Using digital technology to enhance student engagement in physical education

Article *in* Asia-Pacific Journal of Health, Sport and Physical Education · June 2011

DOI: 10.1080/18377122.2011.9730351

2 authors, including:

Ashley Casey
Loughborough University
83 PUBLICATIONS **2,631** CITATIONS

SEE PROFILE

Using digital technology to enhance student engagement in physical education

Ashley Casey - *University of Bedfordshire, United Kingdom*
Benjamin Jones - *New South Wales Department of Education and Training, Australia*

This paper explored the use of video technology as an aid to student engagement in physical education. Working in a comprehensive high school in Australia with disaffected students, the study used the New South Wales Quality Teaching Program as a basis for assessing the effectiveness of video technology in enhancing students' engagement in Physical Education lessons aimed at facilitating deeper understanding of throwing and catching. The results highlighted the effectiveness of video technology in enhancing engagement and subsequently suggest that such a degree of commitment helped students to develop understanding beyond technical replication and towards rational and reasoned student investigations around their learning. Additionally, it helped students to feel less marginalised and enabled them to be more engaged in their learning.

The possibilities are endless; what is needed is imagination - Fernández-Balboa (2003, p. 143)

Introduction

Writing at the beginning of a new millennium Fernández-Balboa believed that there were near-limitless possibilities for teaching and learning in physical education in the digital age. Unfortunately, despite this vision, there is little to suggest that technology is revolutionizing the educative spaces where physical education is taught (Parton & Light, 2010). In fact many authors (see Fernández-Balboa, 2003; Kirk, 2010; Lawson, 2009) firmly believe that physical education is still mired in what Apple (1995, 2004) called "the industrial model of production".

This apparent inertia is occurring at a time when our lives are becoming increasingly saturated by the use and availability of digital technology. Indeed globally there has been unprecedented funding for the development and procurement of technologies for use in education. In response to the astonishing rate at which technology is advancing, Richard Riley, the former United States of America Secretary for Education, suggested that we are currently preparing students for jobs that don't yet exist, using technologies that haven't yet been invented in order to solve problems we haven't yet identified. The disparity between this message and the current use of technology in physical education is stark. More deeply worrying though is the fact that the massive investment in technology has had such limited impact on enhancing student learning (Tearle & Golder, 2008).

In reporting on the state of physical education in the UK, the Government's inspectorate, the Office for Standards in Education (OFSTED, 2009), recently concluded that few schools routinely use Information Communication Technology (ICT). Furthermore, they suggested that of those schools who do use ICT less than 1 in 10 use it purposefully to engender student interest or to support learning (OFSTED, 2009). They suggest that the best use of ICT in physical education often occurred in examination classes, both in pre and post-sixteen settings, yet even then it was mainly used to assess students and track their progress. OFSTED (2009) described best ICT practice in physical education as the use of interactive whiteboards, still images, digital cameras and video analysis. Nevertheless they also reported that less than 10% of the lessons observed used ICT to stimulate learning and engagement, and that few schools routinely used ICT in physical education.

In their national audit of ICT use and its perception in physical education, Thomas and Stratton (2006) found that the most widely used piece of ICT equipment was a compact disc player - which given the advances in digital music technology many might consider to be nearly obsolete - and the commonest use of ICT was to monitor, assess, record and report on pupils. Indeed they found that although 66% of the 252 schools surveyed reported owning a digital camera, 36% of those said that they rarely used it (Thomas & Stratton, 2006). It is apparent from both these studies that while the use of technology in schools is expanding at an exponential rate, its beneficial use in physical education is only used intermittently (Hemara, 2009).

While the use of ICT in the UK has been slow to evolve, in some regions of the world technology is seen as more than an add on (Jones, 2010). In their recent investigation Banville and Polifko (2009) stated that both the rapid increase in technological capabilities and falling costs have made the use of technology in physical education increasingly important. That is not to say that the use of technology, through video recording, in physical education is a new thing. However, modern technology takes the key capabilities of slow motion, freeze frame and frame-by-frame advance (Banville & Polifko, 2009) away from bulky video players and display units and positions it all within digital video cameras scarcely bigger than the palm of a hand.

The challenge in physical education is to use such technology in meaningful ways that enhance students' learning (Harris, 2009). Such outcomes were noted in a recent study of the use of the motion analysis software 'Dartfish' within 12 school physical education departments in New Brunswick, Canada. The unanimous opinion of all the teachers involved was that, by using options such as live capture and instant replay, video analysis software can easily be used to enhance student learning in physical education (Harris, 2009).

However, despite higher aspirations for the use of ICT in physical education, it must be acknowledged that hardware and software are expensive, which in turn limits the ability of schools to purchase and maintain up-to-date equipment. Fernandez-Balboa (2003) and Stidder and Capel (2010) both noted that some physical education teachers see the use of any technology or innovation as detracting from the core purpose of the subject - to get people moving for learning - while some teachers have simply reworked the term ICT to mean "It Causes Trouble" (Stidder & Capel, 2010) and subsequently avoid using it.

However, in Australia huge investment has been made in ICT through the "digital education revolution". Through this scheme the Australian Government has invested over $2.4 billion to "support the effective integration of ICT in Australian schools" (Department of Education, Employment and Workplace Relations, 2011). Regardless of the international context in which ICT is used, there is a small (albeit growing) body of evidence to show: a) that students engage with technology in its many forms; and b) how the use of technology in physical education might impact on their disposition to be physically active, and their embodied self-identities. One might ask whether the use of technology in physical education leads to greater involvement in physical activity or indeed whether it helps teachers to facilitate learning.

> *In New South Wales (NSW) we have a multi-faceted syllabus designed to explore the individual and their interaction with the world holistically - relationships, sound decision making, individual and community health to name a few. Using technology to complement and enhance our work as teachers seems to be an imperative, not a choice.* Jones (2010)

This paper explores a small project in NSW, Australia that sought to use technology to enhance the engagement and learning of low achieving students in physical education. By examining the findings of a school-based, and practitioner-led research study it explores the use of video-analysis software as a means of enhancing gross motor skill development with underachieving and disaffected students. This project showed that students gained a deeper understanding of the core skills of throwing and catching in a supportive learning environment where they were able to make connections between their performance and the performance of an elite athlete. The findings show that the introduction of technology had a significant impact on the engagement of these students and helped them to enhance their learning and engagement in physical education. Finally it shows that the meaningful use of technology acts as a catalyst for enhanced student appreciation of the application of skills in real situations, increased verbalisation of their deeper understanding, and a transfer of practice from one activity to another.

Method

Study Site

The study site was a comprehensive high school in Australia. It was situated in an area of low socio-economic status and had a student population of approximately 1100, including some of Aboriginal and Torres Strait Islander descent and other culturally and linguistically diverse groups. Engagement in Personal Development, Health and Physical Education (PDHPE) was described as mixed, with small pockets of both high and low involvement across the curriculum. At the time of the study ICT use in the school was very limited, focusing mainly on its functional application in technology lessons and limited by the resources held in only four computer labs.

Participants

The student participants in the study came from one mixed gender class of twenty-seven year 7 students (8 boys, 16 girls). The teacher used observations from the first semester of physical education to identify students in the class who were underachieving and/or disengaged. This assessment occurred in a unit of Fundamental Motor Skills (FMS) in which students were graded on their execution of each of a predetermined set of skills. This data was subsequently used to

identify gifted and talented students and those who were underachieving or disengaged. Using professional judgment underachieving students were identified as having FMS schemas that were either inconsistent or delayed developmentally. Importantly, the teacher observed that the small group of boys constantly sought a full game experience while the girls needed a more comfortable modified experience. It was difficult to balance these two demonstrated needs so as to challenge and engage all the students, which was a key reason for the use of video analysis.

The practitioner in this project had a wide range of experience as a teacher, and skills in video analysis. At the time of the study he was in the 3rd year of his teaching career and was undertaking his first classroom-based research project as part of his own professional development. Prior to this he had gained 8 years experience in outdoor education as an interpretative facilitator and alpine guide. Furthermore, in the season 2004/05 he served as Australian Junior Canoe/Kayak Coach/ Representative team manager and used video analysis extensively with junior athletes. Finally, as a senior athlete, he had used video technique analysis in the development of his own performances.

Ethics Approval

Ethics approval was sought and gained from the school Principal. As the teacher was researching in his own school with the aim of enhancing student learning this project was considered to be exempt from the "State Education Research Approval Process (SERAP)" (NSW Department of Education and Training, 2006). Furthermore, under SERAP guidelines, the collection of information in this way only required approval from the Principal (NSW Department of Education and Training, 2006, p. 3). However, the teacher also gained parental and participant permission for the research study to occur, particularly in the videoing of students.

Intervention

This project's aim was to increase student engagement in physical education through the meaningful use of ICT and was founded on the teacher's observation that:

> *Many students who came to my class still lacked confidence to participate as there was an obvious difference between their skill level and that of high performing students. We had a feeder primary that created students who hated physical education through a punishment and elitism [approach to physical education]. My aim for this project was to give those students the confidence early in year 7. This unit was a sustained focus on skill development with very few games. My personal style of physical education is 'game based learning' in that skills, rules and practice all occur through experience modified games and full games. My philosophy on physical education is very participation and engagement. So it was a significant shift from my natural physical education teaching style but these students were in their first year so there was not a sustained history of experiencing my teaching style.* (Teacher Interview)

The use of video technology was used with the primary aim of increasing the engagement of low level students. Learning experiences were personalised for all students, but teacher observations focused on low ability students. It was noted that high ability students were more able to articulate the components of good technique and took leadership roles in the class. In the feedback session, high ability students

were given more detailed feedback but, because of the research focus, detailed notes were not taken on the outcome of this feedback. That is not to say that the more able or more engaged students were excluded from the project and all participants were able to watch the example of another PDHPE teacher who, as a senior cricketer, was identified as having excellent throwing and catching techniques.

Explicit Quality Criteria (as we will discuss later in the paper) were applied from the Quality Teaching Program (NSW Department of Education and Training, 2003) which requires the modelling of high expectations, which are subsequently broken down to meet the individual needs of the students. Therefore, all students viewed the expert's technique as a model of explicit quality criteria and then used this as the model for best practice and as a reference point for what their technique should look like. The students were then videoed by the teacher who used the 'slow mo' and 'freeze frame' on the camera to show the students their performances in comparison to the example they had previously seen. The unit was originally designed for 6 weeks (12 lessons), but because of the nature of the Research project several modalities were repeated to try alternative methods, which resulted in the unit taking 8 weeks.

Each lesson involved an element of technology intervention, some short and some encompassing the entire lesson. Students constructed their own checklists based on feedback and a comparison of their technique as against the 'Explicit Quality Criteria'. Table 1 shows the range of interventions that the teacher used in this study. In addition the table gives details of the equipment used, describes the intervention and contains the teacher's own evaluations of each teaching episode (in the form of "plus, minus, interesting" observations):

Table 1
The teacher's technological interventions

Intervention	Equipment	Description	Teacher Evaluation
Field video recording, whole class playback in classroom	Camera Tripod Data projector Laptop VLC Media player Video of colleague	Students perform throwing action twice in front of camera. Whole class taken to a classroom. Students view footage of 'perfect technique' and key features of technique highlighted. Class views footage of themselves in real time speed and 20% speed. Students return to the field and practice based on feedback.	Plus • Time between lesson to capture and prepare video Minus • Lag between performance and feedback • Long time to give personalised feedback to every student • Difficulty in keeping non recorded students on task Interesting • In future lessons students regularly made reference to this lesson • The teacher had predicted some anxiety & masculine issues that never eventuated • During the whole project, this lesson had the most sustained learning.
Record and playback in field	Camera Tripod Laptop (spare battery) VLC Media Player	Whole class playing a European Handball Game. Small groups extracted to do small drills, be recorded and review footage live in the field. Repeated but took footage of the game live then extracted students as needed to show key moments.	Plus • An unrivalled opportunity for personalised feedback • All students engaged and on-task Minus • Much preparation required to have everything working for the lesson Interesting • Students were extremely responsive to the personalised feedback
Instant replay in field, live record and 10sec replay lag	Camera Tripod Laptop (spare battery) VLC Media Player	Students throwing and catching in front of kiosk. After the students had thrown, they could turn and view an instant replay of their action.	Plus • The teacher was more mobile and able to provide feedback to all students Minus • Relies on a lot of technology to work • Some students looked to the playback before completing throw • Requires the student to already have a visual schema of the actions Interesting • Students were lost in the technical marvel and here the lesson evaluation focused on technology and not development
Still image analysis using digital camera, playback in field	Students' digital cameras set to burst mode	Students brought their own Digital Still cameras and mobile phones to class. Using either slow motion features or 'burst mode' (multiple quick fire stills shots). Students performed throwing and catching captured by a third student, then using knowledge from previous lessons, coached each other.	Plus • Had the richest substantive communication between students. Minus • Some students unaware of features of their own technology so a little time lost problem solving. Interesting • The most technology rich lesson of the series as students exposed to a range of technologies • The teacher feared the students would be bored of throwing and catching but the students were clearly engaged in the lesson

Data Gathering Methods

Seven data gathering tools were used in this study: a professional development journal, student evaluation forms, lesson notes, quality teaching program coding (NSW Department of Education and Training, 2003), student group discussions, ad-hoc lesson observations, and a teacher interview.

A *professional development journal* was used by the teacher to take notes of what he tried and to reflect upon what happened and how he could do it better next time. He chose to do this because he had identified several modes of video analysis (see previous page) and wanted to keep track of the respective outcomes.

Student evaluation forms, focused on engagement and deep knowledge, were used to develop a quantitative and summative evaluation of the project. A simple unit evaluation form (employing the Likert scale) was used to ask quantitative questions on lesson satisfaction, pre-lesson confidence and how useful the video components of the lesson had been. Qualitative questions were asked about what the students enjoyed about the lesson and what they learnt (see appendix 1).

The teacher made *lesson notes* as part of his diary and allocated a page to post-lesson reflections using a 'plus, minus, and interesting' code (see table 1 on previous page).

Quality Teaching Program (QTP) coding was undertaken by an experienced teacher mentor. This project, part funded by Australian Government Quality Teaching Program (QTP) as part of the teacher's professional development, used a QTP focus in an effort to deepen the teacher's understanding of QTP in PDHPE. It is therefore important at this point to examine the QTP, especially as it relates to quality teaching in New South Wales (NSW) public schools.

In their publication *A Classroom Practice Guide* (State of NSW Department of Education and Training, 2003) the State of NSW sought to help teachers to engage in four key processes (reflection, analysis, planning and re-design) with the aim of enhancing "student learning benefits of each learning experience" (NSW Department of Education and Training, 2003, p. 5) as a direct result of their pedagogical practices. To this end, the State, with the help of the University of Newcastle, designed a model of pedagogy (see table 2) which focused on three dimensions of learning (intellectual quality, quality learning environment, significance) each of which had six dimensional elements (see table 2). In this pedagogical model *intellectual quality* was defined as the development of "deep understanding of important, substantive concepts, skills and ideas" (NSW Department of Education and Training, 2003, p. 9) and focused the teacher on cultivating cognitive as well as motor learning in physical education. The desired pedagogy extolled by this model asked teachers to create a *quality learning environment* where students and teachers could work productively with a clear focus on learning. The third dimension in the NSW model, *significance*, was the development of 'meaningful and important' learning that built on, rather than replicated, students' prior experiences.

Table 2
NSW model of pedagogy

Elements	Intellectual Quality	Quality learning environment	Significance
	Deep knowledge	Explicit quality criteria	Background knowledge
	Deep understanding	Engagement	Cultural knowledge
	Problematic knowledge	High expectations	Knowledge integration
	Higher-order thinking	Social support	Inclusivity
	Meta-language	Students' self-regulation	Connectedness
	Substantive communication	Student Direction	Narrative

It was not the expectation of the model that all eighteen of the elements could, or should, be achieved in every lesson. However, the learning and the learning environment created in this project were evaluated against the three dimensions and their respective elements in an effort to understand what had, if anything, been achieved.

In addition to the formal QTP coding, further data were gathered through *ad hoc* observations made by the teacher's colleagues (also against the QTP model) which helped to conceptualise the formal data in this PDHPE teaching and learning setting.

Unstructured *group discussion*s were used at the end of the unit to explore any unintended or unrecorded outcomes of the project. By this we mean the learning that occurred beyond the development of gross motor skills. During these discussions students were asked to talk together about their experiences of video analysis, highlighting particular examples of what worked and what didn't.

In the preparation of this paper the teacher was *interviewed* by the first author to uncover his perceptions of the teaching and learning that occurred in this unit.

Data Analysis

Data analysis had a cyclical structure that originated with the action research process developed by Lewin (1946) and centred on planning, action and fact-finding. The analysis occurred on three levels. The first aspect of the data analysis, due to the nature of teaching, was immediate and ongoing – allowing the teacher to meet the 'on the spot' learning needs of his students within the school context (Casey, 2010). This occurred through the "ordinarily tacit" process described by Schön (1983, p. 49) as reflecting-in-action: an implicit knowing "in our patterns of action and in our feel for the stuff with which we are dealing". At the second level, the teacher systematically collected and organised data and then analysed it using inductive analysis and constant comparison (Denzin & Lincoln, 1994; Lincoln & Guba, 1985). During several readings, each interview or log text was segmented into a series of thoughts and perceptions. Based on the work of Bell, Barrett, and Allison (1985), a thought or perception was defined as a statement that was conceptually consistent

with a single topic or idea. Next, these thoughts and perceptions were coded and placed in a series of emerging categories and subcategories. As this process continued, some data were moved from one category to another based on goodness of fit. At the third level the research team explored these categories, analysed new data in the form of the teacher interview and continued to recode and categorise the emerging themes. At this third level thoughts and perceptions were reconsidered in the light of teacher interviews, and topics and categories were reconfigured where appropriate.

Results

The results of this project centred on three QTP elements: i) deeper understanding (within the intellectual quality strand); ii) explicit quality criteria (quality learning environment); and iii) connectedness (significance). However, in addition to these themes there were other unanticipated outcomes that in themselves contributed to the enhancement of the physical education experiences of the students involved. These particularly centred on *increased participation by previously marginalised, disinterested and disaffected students,* as in the semi structured discussions students commented that they felt more confident and enjoyed participating in physical education as a result.

Deep Understanding: The teacher felt that the students demonstrated a greater depth of knowledge about throwing and catching skills as a direct result of the use of technology. This understanding was focused on three key areas: the identification and verbalisation of errors made by peers, more in-depth and developmentally appropriate questions asked of peers, and an increased ability to answer questions well beyond the superficial responses observed previously.

All of the observed students were able to better articulate the components of a quality throw and stated that they enjoyed the lesson most or all of the time. Vincent said "*I really liked the video because I could see myself and what I was doing wrong*", yet he was also able to clearly articulate key features of the fundamental movement skill such as "*start side on and point to target*" and "*wind arm all the way back then throw*". Jessica, who had historically been a reluctant participant in physical education, explained that she "*really liked being able to help others throw better*". Furthermore the teacher's lesson observations recorded that Jessica was taking on a learning leadership role in the class and that she was actively engaged in the learning process.

However, the use of technology was not straightforward and the teacher felt that it was difficult to find "*an application that was simple enough to give the students what they needed*" (Teacher Interview). Yet, after considerable investigation of some video analysis software he concluded that he "*just could not frame it for underachieving populations*" (Teacher Interview). In the end he found that "*after much practical research, VLC media player and the camera/video camera were all that was needed*" (Teacher Interview).

Once the issue of technology had been resolved the teacher was able to begin teaching. Due to the social deprivation in the area surrounding the school, he felt that the use of technology immediately enjoyed an 'oohah' status within the lessons. This certainly helped to generate a level of credibility for the intervention, but was not the sole contributing factor to the success of the project.

Students were able to frame their interactions around the 'best practice' example that was provided and the actions of their peers as observed through the VLC software.

The immediate accessibility of the images created a depth of student dialogue that had been absent from previous lessons. It aided the students to conceptualise and articulate what they saw and engendered an interactive discussion that surprised the teacher:

> *Seeing themselves on screen was fascinating to be part of. The level of questioning and self reflection was so deep it even made me think. The language in the classroom (when viewing footage) then carried out on to the field and students were providing feedback referring to the classroom observations.* (Teacher Interview)

Explicit Quality Criteria (EQC): The NSW Department of Education identified the EQC as reference points to occasions when teachers and students used specific and detailed criteria to "develop and check their own work or the work of others" (NSW Department of Education, 2003, p. 26).

After watching the video demonstration, the most common supporting statement made by students to their peers was "like we saw in the video". Students were observed referencing the video (and the "broken down" feedback they received from the teacher at key times during the lesson) when providing their peer feedback, and further based their 'teaching' on their memorized schema of throwing and catching.

In keeping with this objective, the teacher defined the learning achieved by his students as being supported by the reference points created by the 'best practice' example. Furthermore, he noted that the VLC images became explicit parts of the teaching and learning experiences for these students, allowing them to check and develop their work as a class:

> *The most obvious learning was an instant ability to clearly articulate what good technique looks like and provide feedback to others based on that knowledge. All students involved made some significant shifts in their fundamental movement skills.* (Teacher Interview)

The ability of the students to reformulate their knowledge through their verbal reasoning, their peer-on-peer assessment and their observations of their own performances was very encouraging. When the teacher questioned students in the field, he noted that their ability to provide more meaningful responses was evident. When Amanda was asked what characteristic of her throw prevented her from achieving great distances she was able to quickly respond "*because I don't start with my arm all the way back like we saw in the classroom* [watching the video]". Whilst her technique had only marginally improved, it was noted she was positive about the gap in her knowledge: prior to this unit she was vocally negative about the entire physical education experience.

Previously these learners, and others of similar ability in other classes, would be content to replicate (and not always very successfully) the model of best practice as demonstrated by their teacher. They would previously mimic the words and actions of their teacher (and only after regular

teacher reinforcement and praise) and sometimes replicate 'good form' in the throwing and catching sequence. What was different in this unit was that the students were able to analyse and critique their own performances as a result of the video analysis they undertook as learners. This self-observation allowed them to develop and utilise a subject-specific vocabulary well beyond what was 'normal' for them. It seems reasonable to surmise that the discussions and evaluations prompted by the use of video analysis were explicit in the formation and use of this technical vocabulary. Furthermore, the experiences they gained in assessing their peers allowed them to apply this knowledge rather than simply regurgitating those words of their teacher that they could remember. For example, during the still motion picture analysis session David, an Aboriginal Australian student who was socially quiet, proudly showed his camera to the teacher. Rather than just saying "look at me throw" or "I can throw far" David skipped through several frames and proudly articulated the quality elements of his throw stating *"see I point at my target and start with my arm all the way back"* and *"see I finish pointing at the target".*

Connectedness: MacPhail, Kirk, and Griffin (2008) recently argued that the skills of throwing and catching are more complex than is commonly understood because they are relational. That is to say, throwing and catching are merely activities unless they are applied to real-life contexts and problems. This degree of connectedness to a real context was evident in this study and, as the group discussions showed, the students frequently sought further opportunities to share their work in other contexts, and with other people. They started to recognise the importance of peer-on-peer evaluation in improving their own performance. Christopher, a vocal student, was observed actively moving freely and easily between partners. In the lesson evaluation he commented *"I like telling others what they can do better and hearing what I can do better".* However, the use of video analysis wasn't a panacea for disengagement and Christopher was also heard to ask (during the instant feedback session) *"why are we doing this?"* His 'on' and 'off' task engagement was independently noted by the teacher in his observation 'that the learning was quite superficial'. Finding the "right" way of engaging learners and engendering high quality learning was a key outcome of this research and one that wasn't always achieved (despite the best efforts of the teacher).

However the positives did outweigh the negatives. The findings show that not only did students readily accept critical observations from their peers, they actively encouraged their friends to help them. This was best shown in lessons where video analysis wasn't scheduled to be used. The students asked for the technology to be used so that they could make direct comparisons between a model of 'best practice' and their own endeavours. The teacher recalled the enthusiasm with which the students worked:

> *Amazingly well, the shift in skills and informal evaluation was that students were highly engaged, demonstrated a significant shift in the level at which they demonstrated performance based outcomes.* (Teacher Interview)

Additional, non-QTP outcomes: In addition to the main findings detailed above, there were a small number of other findings that emerged from this project. While it could be argued that these results are less substantiated than the main findings, they do suggest that there are greater potential

benefits to the use of video analysis in physical education. However, they also suggest that there are potential risks that need to be considered prior to the start of any video analysis in physical education. These additional findings centred on two main issues; decreased marginalisation of students, especially girls, and body image.

De-marginalisation: In their exposition of student motivation, O'Donovan and Kirk (2008) reported that there was little evidence that physical education fostered an approach that sought increased engagement in physical activity. Indeed the prevalence of instructor-led pedagogies that focus almost exclusively on traditional team games led Ennis (1996) to suggest that more than just apologies should be offered to whole generations of young people. It could be argued here that the very act of videoing the students made this intervention teacher-centred. However, whilst the act of recording placed the emphasis on the teacher, the subsequent discussions and interactions were firmly centred on the students.

Importantly the teacher in this study recalled that marginalised students gained the most from the use of video analysis. They felt involved, and connected well with the technology, as it allowed them to make comparisons between their work and the 'best practice' example. Sally, who was one of the most underdeveloped FMS students in the group, demonstrated the most growth over the unit. She was regularly engaging with students outside of her normal classroom social circle and was actively seeking students who gave the most feedback. Her lesson evaluations where often filled with important and pertinent information. During a focus group discussion she said *"I have improved heaps, I don't know why but I know what my throw should look like and I can now throw twice as far".*

In seeking to understand girls' motivations, O'Donovan and Kirk (2008) examined the interactions of 13 girls in physical education over a ten-week period. They concluded that physical competence was a currency that afforded individual students credibility, but only when they were confident that a mistake wouldn't make them 'look like a fool'. In this project the girls, like Sally, displayed increased "eagerness to be involved" (professional development diary) when before they had been careful to manage their "gender identities through their engagement...this offsetting their sporting interests against the femininity displays valued by their peers" (O'Donovan & Kirk, 2008, p. 79).

Body image: As the study by O'Donovan and Kirk (2008) indicated, participation in sport is not seen as a good way to create a 'valued identity' for girls. Indeed research by Cockburn (1999) and Gorely, Holroyd, and Kirk (2003) has suggested that the media created expectations of what it meant to be feminine, masculine and teenaged. On this basis the teacher predicted that such gender expectation would be present at high levels in this study, given the age and prior learning of these students. However, the use of video analysis did not produce the predicted amount of these expected behaviours (i.e. what a 'girl' or a 'boy' is perceived as being and how they should behave).

Nonetheless, the use of images of themselves in the teaching of throwing and catching over-emphasised the significance of performance. A small number of students did display a greater than expected level of stereotypical gender behaviours. This was most noticeable in the boys who would

normally engage in what the teacher described in the interview as "Male Macho-ism". This was very strong with a number of more able students who used the video camera as a medium through which they could 'showboat' and engage in the systematic reinforcement of their masculinity. Less obvious, but still prevalent, was the grooming that was shown to indicate the reinforcement of femininity (O'Donovan & Kirk, 2008). The apparent need by a small number of students to 'look good' - as befitting the perceived image of a boy or a girl - is clearly something that the teacher had not expected and which, in turn, needs careful management in future interventions that use video analysis.

Conclusion

There is a dearth of current research into the use of technology in physical education (Tearle & Golder, 2008) and this paper contributes in a small way to developing this hugely under-researched area. Furthermore, it starts to envision technology as a catalyst for enhanced student appreciation of the application of skills in real situations, increased verbalisation of their deeper understanding, and a transfer of practice from one activity to another.

It is clear from these findings that students displayed greater understanding of throwing and catching in the wider context of PDHPE. They were better able to construct new meaning from the lessons in which they were engaged, rather than simply repeating the instructions of their teacher. The *intellectual quality* element allowed the teacher to develop a learning environment where "deep understanding of important, substantive concepts, skills and ideas" (NSW Department of Education and Training, 2003, p. 9) was important. This development of a deeper understanding by the students highlights the potential impact that technology (such as video analysis) can have on students' engagement in and attitudes towards physical education.

This research offers up expanded, technology-based approaches that can significantly engage students in physical education. Such a technological approach could enhance the quality of peer-on-peer assessment, as occurred in this study as a direct result of the video analysis. It can be argued that in employing an approach that supports cognitive as well as motor learning the teacher created a *quality learning environment* where his students could work productively with a clear focus on learning. Similar findings have been found in studies of models-based practices such as Sport Education and cooperative learning (see Siedentop 1994; Dyson, Linehan, & Hastie, 2010) which suggests that higher quality learning outcomes are achieved when teaching is concerned with the types of interactions students and teachers are engaging in.

Importantly, the additional *significance* given to the task by the teacher through the use of video analysis gave the whole project a 'oohah' feel. This served to engage the students in the lessons and allowed the teacher to develop an environment where student learning was discerned in their interactions and discussions rather than simply their performance. Significantly it was through the development of 'meaningful and important' learning that students showed they were able to build on, rather than merely replicate, their prior experiences. However, the 'newness' of the approach may have had an impact on student engagement and it will be important in the future to ensure that the pedagogy employed sustains the engagement of the class.

The impact on student learning and the increased engagement by disaffected students allows for a positive conclusion to this paper. However, it is important to remember that video analysis did stimulate some showing-off by the students and their fascination with new technologies may have been a catalyst for their enhanced involvement. That aside, it is clear from this project that there is a place for new technologies in the teaching of physical education. More importantly, though, it highlights the need for further research into the use of technology and its ability to aid teachers in developing deeper, broader and more sustained learning for their students.

The concerns about innovation detracting from the core task of physical education being to get kids to move should not limit our imaginings around high quality teaching. Instead, as Fernández-Balboa (2003) said, we are only limited by what we can think up, and in a world where technology's 'wow factor' is measured in months not years, it is important that physical education steps out of its comfort zone and finds the technology that will support not hinder our movement cultures.

References

Apple, M. W. (1995). *Education and power* (2nd ed.). London: Routledge.

Apple, M. W. (2004). *Ideology and curriculum* (3rd ed.). London: Routledge.

Banville, D. & Polifko, M.F. (2009). Using digital video recorders in physical education. *JOPERD: The Journal of Physical Education, Recreation & Dance,* 80(1), 17-21.

Bell, R., Barrett, K.R. & Allison, P. C. (1985). What preservice physical education teachers see in an unguided, early field experience. *Journal of Teaching in Physical Education*, 4, 81-90.

Casey, A. (2010). *Practitioner research in physical education: Teacher transformation through pedagogical and curricular change*. Unpublished PhD thesis, Leeds Metropolitan University.

Cockburn, C. (1999). The Trouble with Girls. . . : A study of teenage girls' magazines in relation to sport and PE. *British Journal of Physical Education*, 30(3), 11-15.

Denzin, N.K. & Lincoln, Y.S. (1994). *Handbook of qualitative research*. Thousand Oaks, CA: Sage.

Department of Education, Employment and Workplace Relations (2011). *Digital Education Revolution*. Accessed May 24th 2011 from:http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/Pages/default.aspx

Dyson, B.P., Linehan, N.R., & Hastie, P.A. (2010). The ecology of cooperative learning in elementary physical education classes. *Journal of Teaching in Physical Education*, 29(2), 113-30.

Ennis, C.D. (1996). Students' experiences in sport-based physical education: (more than) apologies are necessary. *Quest*, 48, 453-456.

Fernández-Balboa, J. (2003). Physical education in the digital (postmodern) era. In A. Laker (Ed.), *The future of physical education: Building a new pedagogy* (pp. 137-152). London: Routledge.

Gorely, T., Holroyd, R. & Kirk, D. (2003). Muscularity, the habitus and the social construction of gender: Towards a gender relevant physical education. *British Journal of Sociology of Education*, 24(4), 429-448.

Harris, F. (2009). Visual technology in physical education using Dartfish video analysis to enhance learning: An overview of the Dartfish project in New Brunswick. *Physical & Health Education Journal, 74*(4), 24-25.

Hemara, N. (2009). New technologies and physical education. *Physical Educator - Journal of Physical Education New Zealand, 42*(1), 12-14.

Jones, B. (2010, July 21). [Comment to blogpost: research into use of technology in physical education]. *Physical education practitioner research network*. Retrieved July 21, 2010, from http://www.peprn.com/2010/07/research-into-use-of-technology-in.html#comments

Kirk, D. (2010). *Physical education futures*. London: Routledge.

Lawson, H.A. (2009). Paradigms, exemplars and social change. *Sport, Education & Society*, 14(1), 97-119.

Lewin, K. (1946). Action Research and Minority Problems. *Journal of Social Issues*, 2: 34-46.

Lincoln, Y.S. & Guba, E. 1985. *Naturalistic inquiry*. Newbury Park, CA: Sage.

MacPhail, A., Kirk, D. & Griffin, L. (2008). Throwing and Catching as Relational Skills in Game Play: Situated Learning in a Modified Game Unit. *Journal of Teaching in Physical Education* 27(1), 100-115.

NSW Department of Education and Training (2003). *The Quality Teaching Paper*. Sydney: NSW DET.

NSW Department of Education and Training (2006). *State Education Research Approval Process*. Retrieved May 20, 2011, from https://www.det.nsw.edu.au/detresources/State_education_guidelines_SJXFTWVaCS.pdf.

O'Donovan, T. & Kirk, D. (2008). Reconceptualizing student motivation in physical education: An examination of what resources are valued by pre-adolescent girls in contemporary society. *European Physical Education Review*, 14(1), 71-91.

OFSTED (2009). *Physical education in schools 2005/8: Working towards 2012 and beyond*. London: OFSTED.

Parton, G. & Light, M. (2010). Using ICT to enhance learning in physical education. In R. Bailey (Ed.), *Physical education for learning* (pp. 129-144). London: Continuum.

Schön, D.A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.

Siedentop, D. (1994). *Sport Education: Quality PE through positive sport experiences*. Champaign: Human Kinetics.

Stidder, G. & Capel, S. (2010). Using information and communications technology to support learning and teaching in PE. In S. Capel, & M. Whitehead (Eds.), *Learning to teach physical education in the secondary school*. London: Routledge.

Tearle, P. & Golder, G. (2008). The use of ICT in the teaching and learning of physical education in compulsory education: how do we prepare the workforce of the future? *European Journal of Teacher Education*, 31(1), 55-72

Thomas, A. & Stratton, G. (2006). What we are really doing with ICT in physical education: A national audit of equipment, use, teacher attitudes, support, and training. *British Journal of Educational Technology, 37*(4), 617-632.

Author notes

Ashley Casey is Senior Lecturer and Course Leader in sport and physical education in the department of physical education and sport studies at the University of Bedfordshire. His research is focused on teachers' professional learning, practitioner research, reflective practice and the use of pedagogical models such as cooperative learning, sport education and teaching games for understanding. In particular he is interested in teachers' sustained engagement in changing practice through the use of supported research-informed practice.

Benjamin Jones is the Professional Learning & Curriculum Support Project Officer for the NSW Digital Education Revolution. Previous to this role he was a Personal Development, Health & Physical Education Teacher at Rooty Hill High School and an Alpine Guide. His teaching focus is on integrating real world technologies into the curriculum and differentiating learning for all students.

Acknowledgements

We would like to thank the students who were involved in this project for their contributions. We would also like to thank the colleagues who took the time to read and comment on the drafts of this paper.

Correspondence

Dr Ashley Casey
Department of Physical Education and Sport Studies
University of Bedfordshire
Polhill Avenue
Bedford
Bedfordshire
MK41 9EA
UK
Email: Ashley.Casey@beds.ac.uk