responses from students indicated that the *CRITIQUE* editing system was difficult to use and problematic if the quality of the original recording was poor as visibility of the skill performance in *CRITIQUE* was hindered. The time for uploading videos into the

University iLecture system was problematic. The uploading proved to be a time consuming for the tutor. Devices such as an iPhone® were in a compatible format (video file) for the iLecture system, while non-compatible files from other cameras had to be converted.

Discussion

The results from this study indicate the potential benefits of the inclusion of *CRITIQUE* into pedagogical practices used to develop nursing students' clinical skills. In particular the program appears to effectively support reflective practice, which was shown by others to be a salient educational feature of video technology (Hands et al., 2009; Preston, 2008). The strong positive responses by students indicating the exercise helped them to understand the principles behind the skill may indicate the learning activity stimulated critical thinking about their performance – "The fact you can see more objectively the pros and cons of your technique . . . " (student comment). The positive trends shown by the intervention group for confidence and perceived skill level are encouraging and indicate the value of a wider reaching study. This is especially relevant given students felt the experience helped them prepare for clinical practice and is therefore congruent with evidence from Gordon and Buckley (2009). Given the prevailing limitations in clinical placements the use of video interactive technology should support improved preparation prior to applied practice, maximizing the time available for the real world experience.

Overall, students in the intervention group indicated that the experience was worthwhile. They indicated a high level of satisfaction and enjoyment gained from the experience, which is consistent with the findings of Das and Alliex (2010a) in their study involving nursing students. In particular it seems students felt the time investment for the task was reasonable, similarly supported by Das and Alliex (2010a) in their pilot study using the same video program.

The technological skills required to use *CRITIQUE* were generally seen as non-threatening, with students believing they already possessed the necessary information technology skills to successfully use the program. However, reported problems, predominantly related to the creation of Web addresses for the video, have also been noted by others (Das & Alliex, 2010b; Hands et al., 2009). To avoid IT issues being seen as a disincentive to *CRITIQUE's* use the technological aspect of installing video footage into *CRITIQUE* needs to be overcome. At Curtin, this can be overcome by direct automatic recording onto the iLecture system. Some of the available clinical laboratories are equipped with video recording facilities directly linked to the Curtin University iLecture. Using this style of recording would also improve the video quality and enable a Web address of the stored footage to be automatically e-mailed directly to the students for use in the video analysis software. Furthermore, when the laboratories are available the students could book into a laboratory and record skills at a time convenient to them.

The limitations of the pilot included the low post survey response rate. Accessing students during their scheduled laboratory times encouraged response to the pre-test questionnaire; however this was not feasible for the post test which may explain the reduced number of questionnaires returned for analysis. The low number of control group responses may have been due to a lack of engagement by those students who were not part of the intervention. If the study was repeated it is recommended the recording session takes place earlier in the semester to allow greater contact with students to prompt them to return questionnaires. Alternatively, questionnaires could be made available via an online survey service which could be linked through the unit Blackboard site. Santos and LeBaron (2005) indicate that online survey mechanisms can often result in a lower respondent rate. Other strategies could be taken to improve the response rate, for example a recent online questionnaire resulted in respondent rates in excess of eighty percent when students were encouraged to complete a paper-based questionnaire during scheduled teaching time (Stanley & Glaister, personal communication, December 12, 2010). A further limitation of the pilot was the small number of participants. If the study was to be repeated choosing a larger student sample size would increase the opportunity for more statistically significant findings.

Conclusion

This project studied a group of nursing students and examined the impact of video analysis of a clinical skill on student self-efficacy and its acceptance and value as a learning tool. Preliminary findings from the pilot study are favourable. Although analysis showed no significant statistical difference between the self-efficacy ratings of the intervention and control group, positive trend data suggest its potential. The results from this pilot study correlate with other studies involving video analysis in student learning. In summary, students were provided with an authentic learning experience that was viewed positively by both staff and students.

The evidence produced support the expansion of this pilot study to a larger study. Prior to this it is recommended that the implementation difficulties in storing of videos on the Web be overcome. Further study will demonstrate if this approach has a statistically significant impact on the students' preparation for clinical practice.

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