Model fidelity and students' responses to an authenticated unit of Cooperative Learning

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1 Model fidelity and students' responses to an authenticated unit of Cooperative Learning

Abstract

A wealth of school-based interventions report on students' positive responses to the use of models-based practice in physical education. However, research that examines the effectiveness of models-based practice rarely reports on the fidelity of implementation i.e. when all of the characteristics of a model are implemented. The purpose of this study was to explore model fidelity in the use of the Cooperative Learning model. Action research and systematic observation (using the Cooperative Learning Validation Tool which acknowledged the key characteristics of the model) were used to confirm model fidelity. Consequently, the themes of 'scaffolding student learning', 'working together', and 'deeper learning' could be directly linked to the authentic use of Cooperative Learning context. The paper concludes by arguing that when reporting on findings from empirical research on the use of Cooperative Learning we need to adopt a more robust approach in determining – through rigor and quality of research – the authenticity of implementation.

Keywords: Authenticity, Pedagogy, Models-Based Practice, Pedagogical Models

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Much has been written about pedagogical models (Haerens, Kirk, Cardon, & De Bourdeaudhuij, 2011; Jewett, Bain & Ennis, 1995; Kirk, 2013; Metzler, 2011). Hundreds of empirical studies, undertaken in schools and sports clubs, have reported on the findings from model-based practice (MBP). Reviews of literature on Sport Education (Hastie, de Ojeda, & Lequin, 2011), Teaching Personal Social Responsibility (Hellison, 2003), Game-centered approaches (Harvey & Jarrett, 2014) and Cooperative Learning (Casey & Goodyear, In Press) all affirm that models promote the legitimate physical, cognitive, social, and affective outcomes of physical education (Kirk, 2013). Yet, as O'Donnell (2008) reports, studies that examine the effectiveness of K-12 curriculum programs rarely report on the fidelity of implementation. Therefore while models have been extensively researched limited evidence exists about how models have been used authentically. In other words, there is a limited understanding as to whether the "procedures for organizing content, task structures, and the sequencing of learning activities" in the respective models (Hastie & Casey, 2014, p. 422) have been implemented.

Given the significant consensus that surrounds MBP (i.e. that it is a possible future practice for physical education) there is a need to marshal against complacency. We need to ask the extent to which student responses to teaching can be attributed to authentic implementation i.e. the fidelity of teachers' use of models (Hellison, 2003; Kloeppel, Kulinna, Stylianou, & van der Mars, 2013; Pascual, et al., 2011; Zhu, Ennis, & Chen, 2011). Moreover, we need to be more rigorous in the ways in which we report on findings from empirical studies; most particularly the claims we make about MBP (Hastie & Casey, 2014). In short, we need to stop celebrating the

possibilities of MBP and start to ask some hard questions about what we are finding.

One way of actualizing such questioning can be found in the work of Zhu, et al. (2011) around "curriculum fidelity". Zhu et al. (2011) suggest that teachers who engage with and actualize a curriculum, and keep faithfully to its original tenets could be said to have a direct and intentional impact on students. When that curriculum is a pedagogical model, and when researchers are making claims about the educational significance of that model, then it is important that, as a community of scholars, we are cognizant of (a) how the teacher constructs his/her understanding of the model and, (b) the impact of personal and professional beliefs and instructional context on implementation (Hastie & Casey, 2014; Zhu et al., 2011). Building on this work we argue that there is a need to explore model fidelity in MBP. This is particularly important if, as a field, we are to gain a clearer idea if the findings from published research can (a) be attributed to a specific model (because researchers and teachers kept to the original tenets of that model) or, (b) the local context changed the way in which the 'design specification' (Kirk, 2013, p. 979) of the model could be used.

It could be argued that Metzler (2011), in defining a set of benchmarks, has presented a mechanism through which to hold researchers 'accountable' for their reports on the authentic use of models. Harvey, Cushion, and Massa-Gonzalez (2010) used Metzler's benchmarks to validate coaches' use of Teaching Games for Understanding while Dyson, Linehan, and Hastie (2010) used benchmarks to authenticate a teacher's use of Cooperative Learning. However, we believe that benchmarks take little account of the practitioner or the context in which the model is used. Their expertise at the point of implementation (Kirk & Macdonald, 2001) is overlooked in favor of a set of generic standards.

To better understand teaching, learning, and the local context of implementation

when models are used we need, to do more than make spot judgments about what is 'happening' through objective forms of standardized assessments such as 'benchmarking'. Instead we need to understand what it means to teach through these approaches in the "busy bustling business of schools" (Hattie, 2009, p. 9), where the teaching context, the receptiveness of students to change, the political routines of the school, and teachers' philosophies all play a role in how models can be implemented (Pascual et al., 2011). In their exploration of implementation challenges Zhu et al. (2011) argued "when a curriculum is tested in a clinical trial, it is critical that the teachers implemented it [the curriculum] with high fidelity so that students can achieve the learning goals that the curriculum is designed for" (p. 84). However, there is a need to move beyond clinical trials, and understand model fidelity in the day-to-day realities of teaching.

This paper considers how model fidelity can be understood and determined in respect to Cooperative Learning. We explore how a rubric (The Cooperative Learning Validation Tool (CLVT)) and situated and contextual understandings drawn from a teacher-as-researcher's use of action research provided an appropriate way of ascertaining model fidelity and subsequently authenticating student learning. In the following section we discuss the Cooperative Learning model and identify the implementable classroom practices that would be appropriate for determining model fidelity in Cooperative Learning.

Cooperative Learning and Constructivism

Cooperative Learning is a student-centered pedagogical model (Dyson & Casey, 2012). The central theme of the model is that students '*sink or swim together'* because they are dependent on their peers in order to learn (Johnson & Johnson, 2009). The focus is therefore on the interpersonal nature of learning and on students

working together in small heterogeneous groups to construct new understandings (Dyson, Griffin & Hastie, 2004). In a recent review of literature, Casey and Goodyear (In Press) argued that Cooperative Learning is a model capable of promoting the physical, cognitive, social and affective learning outcomes of physical education (Bailey et al., 2009). Drawing on a variety of educational contexts, with students of different grade levels, and in different physical activity areas of the curriculum this review founds that these learning outcomes were reported to have occurred.

Drawing on research from eight different international contexts Dyson and Casey (2012) argued that five elements were positioned to support (a) group work and (b) the achievement of the physical, cognitive, social, and affective learning outcomes. These elements include: positive interdependence, individual accountability, group processing, promotive face-to-face interaction, and small group and interpersonal skills (Dyson & Casey, 2012). However, it is important to acknowledge that the elements have not just 'sprung up' or emerged out of research in physical education. Indeed, Cooperative Learning is a model developed in general education subjects and has been widely researched since the 1970s (Kyndt et al., 2013). The elements have been found, across many studies, to support group work through constructivist informed dispositions (Cohen, 1994; Johnson & Johnson, 2009; Kagan & Kagan, 2009; Slavin, 1996). Through this constructivist lens, learning is based on the assumption that students' ongoing construction of knowledge occurs in a social context (Rovegno & Bandhauer, 1997; Rovegno & Dolly, 2006), 'with the individual making personal meaning from socially shared perceptions' (Macdonald, 2004, p.16). Individuals construct new meanings and understandings with each other by engaging in dialogue, working in the same social space and, by connecting their past, current and future learning experiences together (Brooks & Brooks, 1993; Ennis,

1994; Lafont, 2012; Perkins, 1999). To cultivate such a constructivist learning environment within Cooperative Learning, the five elements can be considered as a pentagonal scaffold to group work.

Consequently, Cooperative Learning's 'history' in general education helps us to conceptualize ways in which 'model fidelity' can be determined (Cohen, 1994; Dyson & Casey, 2012; Johnson & Johnson, 2009; Kagan & Kagan, 2009; Slavin, 1996); especially when constructivist theory is the core theoretical underpinning used to position the model (Dyson, Griffin & Hastie, 2004). It suggests that we cannot make 'spot judgments' about learning without acknowledging the process of learning, the context and nature of peer-interactions. In this way, and to authenticate learning we need to understand (a) how they elements were used to support group work, and (b) students' learning when the elements were used. It is only then that the stated student responses to Cooperative Learning can be directly attributed to the model. The purpose of this study, therefore, was to explore model fidelity of the Cooperative Learning model in physical education.

This study considered two research questions:

1. How can Cooperative Learning model fidelity be determined?
2. How do students respond to an authenticated Cooperative Learning Unit in Physical Education?

Methods

Design

Central in this study was the role of the first author as a teacher-as-researcher (Stenhouse, 1975). This dual responsibility allowed him to undertake an insider action research approach in the teaching setting where his own use of Cooperative Learning occurred (Elliott, 1976; Kemmis, 2010). The action research approach involved the

teacher-as-researcher following the Lewinian conception of action research, i.e. 'a spiral of steps each of which is composed of a circle of planning, action, and fact-finding about the result of the action' (Lewin, 1946, p. 38). Specifically, each lesson followed one cycle of action research where the teacher-as-researcher planned lessons (plan), taught these lessons (act), and then wrote post lesson reflections that evaluated his use of Cooperative Learning and his students' learning (fact-finding). These lesson cycles were used to inform the planning for the next lesson, and the next lesson cycle of action research. The teacher-as-researcher also engaged in a broader cycle of action research that overarched the whole unit. He planned overarching unit aims and objectives (plan), taught a series of lessons within the unit (act), and then reflected and used interviews to understand his wider use of Cooperative Learning and his students' learning (fact finding). These two interdependent and simultaneous action research processes were used by the teacher-as-researcher to inform both his practice and his use of the Cooperative Learning model. However, following the unit the teacher-researcher and the second and third authors worked together to make informed decisions about the use of Cooperative Learning. These choices were made by drawing on the qualitative data gathered, as part of the action research process, and the quantitative data gathered after the completion of the unit. The aim of using both data sets was to determine model fidelity and students responses to the unit that was taught.

Data Gathering

This section begins by reporting on the ways in which both qualitative and quantitative data were gathered in the effort to (a) inform the teaching of the unit, and (b) subsequently gauge model fidelity. The section then explores the data analysis and how trustworthiness was established. Finally this section uses the guidelines offered

by Hastie and Casey (2014) to ascertain model fidelity for this unit of Cooperative Learning.

Qualitative Data Gathering

Qualitative data gathering was primarily informed by the action research approach. The teacher-as-researcher wrote *post lesson reflections* on each lesson taught (16 reflections) and at the end of the unit the third author interviewed the teacher-as-researcher using a structured interview approach. A structured interview was used to reduce researcher bias by limiting the interviewer's ability to lead or guide the teacher-as-researcher towards 'better' answers.

To mediate against possible bias of the teacher-researcher's interpretations, 'Sam' (a teaching assistant in the school) was interviewed by the teacher-as-researcher and Sam, in turn, conducted interviews with each of the eight student groups both during and after the unit. This data gathering informed two aims of the research. Firstly it sought to explore how the students responded to the implementation of the model from the situated perspective of the participants (both students and Sam) - a feature that Bradley (2009) suggested is necessary and vital when understanding practice. Secondly, the qualitative data were used as a means to ascertain the extent to which the curriculum was implemented as planned.

A total of eleven lessons were video recorded in an effort to move beyond a sole dependence on insider perspectives. Through the analysis of each lesson with the CLVT both qualitative and quantitative data were gathered to help determine a robust notion of model fidelity. Related to the CLVT, qualitative data took the form of researcher observations of the recorded action and transcriptions of videoed conversations between students and between teacher and students. During the observational process additional field notes (henceforth known as Validation Tool

Field Notes – VTFN) were gathered to document to what degree model fidelity had or had not been achieved and to report on student learning and teacher actions that were observed.

Quantitative Data Gathering

Quantitative data were gathered through event coding the 17 categories on the CLVT (see table 4). This coding provided a quantitative understanding of the teacher-as-researcher's implementation of Cooperative Learning that was in addition to the qualitative data.

The Cooperative Learning Validation Tool

While Cooperative Learning has a breadth of empirical school-based curriculum evidence reporting on its effectiveness (Kyndt et al., 2013), a tool that served to ascertain model fidelity had not been developed. Drawing on empirical evidence in general education and physical education, the Cooperative Learning Validation Tool (CLVT) was developed by Dyson (2010) and field tested and modified during this study. The five critical elements of Cooperative Learning were the first categories that informed the CLVT. In acknowledging additional features of Cooperative Learning (Cohen, 1994; Johnson & Johnson, 2009; Kagan & Kagan, 2009; Slavin, 1996), categories were also included such as heterogeneous teams, group goals, and the teacher-as-a-facilitator. As a means to determine if the implementation of Cooperative Learning had met the desired goals, categories related to physical, cognitive, and social learning also featured.

An international community of scholars and teachers involved in research and the teaching of Cooperative Learning assessed the content validity of the CLVT (Brewer & Jones, 2002; van der Mars, 1989). The CLVT was sent out to experts from seven different countries. Through discussions with this international community, the

tool was then modified until a level of agreement was reached (Dyson, 2010).

The second author determined face validity through a series of pilot observations of two video recorded lessons taught through Cooperative Learning (Brewer & Jones, 2002; van der Mars, 1989). Moreover, and using the same videos, she explored the form of analysis and data that provided an interpretation of model fidelity, where event-recording, duration-recording, and interval-recording were all trialed. Subsequently, further amendments to the CLVT were made and a final observation sheet consisting of 17 categories was developed (see Table 4 for a full list of the categories). Through this iterative process an understanding developed that informed the ongoing data gathering process. For example, as an element such as group processing might only occur once in a lesson, recording the frequency that categories were observed was deemed non-conducive to fidelity. Indeed, it was felt that it could lead a reader to assume that group processing is not a vital learning process perhaps when it was compared to the number of times promotive face-to-face interaction was coded. Instead, how and when the categories were observed was noted and the transcription of discussions (student-student or student-teacher) supported an understanding of how the constructivist pedagogy was being implemented (this formed part of the qualitative data gathering discussed above).

Following the determination of validity and the method of observation, reliability was then determined through inter- and intra-observer reliability tests. The first and second author performed inter-observer reliability with a researcher external to this study. This researcher was included to confirm that the results obtained were due to the categories within the tool rather than previous experience or knowledge of Cooperative Learning (Brewer & Jones, 2002). Four ten-minute extracts of lessons (10% of the total duration of the lessons) were used to ascertain reliability and the

value of 85% or above was considered reliable (van der Mars, 1989). The first test revealed that both observers were below 85% agreement with the second author (Table 1). Tests were repeated seven days later in keeping with van der Mars's (1989) recommendations and both observers reached above 85% agreement with the second author (Table 2). Following inter-observer reliability tests the second author conducted intra-observer reliability seven days later and reached above an 85% level of agreement (Table 3).

<insert tables 1, 2 and 3 about here>

Once inter and intra reliability had been achieved, the CLVT was then used to analyze the recorded lessons and gather both quantitative and qualitative data..

Data Analysis

Quantitative data analysis involved the calculation of the mean percentages of each category coded in the CLVT. Qualitative data analysis involved a process of inductive analysis and constant comparison (Lincoln and Guba, 1985). This began with the coding of data from the VTFN, documents, reflections, and the transcribed interviews with the eight learning teams, Sam, and the teacher-as-researcher. Following this data were grouped into categories of similar codes and analytical memos were written to describe the 'grouped data sets' and similar messages that emerged. Once initial themes were constructed (teacher-facilitator, interdependent learning, social learning), these were compared with the quantitative data to uncover key themes about model fidelity and to report on students' learning. Consequently, three themes were drawn from the data: *Scaffolding, Working Together,* and *Deeper Learning*. While we acknowledge that these themes might be considered as central facets of constructivism, constructivism did not guide our analysis. Instead conceptual links were made to constructivism after the primary analysis occurred. To that end we

believe that this paper supports previous suppositions that Cooperative Learning is constructivist pedagogy rather than necessarily allowing us to further the literature around constructivism.

While data analysis occurred in different phases, and using a mixed methods approach, our aim throughout was to adhere to Lincoln and Guba (1985) recommendation that researchers establish trustworthiness of the data by demonstrating that the work has credibility, dependability, confirmability, and transferability.

Credibility was achieved through the teacher-as-researcher's 13 year career at the school. Throughout the process of analysis, peer debriefing with colleagues was an important part of developing the credibility of the data analysis. In addition, the triangulation of multiple data sources enhances this process (Greene, 2007). *Dependability* of the findings was determined through a peer examination strategy to member check the themes explored and the subsequent conclusions drawn (Gall, Borg, & Gall, 1996). Specifically, the second and third authors challenged the logic behind interpretations made by the first author until all three authors agreed that the themes were a 'best fit' representation of the original intervention. C*onfirmability* was sought through the provision of a reflexive and self-critical account, and by triangulating our findings and interpretations. Finally, *transferability* has been considered through the rich description of events using multiple and mixed data sources.

In acknowledging that the teacher-as-researcher in this study was also the first author, it is important to note here that there was a need to consider his internal-idealist ontology and subjectivist epistemology that confronted issues of researcher bias. In other words, and as a result of his insider position, other possible merits of

outcomes may not have been considered due to the socially constructed nature of reality. Consequently, we made an explicit attempt to deconstruct the teacher-as-researcher's voice in order to 'validate personal perceptions of practice and explanations of what counts as good practice' (O'Hanion, 2009, p. ,122). Deconstructing the teacher-as-researcher's voice was achieved by the second author, a 'disinterested peer' during the construction and implementation of the track and field unit, playing 'devils advocate' (Amis & Silk, 2008, p.464). She challenged both the interpretations of events and sought clarification throughout the analysis of the judgments that were made about practice, and in particular those made 'in-action' and accounted for by the teacher-as-researcher in his field journals and interview. Consequently, we feel that the evidence reported on in this paper represents all three authors shared perspectives. However, despite these actions we do acknowledge that this action research project reflects the socially constructed nature of reality and does not provide certifiable guarantees of truth or reality.

The results from the CLVT are explored below with the aim of showing if high fidelity, fidelity, or indeed infidelity to the model was achieved. Following this we explore the data from the qualitative data analysis.

<Insert table 4 about here>

Model Fidelity

Curriculum fidelity, Zhu et al. (2011) suggested, allows the researcher(s) to describe the faithfulness to the original plan of any curriculum intervention. Drawing on this work, but extending it so that it applies to MBP, Hastie and Casey (2014) recently argued that increased robustness is needed in the reporting of models-based practice research. They argued that given the significant expansion in this type of research, coupled with the fact that each model has its own set of specific

characteristics or elements that cannot be compromised if one is to describe a particular unit within physical education as incorporating a particular model, then it becomes critical that some form of fidelity of implementation is reported. To this end they argued that any paper reporting on such research should, as a minimum, report on three model fidelity elements:

a) A rich description of the curricular elements of the unit

For each of the two classes the teacher-as-researcher selected four heterogeneous learning teams. These teams were purposefully selected by the teacher-as-researcher to ensure that each team contained students across the full ability ranged. Furthermore they were selected to ensure that they contained neither existing friendships nor rivalries. Each team contained either four or five students. The teacher-as-researcher used both a planned Cooperative Learning structure i.e. 'Learning Teams' (Dyson & Grineski, 2001), and a previously validated unit (Casey et al., 2009). Over the course of the 12-lesson unit (40 minute lessons), teams worked through a carousel of nine track and field events (100 meters, shot put, long jump, 800 meters, javelin, hurdles, triple jump, discus, relay) using modified equipment or rules. In the final three lessons the teams competed against each other in a 'mini Olympics'. The teacher-as-researcher used worksheets as the main source of information and acted in the role of facilitator,.

b) A detailed validation of model implementation

One of the key aspects of this research was the decision, in the planning stages of this research, to try and determine the degree to which the teacher-as-researcher could authenticate his use of the Cooperative Learning model. While the field-testing of the CLVT has already been discussed, what follows shows the high degree of Cooperative Learning model fidelity that was achieved.

The CLVT revealed that in all the lessons the critical elements of Cooperative Learning were employed (see Table 4). Additionally, a number of key concepts, which structure student and teacher behavior, were also observed in all lessons. They include heterogonous teams, student-centered instruction, teacher facilitator, a defined Cooperative Learning structure, and student ownership (Categories, 2, 3, 4, 5, 6 in Table 4). These concepts go beyond the five elements positioned by Dyson and Casey (2012) to support students' group work and learning in the physical, cognitive, social and affective domains.

Student learning was assessed and improvements were made in every lesson (Table 4). Also, based on video observations, students were either highly or moderately focused throughout the unit, with comparable levels of engagement, interest, or attention (Table 4). These findings suggest that academic focus (i.e. learning about track and field athletics) and enjoyment of learning may have had a positive influence on the improvements made to students learning. However, the number of times learning was assessed and the improvements to learning observed varied between each domain. The team folders confirmed that in each lesson students were required to record their measurements in each event and then self-or peer-assess physical competence. In the cognitive domain, while learning was only assessed in 45% of the lessons, students made improvements in 91% of lessons (Table 4). Importantly, the VTFN suggested that the improvements in the cognitive domain were mostly observed during group processing. In the social/emotional domain (i.e. interpersonal skills and self worth), learning was assessed in 91% of the lessons and improved in 64% (Table 4). Similar to the cognitive domain, learning was assessed during group processing (VTFN). Although interpersonal skills were present in each

lesson, students rarely improved their social/emotional learning and rarely encouraged one another (Table 4).

Finally, the CLVT revealed that social/emotional, physical and cognitive goals were rarely observed (Table 4). However, these goals were stated at the beginning of the unit and were evident in each team's folder. This finding suggests that although some of the elements or categories were not coded as 'observed', it was important to utilize information from secondary sources such as unit outlines, team folders and worksheets to ascertain whether the categories were present in the intervention.

c) A detailed description of the program context that includes the previous experiences of the teacher and students with the model or with MBP

Heathcote School is a state, selective grammar school in England. At the time of the study the school population consisted of predominantly white British pupils (*n*= 821), of which 1.2% received free school meals and 99.4% had English as their first language.

A total of thirty-three boys (from the two classes, one of 16 and one of 17) aged 11-12 were invited and agreed to be involved in the study. The study began only after ethical approval had been obtained from the university ethics board, the school granted permission for the study, and assent for participation was requested and agreed upon by the students and guardians. Students had first been introduced to MBP by the teacher-as-researcher six month previously and had been taught using Cooperative Learning in one previous unit of swimming that lasted 16 weeks. As only single sex classes were taught, coupled with the fact that only teachers of the same gender as the students taught physical education, and as the teacher-as-researcher was a man, only boys were involved in this study.

The teacher-as-researcher was both an experienced action researcher and an experienced proponent of MBP. At the time of the intervention he had extensive experience of using Cooperative Learning, Sport Education, and Teaching Games for Understanding. He had taught in excess of 25 units of work (across multiple classes and age groups) and had undertaken a number of research studies over the previous seven years. One teaching assistant also helped in the study. Sam had no prior experience of teaching physical education or Cooperative Learning.

Results

In presenting these results we hold that the teacher-as-researcher obtained a high degree of model fidelity when teaching track and field through the Cooperative Learning model. That is not say that full fidelity was achieved in every lesson and there are certainly examples highlighted by the CLVT that show fluctuations in the degree of fidelity obtained. However, this high degree of model fidelity allows us the confidence to suggest that the students' response to this unit occurred as the result of Cooperative Learning and the creation of a constructivist learning environment. We also believe that this confidence allows the reader a real degree of understanding as to the nature of the intervention and the impact of the Cooperative Learning model on these students' responses to the unit; and it is from this position that we present the results.

Cooperative Learning, as a pedagogical model, helped students to support one another in their lessons. Particularly this was achieved through *Scaffolding,* and *Working Together,* which in turn produced *Deeper Learning* in both the physical and cognitive domains.

Scaffolding

The central pillar or foundation of traditional practice in physical education is

the teacher (Kirk, 2010). Yet this unit – indeed the Cooperative Learning model itself – was designed to deliberately move away from the stanchioning of learning around the expertise of the teacher and sought instead to focus on learning as a co-constructed process that drew on the understanding of students and teacher alike. Consequently, the five critical elements could be conceptualized as pentagonal scaffold designed to equally and interdependently support the learning that occurs in a Cooperative Learning classroom. Indeed the CLVT showed that student-centered instruction, accountability and positive interdependence were manifest in every lesson (Table 4).

In light of the dominant pedagogical discourses in physical education, in which attainment frequently outweighs learning, Cooperative Learning facilitated a very real move away from normative comparisons, performance testing, and attainment. Indeed scaffolding does not relate solely to development and progress in an academic sense i.e. getting better at performing track and field events. Instead, and in keeping with Gillies and Haynes's (2011) discussions around Cooperative Learning, scaffolding also relates to supporting student interaction and developing students' understanding of the activities and tasks. When asked about how the students had supported one another Sam suggested that student support was "definitely be a lot more tangible" than his own competitive experiences of track and field:

> I had never done it [Cooperative Learning] before [and] I noticed from watching the sessions how much more social [the students were and] how much more students talked a lot on different techniques where they went wrong and how they can improve. (Sam, Post Unit interview)

The CLVT helped to ascertain that the goals of the teacher-as-researcher were achieved in terms of using Cooperative Learning and it associated elements and key

concepts. Moreover, the VTFN revealed that students were accountable for their contribution to group work through their participation in roles which, in turn, was linked with them being positively interdependent. Students were observed telling group members what they should be doing when they weren't doing their role, "you're the coach you have to organize everyone". Furthermore, although there was a shift from the traditional notion that physical competence should be the organizing center of the unit, students' performance was assessed and students improved their physical competence in every lesson (Table 4).

Working together

Students worked well together, they gave each other praise, they listened to the student-coach's instructions and lesson-by-lesson they improved their interpersonal skills (VTFN). In the post unit interviews, 'Tommy' suggested that the goal was to work with and for each other:

> If we didn't know how to do something…we helped each other work it out…We were fair…if somebody wasn't good at something we would tell them how they could improve rather than just telling them they were wrong… we learnt how people were better at different stuff how they like worked in different ways.

Two key aspects of working together – which served as a key stanchion in the scaffolding of student development – were the roles that students undertook within their groups and the degree to which they were positively interdependent. The VTFN showed that "students worked in Learning Teams and they each had a role, coach, equipment manager, timekeeper, and the recorder." Furthermore students were seen leading the instruction, and the groups were observed helping each other to learn: Additionally the CLVT indicated that examples of positive interdependence were

evident in every lesson (Table 4).

> Whenever they were set a job they would organize what they were doing. If you were the equipment manager the person for that week would make sure that they got the stuff and it would all be ready for us to start (Rex, Post Unit Student Interview).

However, and comparable to previous research on Cooperative Learning (Goodyear, Casey, & Kirk, 2014), the role of the coach had the most impact on students' participation and the biggest effect on development and progress within the learning team (VTFN). In this study students appeared to be dependent on the coach for direction, "I think that the coach needed to do more" (Adam), "yeah" (Rick), and "actually help instead of throwing the discus when he is not meant to and then just running off" (VTFN).

> I hear the coach "now try a three or four stride run up" followed by the coach demonstrating. He then focuses the student who was off task "right Alex practice the whole thing with a 3 or 4 stride run up" the students in the team watch Alex [who seems high ability]. They are then all practicing and appear to improving by the distance between strides and coordination of the hop step jump. Students in the group are providing feedback to each other; the coach is encouraging "yeah that's it". (VTFN)

As in many pedagogical contexts, things did not always proceed as planned. For example, during the early phases of the unit some groups were not focused, struggling to adopt their roles and work together: a concern with Cooperative Learning that Ward and Lee (2005) noted in their review of research. For example, in lesson four the VTFN showed that Lyndon was struggling to organize his team. This group took longer than others to get started on practical activities; two students in the group were

lying down while waiting for the coach to interpret what to do from the clipboard. Another student in the group began giving the learning cues "from the minute you are running focus on posture, hips, chest out, chin tucked in." In protest Lyndon lay down and, while the rest of the team was performing the learning task chose to remove himself from not only his role but also the activity. Later on in the lesson he began performing the tasks, however there was no evidence to suggest that he was able to 'fully' adopt the role of the coach and during group processing he failed to engage with his team in the discussions.

On some occasions, in the initial lessons of the unit, the teacher-as-researcher needed to support and encourage students to adopt their roles, develop their understanding of how to act in these roles, and encourage face-to-face promotive interaction. Indeed, the teacher-as-researcher commented "there were times when I had to remind them that they needed to follow my instructions on the sheets rather than sort of ad-lib um, which did happen on occasions" (Teacher Interview).

This refocusing by the teacher-as-researcher, another example of how he was scaffolding students' progress, helped develop students' ability to work together. For example, Darren was observed taking on his role and using the clipboard with learning cues on them to see if his peers were performing the skills (VTFN). By half way through the unit it was observed that "Most groups worked closely together, they listened to the coach, and helped each other to learn." (VTFN) and by the end of the unit the teacher-researcher could "walk away" (VTFN) having trust in the students and confidence that they would manage their own progress.

Deeper Learning.

This theme was operationalized as pupils' critically evaluating performance, providing feedback, assessing peers, making decisions together, and resolving

conflicts. Compared to the traditional reliance on learning being defined as "correct form" and "movement sequences", pupils in this unit were encouraged to investigate different possibilities and outcomes. In his interview Sam felt that the unit "made them [the students] think a lot more". He went on to suggest" I think it is a good way of teaching because it does make them think for themselves rather than having the teacher do everything for them" (Post Unit interview)

On some occasions the teacher-as-researcher recognized that students were not following the learning cues, or did not understand the learning cues on their task sheets. He used both direct and open-ended questions to develop their understanding of how to perform the skills and re-focus them on the learning cues. Following teacher and learning team discussions, and a deepening in their understanding of the learning cues, there was often an improvement in their performance. For example, before one such discussion members of a learning team were observed throwing the shot put face on and releasing it horizontally (VTFN). The teacher-as-researcher recognized this and spoke to the learning team:

> Teacher: What do you think is the best angle to release it at? What angle is that?
>
> Michael: 45 degrees.
>
> Teacher: Why is it 45 degrees?
>
> [Michael demonstrates with the support of the teacher]
>
> Tom: Because if it goes lower it will just go straight you want it to go up so if goes further (VTFN).

Following this discussion and after the teacher-as-researcher had moved away the VTFN indicated that, "they [the students] all progressed to turning their heads, bending their knees, using their legs to transfer weight, and releasing the shot put at a

45 degree angle". However, the teacher-as-researcher did not always need to intervene to extend the students' learning. Some teams recognized that they needed to work together to try to understand the learning cues and then help each other to perform these. Yet after group discussions if they still felt that they needed support from the teacher-as-researcher, they could ask for help.

> This group didn't understand what a concave back was, "I am not actually sure what that means, it's either this or that, I am going to ask Mr Casey" Jason goes over and gets the teacher. "It basically means a relaxed back, relax your back a bit, that's it nice and relaxed". After the teacher discusses with the group about a concave posture, the group improve and they begin running with an improved, more upright, back posture as opposed to when they were leaning too far forwards before. (VTFN).

Deeper learning also occurred as a result of the development of students' ability (perhaps willingness) to resolve their own conflicts and work with their peers in their heterogeneous teams. For example, there was one student who the teacher-as-researcher described in his interview as someone who "was very good at being off-task". At times during the unit, this student was observed to be quite disruptive, rude and sometimes failed to engage with tasks with his learning team (VTFN). Group processing, and time for promotive face-to-face interaction, afforded his team the opportunity to discuss each other's concerns and by the end of the unit help this student to participate in the learning tasks:

> Ollie: I sometimes get annoyed because nobody else does it and everybody has a go at me because I am doing it wrong when it is just because I am not very good at it.
>
> Ross: No, he doesn't follow orders.

James: No, he just doesn't listen and then he doesn't understand why we are all getting in a mood with him because he doesn't listen to what we are supposed to do.

Ollie: I do listen.

Jason: He does mess around.

Ollie: I just don't get all this movement

Robert: Well then you can say "I don't get it".

James: When we do the proper thing we are going to do really badly if we don't start working together (VTFN).

The teacher-as-researcher noted that as students became better placed to judge the pace at which they wanted to work: "the pupils are able to move at a pace that best suits them rather than best suits me and it is a much more specific thing based on the individual group" (Teacher Interview). Indeed the CLVT indicated that the teacher-as-researcher adopted the role of facilitator in every lesson (Table 4). Furthermore, the VTFN showed that lesson-by-lesson learning teams varied in their progressions through tasks. For example, some learning teams completed both sides of their worksheet, whereas others would still be focused on completing the first side and developing each team members' performance using the learning cues. Therefore, as students learn how to learn within Cooperative Learning, they are supported in their learning and are better able to take greater responsibility for the task and progress at their own pace without fear of repercussion from the teacher-researcher.

Conclusion

While there is a growing body of research reporting on students' learning outcomes within pedagogical models (Dyson et al., 2010; Haerens et al., 2011; Harvey & Jewett, 2014; Hastie et al., 2011) we positioned this paper by questioning

whether the reported student learning outcomes occured as a result of the authentic use of a model. Drawing on a number of papers (Hastie & Casey, 2014; Pascual, et al., 2011; Ward & Lee, 2005; Zhu et al., 2011) we set out to explore model fidelity as a means of ascertaining if students' responses to the learning environment occurred as a direct consequence of using Cooperative Learning.

This study augments the research of Dyson et al. (2010) on the ecology of Cooperative Learning in physical education using benchmarks. Multiple voices, that included a teacher-as-researcher, students, and a teaching assistant informed our belief that 'high fidelity' with the Cooperative Learning model was achieved. This belief, in turn, allows us some confidence in stating that progress was a co-constructed process and that the goals for individuals within each learning team were interrelated and correlated with the attainment of that goal by other group members. In other words the students were very much required to *sink or swim together,* the central constructivist theoretical pillar of Cooperative Learning (Johnson & Johnson, 2009).

In exploring the results we acknowledge the fluidity of constructivist approaches and hold that full model fidelity is neither obtainable nor desirable as it would serve to violate rather than facilitate some of the assumptions underpinning constructivism and constructivist models. In practice, from a constructivist theoretical perspective, models are not fixed but rather fluid and contextualized, based on the dynamic interactions among students and between students and teachers (Rovegno & Dolly, 2006). As such it was important to understand the "factors that facilitate or hinder planned implementation" (Zhu et al., 2011, p. 85) – an undertaking that was achieved, we believe – through the use of action research. Indeed, an insider perspective provided a clearer understanding of fidelity of implementation and

allowed us to see that objective benchmarking is not sufficient to understand the complexity of a constructivist learning environment (Rovegno & Bandhauer, 1997).

In concluding this paper we argue that when reporting on findings from empirical research on the use of models we need to adopt a more robust approach in determining – through rigor and quality of research – the authenticity of implementation. Additionally we need to begin to do this over longer periods of time with different age groups and in different contexts. We believe that this research is a step forwards in terms of our understanding of fidelity in MBP generally and Cooperative Learning specifically. That said, model fidelity is not designed to be a stick with which to beat teachers, it is instead a means of better understanding the version of the model that was used in a given research study. This in turn allows us, as a research community, to better understand the learning context in which students are situated.

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Table/s

Table 1

Mean scores of Test 1 Inter-observer reliability

Episodes of Lessons	**Percentage inter-observer reliability between 2nd & 3rd author**	**Percentage inter-observer reliability between 3rd author & external researcher**
Video 1	68	88
Video 2	88	84
Video 3	80	96
Video 4	96	60
Mean	83	82

Mean interobserver reliability: 82.5

Table 2

Mean scores of Test 2 Inter-observer reliability

Episodes of Lessons	**Percentage inter-observer reliability between 2nd & 3rd author**	**Percentage inter-observer reliability between 3rd author & external researcher**
Video 1	76	84
Video 2	100	88
Video 3	84	96
Video 4	100	80
Mean	90	87

Mean interobserver reliability: 88.5

Table 3

Mean Scores Test 1 Intra-observer

Episodes of Lessons	**Percentage Intra-observer reliability**
Video 1	100
Video 2	86
Video 3	100
Video 4	100
Mean	96.5

Table 4

The Percentage of Lessons Each Category on the Validation Tool were Coded as Observed

Category Number	**Description of Category**	**Percentage of lessons category coded as observed**		
1a	Social/Emotional Goals	9		
1b	Physical/skill Goals	18		
1c	Cognitive Goals	18		
2	Equitable heterogeneous groups	100		
3	Student centered instruction	100		
4	Teacher facilitator	100		
5	Cooperative learning structure	100		
6	Students have shared ownership	100		
7	Face-to-face promotive interaction	100		
8	Positive Interdependence	100		
9	Small group and interpersonal skills	100		
10	Individual Accountability	100		
11a	Physical assessment	100		
11b	Cognitive assessment	45		
11c	Social or emotional assessment	91		
12a	Physical improvement	100		
12b	Cognitive improvement	91		
12c	Social or emotional improvement	64		
13	Self, group or peer assessment	91		
14	Students encouraging one another	45		
15a	Group Processing – what happened?	100		
15b	Group Processing – so what?	91		
15c	Group Processing – now what?	73		
16	High academically focused class time	**Low**	**Medium**	**High**
		0	27	73
17	High level of student attention/interest/engagement	**Low**	**Medium**	**High**
		0	36	64