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**UNIVERSITY OF SUNDERLAND**

**FACULTY OF EDUCATION & SOCIETY**

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**The Development of Key 21<sup>st</sup> Century Skills Using Project-based Learning in  
Physical Education**

by

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## **Abstract**

This action research project investigated the use of project-based learning within physical education (PE) to develop key 21<sup>st</sup> century skills, specifically critical thinking, collaboration, motivation, and grit. It considers the current status of physical education within education systems around the world. It is apparent that this subject area is becoming increasingly marginalised, and there is a need for urgent reform to reverse this trend. This study aimed to address four research questions to determine how project-based learning within physical education can be used to increase student engagement, to encourage student motivation, as well as identifying any benefits arising from its use and how project-based learning can be used to influence student behaviour. Weekly surveys completed by students for the study indicated a positive level of engagement, while student interviews concurred with this view and also indicated a significant level of motivation. Students were observed practicing their skills at times other than PE lessons with a majority of interviewed students stating that they practiced at home. Critical thinking skills were assessed where results proved not significant, but student interviews did indicate their ability to analyse, problem solve, plan, and reflect. Structured observations found that students were able to collaborate effectively, although students mainly worked within their friendship circles, thereby reducing the need to navigate new group dynamics. Grit-S results found significant improvements with the high- and middle-ability sample group. However, the low-ability group improved but statistical analysis indicated this was not significant. The conclusions reached in this study present the potential that project-based learning has by demonstrating its use within physical education and how its use can assist in developing key 21<sup>st</sup> century skills.

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## **Chapter 1: Introduction**

### **1.1 Aims of the Study**

This study aims to determine the effectiveness of project-based learning (PBL) within a grade 5 physical education (PE) setting, and what benefits arise from using PBL in PE for students. In addition, this study aims to identify and understand what essential 21<sup>st</sup> century skills are and whether these skills can be enhanced through PBL in a PE setting. For the purpose of this study PBL may be defined as a student-centred pedagogical approach where students inquire and learn by engaging in relevant and authentic projects (Bell, 2010; Larmer et al. 2015). This is discussed further in chapter 2.

This study will consider the current status of PE and briefly explore how it is implemented around the globe. It will draw upon the current political and cultural climate relevant to the acceptance of PE in school curriculums.

An initial objective was to establish student engagement levels. Firstly, Axelson and Flick's (2011) definition was used to initially investigate what the term 'engagement' means. This research then informed how data would be collected to accurately capture the sample's engagement during lessons. These findings would then be used to determine the student experience within PE through PBL.

A further objective was to explore desirable 21<sup>st</sup> century behaviours as listed in Lamb et al.'s (2017) report, such as motivation and grit, and whether these levels can be maintained or improved through the PBL approach in PE.

In addition, the study investigated how collaboration, an essential 21<sup>st</sup> century skill according to literature (Lamb et al. 2016; Soland et al. 2013) could be nurtured through the PBL approach in a PE setting.

Lastly, the study explored the benefits of implementing PBL in PE from a critical thinking standpoint. Research indicates that quality physical education (UNESCO, 2015; Kretschmann, 2014) needs to involve the cognitive domain of the self along with the need for students to develop critical thinking skills in the 21<sup>st</sup> century (Anagün, 2018). This study assessed critical thinking using appropriate formative assessments.

The findings from these analyses would then be used to inform readers on the efficacy of PBL in PE determined through an appropriate evidence-based approach and grounded in rigorous research.

## 1.2 Context

This study took place in an international school in Beijing, China that caters for children from 2 to 18 years old. The school is divided into 2 campuses with the Early Childhood Centre occupying one campus and the remaining campus split into the Elementary and Secondary schools. There are approximately 1200 students with grade 5, who were the focus of the study, consisting of 96 students split equally among 4 classrooms.

The school is recognised as an IB (International Baccalaureate) World School due to it offering all 3 programs of the IB. Throughout these programs, inquiry-based learning is a key pedagogical approach that matches the school's philosophy of educating the entire child. The school is in a unique position of offering instruction in English but due to the school's close roots in China students are offered opportunities to connect their learning into a Chinese context through language and culture. The student population consists of mainly Chinese nationals with their primary language being Mandarin along with varying levels of English competency. Approximately 10% of the student body are other nationalities. Financially, the school is not-for-profit, with education services catered towards families of higher socio-economic status.

It needs to be noted that the author of this paper is also the primary physical education teacher of the students in question. This gives the author the dual role of being a teacher-researcher. Any potential impact of this dual-role situation is discussed further in the upcoming Methodology chapter.

### 1.3 Rationale

The rationale for this study is that Physical Education (PE) seems to be becoming an increasingly redundant school subject (Bailey, 2018; Crum, 2017; Kretschmann, 2014). Bailey (2018) suggests that despite the broad-ranging scope of the PE curriculum the subject historically suffers from constant marginalisation. Crum (2017) goes beyond Bailey's (2018) marginalisation comment to state that PE could be excluded from school curriculums entirely. The fact that there is confusion between the terms physical activity and physical education from various stakeholders within

educational institutions suggests that the aims of the subject is not clear, thus creating further potential for exclusion (Pill, 2007). Furthermore, the United Nations Educational, Scientific and Cultural Organization (UNESCO) mentioned in their Quality Physical Education report (2015) that the delivery of physical education is being reduced across the globe. Couple this with an increase in physical inactivity and an increase in the health risks associated with sedentary lifestyles, the globe is suffering from what the World Health Organization (WHO) describes as a 'pandemic of inactivity' (WHO, 2018). Despite increased awareness and spending on wellness the global trend in inactivity and the resulting obesity levels are on the rise (WHO, 2018). According to UNESCO (2015), PE is when children are formally introduced to lifelong physical activity for the first time and they argue that regular engagement in quality physical education improves health, academic achievement, promotes inclusion, along with the values and skills needed for the 21<sup>st</sup> century. The research demonstrates a need for children to engage in physical education and outlines the benefits of engaging in such programs, however the fact remains that the provision of PE is in decline. Suggested reasons why PE is losing support among key policy-makers include inconsistencies in how PE is delivered (UNESCO, 2015) and the confusion about what it means to be physically educated within the profession itself (Crum, 2017). Kretschmann (2014) mentions that a holistic approach to PE with the cognitive, psychomotor, and affective domains of the self all being targeted is highly advocated for. However, he does add that going this holistic route puts a lot of pressure on PE classes. To adequately satisfy the needs for a holistic approach to PE, students would need to have the opportunity to think critically, have opportunities to develop their social and cooperative skills, and to also be given time to develop a

variety of motor skills along with the appropriate mindset to continue developing these skills as they transition to adulthood (Le Masurier & Corbin, 2006).

Relevant to this, project-based learning seems able to target all domains of the self, as detailed when Ramírez et al. (2017) determined PBL's positive effects in developing students' perceptions and attitudes towards responsibility, effort, self-worth, and personal autonomy. Furthermore, Simonton et al. (2020) encourages PE to implement PBL due to their understanding that it improves student learning and could give an opportunity for PE to be more recognised among other curriculum subjects. Going further, PBL seems to enhance 21<sup>st</sup> century skills (Larmer et al. 2015) due to the opportunities it provides through collaboration, communication, critical thinking, and creativity (Bell, 2010).

This study will identify whether project-based learning in physical education can be utilised in such a way to enhance relevant 21<sup>st</sup> century skills, thus increasing the relevance of the subject within the school and enhancing the PE experience for the students.

#### 1.4 Research questions

Taking in all the above, the following questions have been used to accurately guide the research for this paper:

- How can project-based learning be used to increase student engagement?
- How can project-based learning be used to encourage student motivation?
- What benefits arise from implementing project-based learning in physical education for students?

- What influence does project-based learning have on student behaviour?

The following chapter explores the current literature surrounding project-based learning, physical education, and 21<sup>st</sup> century skills. The chapter will also explore how these questions as topic areas are related to one another, thus providing a solid foundation for the research questions to be responded to.

## Chapter 2: Literature Review

### 2.1 The status of physical education

As mentioned previously, physical education seems to be in the dire situation of being considered irrelevant for the 21<sup>st</sup> century (Crum, 2017; Kretschmann, 2014). Although considered a compulsory subject (Cope et al. 2015), and it also considered a human right to receive appropriate physical education, provision of this subject is decreasing in all regions of the world (UNESCO, 2015). Further, even though it is compulsory, some European Union member states are not allocating enough time to the subject to satisfy WHO recommendations (D'Anna et al. 2019). Schools are under increasing pressure to provide a comprehensive education (Pill, 2007), and with this pressure, a school's curriculum can become crowded, with PE appearing alongside numerous other subjects. Time needs to be given for each school subject to provide the required education for students. Unfortunately, Kretschmann (2014) mentions that PE's status as a subject does not hold a strong position against other core subjects, even though PE is itself considered 'core'. This viewpoint is supported by Bailey (2018) who explains that PE has been a victim of curriculum marginalisation throughout its history. Going further, Crum (2017) provided an extensive list of observations relating to the problems the subject has. He supports Kretschmann's (2014) view of PE having a low status, along with Bailey's (2018) view of marginalization, and UNESCO's (2015) mention of a reduction in its provision. A more recent viewpoint can be found with Simonton et al. (2020) stating that for PE to have an active and relevant role in the school community innovative changes need to be developed and implemented.

This is not a unique time for PE to be in. Hardman and Marshall (2000) state that in 1978 UNESCO created the Charter for Physical Education and Sport and considered its provision a fundamental right for students. However, reading their article two decades on, we can see similar results as we are experiencing now; a reduction in curriculum PE time, replacing PE with other subjects when needed, and the subject being marginalized and sometimes stigmatised with its apparent low status (Hardman & Marshall, 2000). The situation PE finds itself in currently is not new but it is not changing. Contrasting with this, UNESCO (2015) stated that physical education is the start for and most effective means of introducing children toward lifelong participation in physical activity.

## 2.2 Global attempts at increasing physical activity levels

However, there have been attempts at increasing physical activity levels at a global level with the WHO (2018) recognising that investment in policies that prioritize physical activity can help make progress towards the relevant targets within the Sustainable Development Goals (SDGs). The SDGs are a set of global goals that participating nations in the UN have agreed upon to achieve by the year 2030 (UN, 2015). Amongst these goals, increasing physical activity is recognised in 9 of the 17 goals with SDG 4.1, which refers to quality education, identifying that schools are critical in promoting a healthy and active lifestyle (WHO, 2019). At a national level, one relevant initiative that has been proposed to the UK government is The Daily Mile, a school-based initiative designed to make up for the short-fall in physical activity levels for children (Ram et al. 2021). The UK Chief Medical Officer's physical activity guidelines (Department of Health & Social Care, 2019) recommends that children aged between 5 and 18 engage in an average of 60 minutes per day of



physical activity. According to Ram et al. (2021) 47% are meeting that target, with another 29% engaging in at least 30 minutes. The initiative has grown in popularity from a single school in 2012 to now accommodating 963,000 students in the UK alone, although there is now also global recognition (Ram et al. 2021). According to Chesham et al. (2018) the Daily Mile has been an effective tool in countering growing obesity levels by helping increase school children's moderate to vigorous physical activity. However, Chesham et al. (2018) did acknowledge that there are limitations to this initiative, with schools reporting lack of space and facilities to host such activities and that alternatives need to be introduced. The Ride2School program looked at active transportation, specifically cycling, as an alternative means to increase physical activity levels within Victoria, Australia (Garrard and Crawford, 2010). There has so far been a positive response to this initiative. However, Garrard and Crawford (2010) observed that riding a bike to school is not just about changing behaviour but providing related and necessary programs for infrastructure projects that improve bike paths and bike storage, along with community awareness programs that encourage safe driving and riding.

### 2.3 A pandemic of inactivity

Despite the plethora of research on the benefits of physical activity reducing the prevalence of non-communicable diseases (Archer et al. 2017; Skrebutėnaitė and Karanauskienė, 2019; UNESCO, 2015; WHO, 2018), global society is becoming increasingly sedentary; physical inactivity is the fourth leading risk factor for mortality. The WHO (2018) stated that physical inactivity costs the global community \$54 billion per year with an additional \$14 billion for lost productivity. Further, Le Masurier & Corbin (2006) accurately point out that due to physical activity becoming more

unnecessary in most areas of our daily lives due to automation and technological advancements (WHO, 2018), the contribution of physical education and the values and skills it teaches makes it an even more valuable and essential component of society. Despite this, there are a variety of reasons for adults not partaking in physical activity with Skrebutėnaitė & Karanauskienė (2019) indicating that lack of time, motivation and antipathy towards sports were quite prevalent in their sample. Although not discussed in depth in their paper, they interviewed a number of adults on their perceived barriers to physical activity, with one of their interviewees mentioning that physical education was their most hated subject. Their reasoning for this comment was not explored further but the authors did conclude that physical inactivity can be reduced if a person is motivated and wants to engage in physical activity. This viewpoint is supported by Ulstad et al. (2019) who mention that motivation is a key indicator for success in PE, which then influences students' decisions and ability to engage in lifelong physical activity. Several other participants mentioned they do not have the motivation to engage in sport, and that there is a hatred towards sport. These are quite negative comments and do not shine a positive light on physical education. However, it must be said, and people need to be convinced, that physical education is more than just engagement in sports and games (IB, 2009). Rather its aim to create a physically educated person should be done holistically, where the cognitive, affective, and social domains of self are engaged and develop (Kretschmann, 2014). Sport is only one component of an effective physical education program. Whereas sport has a narrow focus on emphasising the training-of-the-body (Crum, 2017) or a focus on the development of elite performance (Pill, 2007), physical education needs to be contextualised within the educative process and outcomes. The fact that the interviewees in Skrebutėnaitė

& Karanauskienė's (2019) paper, and the researchers themselves, situated the negative PE comment in the category of 'Antipathy for sport', indicates a dated perspective of physical education. Fairclough & Stratton (2005) have seen evidence demonstrating that team sport bears little resemblance to what the majority of young people do actively in or out of school even though it is emphasized in, for example, UK PE classes. They suggest a wider range of PE activities to inspire lifelong physical activity rather than sharing the out-dated message that only being talented in sport ensures positive health outcomes.

#### 2.4 The Sports Education model

However, there are benefits to including sport in physical education with Johnson (2019) indicating the positives of using the Sports Education pedagogical approach. This model allows students to experience sport within the context of PE through the key features of sport such as seasons, teams, and competitions (Johnson, 2019), with the goal of developing capable, literate, and passionate sportspeople (Evangelio, 2018). Johnson (2019) argues that sport is a form of play where participants voluntarily engage in overcoming obstacles in a somewhat make-believe world. This, he adds, is why sport is an important and attractive method of physical activity; it has deep roots in play. Back (2009) concurs with this view of sport by stating that sport is a type of competitive play with a focus on measuring physical skills. If sport is a form of play, then sport seems to allow for appropriate challenges that can enhance a player's skills and it also has the potential for immediate feedback and clear goals. In other words, sport allows 'flow' to occur (Nakamura & Csikszentmihalyi, 2002). The concept of 'flow' has been shown to enhance participant engagement, and can improve learning opportunities (Beard, 2015) but achieving this positive

psychological state can be a challenge for an educator to provide. It does require the satisfaction of a number of elements such as a challenge-skill balance, a sense of control, and having clear and immediate feedback (Beard, 2015). This can be acutely difficult in a large class of students with varying skill and motivational levels. A criticism comes from Kirk (2006) who mentions that the Sports Education model emphasizes four broad goals. These are educative, cultural preservation, public health, and elite development goals. Both the educative and public health goals require an inclusive approach as they are designed to encourage active participation from young people. However, there is tension between these two goals and the elite development goal since this goal encourages excellence in both competition and practice, which could cause exclusions within classes and promote the opposite of what this model intends to do. The Sports Education model certainly has strengths and could work quite well in PE units that emphasise sport, however the promotion of competition and excellence could marginalize some students. Taking all of this into consideration, it could be argued that physical education needs a rethink as it has been criticized for failing to evolve to suit the needs of students for all abilities. (Simonton, et al. 2020).

## 2.5 Project-based learning – an emerging pedagogical approach

Project-Based Learning (PBL) has experienced a surge in popularity recently (Larmer et al. 2015) with the concept of *learning by doing* initially being advocated by Confucius and Aristotle and further popularised by Dewey in the early 20<sup>th</sup> century (Boss, 2011). Hixson et al. (2012) observed that PBL has the necessary structure and principles that can successfully expose students to the skills necessary for the 21<sup>st</sup> century. Its strengths lie in the fact that learning is primarily student-driven with

teachers acting as facilitators of learning (Bell, 2010), which has been argued to positively engage and empower students with the knowledge and skills they gain from the PBL experience (Guo, et al. 2020). For example, PBL has been successfully adopted within the United States' K-12 education system (Simonton et al. 2020) with Terada (2021) stating that PBL outperforms traditional approaches to education regardless of ability levels, grade levels, socioeconomic status, and racial grouping. Terada (2021) investigated two extensive studies, one being Krajcik et al.'s (2021) study exploring the efficacy of the Multiple Literacies Project-Based Learning (ML-PBL) on students' science academic, social, and emotional learning, and the other being Saavedra et al.'s (2021) two-year study looking into Knowledge In Action, a project-based learning approach for Advanced Placement within the United States. Both studies state that the strength of PBL lies in its ability for students to investigate questions that they find meaningful where teachers are facilitators of learning providing the necessary scaffolding to support students in their journey to answer these questions (Bell, 2010; Krajcik et al. 2021; Saavedra et al. 2021). This concurs with Larmer et al. (2015) who further add that teachers are necessary to strategically design learning experiences that assist students in understanding new ideas that propel them forward within their projects. Teachers engage students through conversations, scaffolded activities, and continuously monitor student progress. Krajick et al. (2021) argue that a key strength of PBL is the ability to engage students through an adherence to PBL principles. These principles appear to be best described through Larmer et al.'s (2015) Gold Standard Project Based Learning model (see Figure 1), which comprises 7 design elements that are necessary for an effective PBL experience.

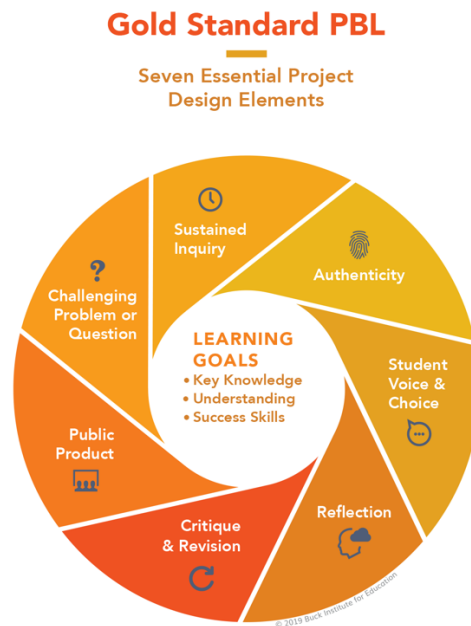


Figure 1. A model presenting the Gold Standard Project-Based Learning model (Larmer, 2020)

## 2.6 The Gold Standard PBL model

Central to the model are the learning goals, which when broken down comprise the critical knowledge and understanding students should be aiming towards achieving, and the development of skills that are not only critical to the project but also necessary for their future, such as analysis, problem solving, etc. Larmer et al. (2015) suggest that by keeping these learning goals central to teacher planning the project has a firm foundation to build upon for the design elements. Bell (2010) and Saavedra et al. (2021) both stress that planning needs to be meticulous to ensure the proper flow of the project as there are multiple milestones students will progress through. Referring to Figure 1, generally a PBL unit commences with the posing of a *Challenging Problem or Question*. Larmer et al. (2015) state that the structure of Gold Standard Project Based Learning relies on questions and problems. These challenging problems make learning meaningful since they give the learning a purpose. Krajcik et al. (2021) support this statement by mentioning that teaching and

learning are informed by a 'driving question' which is challenging, has real-world applications, engages students to learn and allows for inquiry. *Sustained Inquiry* is the second element of the model. Dewey (1910) states that a curious mind is eager for experience and requires little impetus to search and explore for meaning. Larmer et al.'s (2015) model is heavily influenced by Dewey's (1910) work by allowing students to solve the driving question through curiosity, questioning, and inquiry that goes further than merely conducting a library or website search. Students' initial responses to the driving question may invoke more questions where their inquiry eventually becomes a cycle as the inquiry goes deeper. This sustained inquiry is further fuelled by the assurance that the problem being solved is real-world, in other words, it has *Authenticity*. This third element strives for the learning experience to be authentic or as close to real-world as possible. The tasks students complete, or the tools used, are similar to what occurs in the real world. Such tasks as conducting surveys, typing up letters, or designing websites are examples of what occurs in society, and these have a role in making a learning experience authentic within PBL. Furthermore, the project should have relevance to the students' personal interests or issues since this will engage and empower students with their knowledge and skills as they know that their learning will have an impact. Saavedra et al. (2021) discovered that the PBL approach in Advanced Placement courses allowed for an increased level of student engagement due to the development of real-world skills in projects that students felt were authentic. *Student voice and choice*, as Bell (2010) mentions, is an important element to PBL. Children can respond to the driving question and their further inquiries in their way with supervision from the teacher. The degree of autonomy students have is up to the discretion of the teacher, however teachers need to be mindful that students require freedom to act, to

express themselves and their ideas, and to be given opportunities to critically reflect on their actions (Larmer et al. 2015). Accordingly, *Reflection* is a critical component within PBL since it allows for students to determine their current level of success, and also informs the next steps of the project (Larmer et al. 2015). Reflection activities need to be strategically placed throughout the project timeline as they allow students to find ways to improve their projects and to find new approaches; they allow for students to take on board the significance of what they are creating (Dewey, 1910). Whereas the reflection design element focuses on self-reflection, the subsequent element, *Critique and Revision*, provides opportunities for students to receive feedback from teachers, mentors, or experts related to their project. Having this access to experts provides students valuable feedback and an insight into real-world processes (Guo et al. 2020). Finally, all the work students have done culminates in the final design element, the *Public Product*. The projects that students have completed can be presented to an audience that is beyond the classroom, an authentic audience, may it be to other classes, administrative staff, or within their local community. This adds additional opportunities for student choice and develops students' presentation and communication skills (Larmer et al. 2015). Bell (2010) describes one instance of a student electing to go into character as the Pythia, an oracle at Delphi in ancient Greece. Prior to this, the student inquired into the daily life of an oracle and regularly met with her teacher during her research and planning phases of the project. For her public product, visitors approached her, and she responded to their queries in first-person, as the Pythia, through oracle cryptic speech, laced with riddles and fortunes.



## 2.7 Distinguishing features of PBL

Larmer et al.'s (2015) model is only one example of how PBL can be executed in the classroom. Others include Guo et al. (2020), who stated that there are 6 distinguishing features of PBL, which include a driving question, a focus on learning goals, scaffolded activities, relevant educational activities, and collaboration opportunities, all to create a product at the completion of the project. Krajcik and Blumenfeld (2006) alternatively mentions that there are 5 hallmarks for PBL to effectively occur. There is a driving question, opportunities for authentic inquiry, a collaborative environment, strategically scaffolded experiences, along with tangible products designed to solve the driving question. Furthermore, Hixson et al. (2012) indicate that there are key opportunities for the development of 21<sup>st</sup> century skills through student-led inquiry processes where student voice and choice is emphasised in solving authentic questions. Reflecting all of these, there appears to be consensus around what constitutes effective project-based learning; in summary, students should have some degree of autonomy in solving problems in contextually authentic environments through a process of questioning and discovery, all of which are features of constructivism (Jumaat, et al. 2017). PBL actually has its roots in constructivism, which suggests that learners construct knowledge, understanding, and meaning through active experiences (Krajick and Blumenfeld, 2006). In summary, students are not passively receiving knowledge but are rather actively involved through learning by doing (Jumaat, et al. 2017).

## 2.8 Criticisms of PBL

Despite the well-documented advantages of PBL, it is not without criticism. Terada (2021) points out that PBL critics state that novice learners could succumb to

pressures associated with the emphasis on self-management skills. Kirchsner et al. (2006) mention that minimally guided practices such as PBL, inquiry-based learning, or discovery learning ignore the fundamentals of our cognitive structure. They argue that long-term memory, once considered merely as a repository of past memories, is now viewed as playing the principal role for human cognition. Due to the vast amount of knowledge the long-term memory stores it seems that our daily activities and cognitively demanding tasks are largely influenced by this area of memory (Kirchsner et al. 2006). Although there is still some debate on the differences between the short-, long-term, and working memory, Cowan (2008) mentions that it is possible that the long-term memory can organize and group information into manageable chunks to alleviate the load on the working memory. However, for new information to be integrated into long-term memory, it needs to be processed through the working memory, which is inclusive of short-term memory, storage accessibility, and processing mechanisms (Cowan, 2008). It is characterised by its limited duration for holding information and its limited processing capacity. The working memory is further taxed when it is required to process as well as store new information simultaneously. Kirchsner et al. (2006) argue that minimally guided practices ignore the limited capacity and duration of the working memory. The working memory requires sufficient resources for new information to be effectively consolidated into long-term memory. They further mention that problem-based instructional approaches rely heavily on the working memory's processing attributes leaving little capacity left for storage. Therefore, for novice learners the free exploration in a complex and dynamic environment while searching and attempting to problem solve can tax the working memory to a point where limited new knowledge and understanding will be committed to long-term memory (Kirchsner et al. 2006).

However, through effective scaffolding, differentiation, and guiding strategies, Kirschsner et al.'s (2006) arguments can be countered. Hmelo-Silver et al. (2006) state that problem-based learning and inquiry learning should not be considered minimally guided approaches. Both pedagogical approaches facilitate student learning through strategic scaffolding and guidance techniques. The IB (2007), for example, encourages the use of structured inquiry for the Primary Years Program (PYP) as this provides a desirable balance between student-driven inquiry and teacher-guided instruction. In addition, Guo et al. (2020) mention that PBL requires teachers to support student autonomy.

A further criticism of PBL is that teachers and students may suffer from “project fatigue” (Saavedra et al. 2021, pg. 32). It was noted during their study that a large proportion of the students found PBL engaging and purposeful, however Saavedra et al. (2021) discovered that some students wanted a better balance between traditional teaching methods and PBL. Students reported feeling overwhelmed with the constant application of learning and wanted to break up the projects with lecture-style teaching. As with any pedagogical approach, the design and implementation of the lessons determines the impact it has (Hixson et al. 2012). New teachers to PBL also found it difficult to balance teacher-led and student-centred approaches, particularly in Advanced Placement courses where a large amount of curriculum content needs to be covered, while opportunities for collaboration and differentiation also need to be allowed (Saavedra et al. 2021). Simonton et al. (2020) described teachers being resistant to PBL due to the extra planning time needed, which is greater than for traditional approaches. These teacher criticisms can be remedied through professional learning for teachers. This is imperative when it comes to

introducing a new pedagogical approach, particularly with PBL which is substantially different to traditional teaching methods. Krajcik et al. (2021) ensured that teachers had support during their PBL intervention with a total of seven days inclusive of in-person and online meetings throughout the year. During these sessions, teachers were actively engaged in planning their units through the PBL pedagogical approach by designing driving questions, formative assessments, exploratory investigation activities, and possible eventual outputs. Unfortunately, it was not possible for Krajcik et al. (2021) to confidently acknowledge the effectiveness of the PL teachers received during their research due to study limitations. However, Saavedra et al. (2021) found that teachers who were routinely involved in their professional learning applied the guiding principles of PBL more effectively. Students in their study mentioned that they felt better prepared for their exams since the learning was more inclusive and purposeful. Similar findings occurred during Hixson et al.'s (2012) study where when, given time for extensive PBL professional learning, teachers were more capable of teaching 21<sup>st</sup> century skills.

## 2.9 PBL as an alternative model for physical education

Whereas other models are specifically designed for PE such as Teaching Games for Understanding model (Wang and Ha, 2013), Games Sense (Pill, 2016), and the previously mentioned Sports Education model (Johnson, 2019), PBL is a flexible approach to learning that can work in multiple settings, from an elementary PE class to a high school science class (Larmer et al., 2015; Simonton et al., 2020). Coyne et al. (2016) mention that PE can be widely interpreted depending upon the teacher and the learning goals set for the students. The flexibility of PBL suits the unique characteristics of PE. Due to this flexibility, there are enhanced opportunities for PE

to collaborate with other subjects within the school if they are also following a PBL structure (Coyne et al. 2016; Simonton et al. 2020). This, in turn, could prove a valuable opportunity for PE to engage with other subject areas and provide the necessary exposure to demonstrate the validity and relevancy of PBL (Kretschmann, 2014; Simonton et al. 2020). Adopting PBL as a possible pedagogical approach can demonstrate that physical activity is not the only defining characteristic of PE (IB, 2009) but it could potentially showcase the complex, multi-faceted subject that it is, bridging the natural sciences of physiology and anatomy and the social sciences of communication and collaboration (Bailey, 2018). By having a respected seat at key academic meetings and being recognised as a valued team member, the PE teacher's job satisfaction can also improve, which can lead to an enhanced PE experience for students (Simonton et al. 2020). Putting this into practice, Coyne et al. (2016, pg. 45-46) provide a 6-step process to implement PBL into PE (See Table 1).

<b>Step 1</b>	Determine your educational goal	<ul style="list-style-type: none"> <li>- What do you want your students to learn?</li> <li>- Should be aligned with standards / curriculum</li> </ul>
<b>Step 2</b>	Plan your driving question	<ul style="list-style-type: none"> <li>- Create a challenging and meaningful problem for students to solve</li> <li>- Links to standards / curriculum</li> </ul>
<b>Step 3</b>	Ready, set, go! Implement the PBL project	<ul style="list-style-type: none"> <li>- Provide a project timeline and guidelines to students</li> <li>- Teacher acts as a facilitator of learning</li> </ul>
<b>Step 4</b>	Encourage peer-to-peer feedback	<ul style="list-style-type: none"> <li>- Timeline should include regular feedback opportunities</li> <li>- Class and groups should create and follow agreements on how they conduct themselves</li> </ul>
<b>Step 5</b>	Assessment is key	<ul style="list-style-type: none"> <li>- Needs to measure both educational goal and the driving question solution</li> <li>- Variety of methods ranging from rubrics to checklists</li> <li>- Can also include student self-evaluations</li> </ul>
<b>Step 6</b>	Take the time to reflect and celebrate	<ul style="list-style-type: none"> <li>- Provide an opportunity for students to reflect on the project and the learning process</li> <li>- Ensure to highlight the successes of the project</li> </ul>

*Table 1: The 6-step process for implementing PBL within PE (Coyne et al., 2016)*

Coyne et al.'s (2016) 6-step process combined with the Gold Standard PBL model of Larmer et al. (2015) has the potential to provide an effective framework for emerging PBL teachers to follow. However, Simonton et al. (2020) mention that there could be resistance by PE teachers to adopt this approach due to the perception of students receiving less opportunity for physical activity. Nevertheless, Kretschmann (2014) recognises the need for PE to follow a holistic approach where the cognitive, affective, and psychomotor learning domains are focused on. Simonton et al. (2020) advocates this viewpoint and adds that PBL can ensure this occurs. The cognitive domain can be targeted with students breaking down the driving question and conducting their own research. The affective domain can be required for when students need to collaborate with their team but also could potentially be used when handling surveys or other data gathering activities. The psychomotor domain requires students to be actively engaged in piloting their own solutions when the driving question involves a physical element. Although there may be resistance relating to the potential reduction in physical activity, evidence has demonstrated that not only has holistic education increased physical activity within classes, but it has also had a positive effect on student behaviours outside school when compared with traditional methods (Simonton et al. 2020).

#### 2.10 PBL and 21<sup>st</sup> century skills

Project-based learning has also been considered a useful approach to develop skills necessary for success in the 21<sup>st</sup> century (Bell, 2010). Through PBL students become independent thinkers and learners by solving authentic problems that require collaboration and communication skills (Bell, 2010), both of which are generally classified as 21<sup>st</sup> century skills (Anagün, 2018). Although there is some

confusion as to what constitutes a 21<sup>st</sup> century skill (Lamb et al. 2017; Soland et al. 2013), both these skills appear to be considered essential for success in society as it now exists. Broadly speaking, 21<sup>st</sup> century skills are necessary skills for students to competently achieve to manage the demands of the 21<sup>st</sup> century (Anagün, 2018). The ability for today's learners to achieve these skills appears to have an impact on their future career success as they mature out of their schooling (Larmer et al. 2015). Koenig (2011) adds that these skills are highly valued by employers but are far from being effectively addressed in schools. These modern jobs require more than routine processes, they demand skills to effectively deal with people, to solve complex problems, and to think critically and creatively (Koenig, 2011; Lamb et al. 2017). Addressing this, Lamb et al. (2017) investigated a number of different frameworks to consolidate today's thinking as to which skills are of importance to schools and modern society. They found the following skills or constructs are most commonly mentioned (p. 19): "1. Critical thinking, 2. Creativity, 3. Metacognition, 4. Problem solving, 5. Collaboration, 6. Motivation, 7. Self-efficacy, 8. Conscientiousness, 9. Grit or perseverance". Despite these skills being identified, although not perfectly so considering the varying priorities of the different frameworks, there is the further dilemma of how these skills should be assessed to determine student progress. Again, similarly to the identification of 21<sup>st</sup> century skills, there seems to be a lack of agreement on best practice when assessing these skills through valid and reliable means (Koenig, 2011). Lamb et al. (2017) determined that these skills can be measured through direct assessments, self-assessments, or teacher judgements, but the assessment approach selected needs to suit the skill being tested. The authors state that traits or soft skills such as grit and self-efficacy are best assessed using self-reporting methods through surveys, as an example. Direct assessment is

best suited for skills that are more cognitive and have a clear definition of what is being assessed, such as problem solving and creativity through a Programme for International Student Assessment (PISA) test (Koenig, 2011). Lastly, assessments through teacher judgement are effective due to their immediacy but also because of the familiarity the teacher has with the students. The teacher can adopt a variety of assessments all of which the teacher interprets and subsequently use to inform the next steps for the students (Pellegrino, 2014). One such assessment approach that has been widely adopted by teachers are rubrics. These clearly state criteria to reach certain levels of achievement that is clear to both students and teachers (Lamb et al. 2017). Summarising, progress is being made to consolidate views of what 21<sup>st</sup> century skills are and how best to assess them, but what has become clear is the urgency required for schools to refocus student priorities away from simply acquiring information to being able to apply their learning in meaningful ways through analysing, synthesizing, creating, collaborating and communicating (Anagün, 2018; Bell, 2010; Koenig, 2011; Lamb, 2017; Pellegrino, 2014; Soland et al., 2013).

### 2.11 Physical education, project-based learning, and 21<sup>st</sup> century skills

Keeping all of this in mind, Bailey (pg. 51, 2018) poses the question, “how can PE secure its place in the school curriculum?” The literature on the status of PE seems to suggest that reforms are needed within the subject itself to make it more relevant and respected. Project-based learning is a promising pedagogical model that could ensure PE’s place in school curricula for the future. Ramírez et al. (2017), Simonton et al. (2020) and Treadwell (2018) both advocate for PBL to be used in PE. However, although they mentioned that PBL targets 21<sup>st</sup> century skills, there was a deficiency of data that confirmed any changes in student competency related to these skills.



This present study aims to fill that gap by attempting to implement the PBL model at a Grade 5 PE level, by identifying any potential changes in motivation, collaboration, grit, and critical thinking, all of which are considered 21<sup>st</sup> century skills. The methodology for the study is described in the next chapter.

## **Chapter 3: Methodology**

### **3.1 Introduction**

This chapter sets out how the research questions for the study were addressed.

These questions are:

- How can project-based learning be used to increase student engagement?
- How can project-based learning be used to encourage student motivation?
- What benefits arise from implementing project-based learning in physical education for students?
- What influence does project-based learning have on student behaviour?

These questions helped guide the study to ensure the overall aim of the study was achieved, where potential relationships or themes could be drawn out through a variety of data collection methods. At the conclusion of the study, analysed data was used to determine if PBL could be used effectively in the PE setting to develop relevant 21<sup>st</sup> century skills.

### **3.2 Methodology outline**

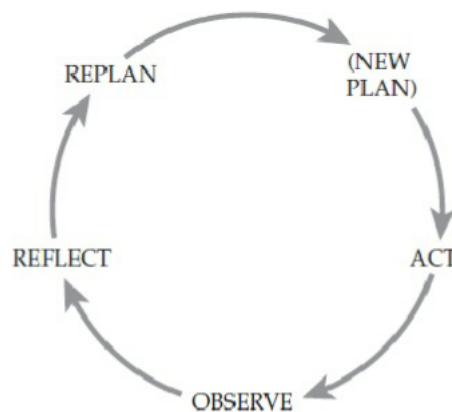
The study followed a pragmatic approach where both quantitative and qualitative paradigms were used through an action research methodology. Through the cyclical process of plan, act, evaluate, and rethink, which is characteristic of action research (Casey et al. 2017), the intervention of PBL in PE was continually reflected upon and refined. To ensure accurate responses to the research questions and to determine the true PE experience of the sample, a mixed methods approach was utilised. Cohen et al. (2018) mentions that mixed methods research allows for a more

thorough understanding of phenomena than a single method approach due to its ability to combine both quantitative and qualitative approaches.

### 3.3 Action research

The study was carried out following the principles of action research where the researcher and context are at the centre of the research and practice (McAteer, 2013). At the most fundamental level, action research in education aims to answer the question, “How can I improve my practice?” (McAteer, 2013, pg. 13). McNiff (2016) views action research as a “disciplined, systematic process” (pg. 113), where practitioners evaluate their practice to determine if it is as effective as it could be. When breaking down the term, *action*, this refers to the process where an intervention is planned and introduced within a research context (Burns, 2005). This is in response to a perceived problem needing addressing which the action researcher views as a gap between the ideal and present reality. The *research* element refers to the systematic collection of and analysis of data during the intervention’s implementation (Burns, 2005). Casey et al. (2017) indicate that there are 5 defining features of action research: 1. *The practitioner*, as mentioned previously, is at the centre of the research along with the context. 2. *Self-reflection* is consistently used throughout the study to inform the plan, act, observe, and reflect cycle that characterises the action research process. 3. *The social situation* is where the research context occurs. 4. *Improving practice* is the fundamental purpose of action research. 5. *Ethics*, whereby the study follows appropriate protocols ensuring that the participants in the study are safe and that their rights are explicit and observed. In essence, it is an action researcher’s purpose to focus on their own pedagogical practice by developing, testing, and critically evaluating their actions

(Casey et al. 2017). These features concur with McAteer (2013) who states that action research is 1. A practical approach to research, 2. It emphasises critical reflection, 3. It is motivated by improving one's own practice, and 4. It aids in enhancing professional knowledge. McNiff (2016) indicated similar views of the features of action research by stating its commitment to reflection, generation of knowledge and the enhancement of practice. However, she also adds that action research is about informed, committed action. Action research is 'informed' due to its participatory elements and it is 'committed' due to the continuous reflection on one's own practice for the benefits of others. Lewin (1946) cited in McNiff (2016) proposed the action-reflection model, as in Figure 2, which most action research models build on.



*Figure 2. A graphic presenting Lewin's action-reflection model (Lewin (1946), cited in McNiff (2016))*

Tripp (1995) goes into more detail by elaborating on each of the phases as indicated in Figure 3. The phases of plan, act, evaluate, and reflect can be seen, however more detail is given to each of the phases to indicate the types of activities that occur within each phase.

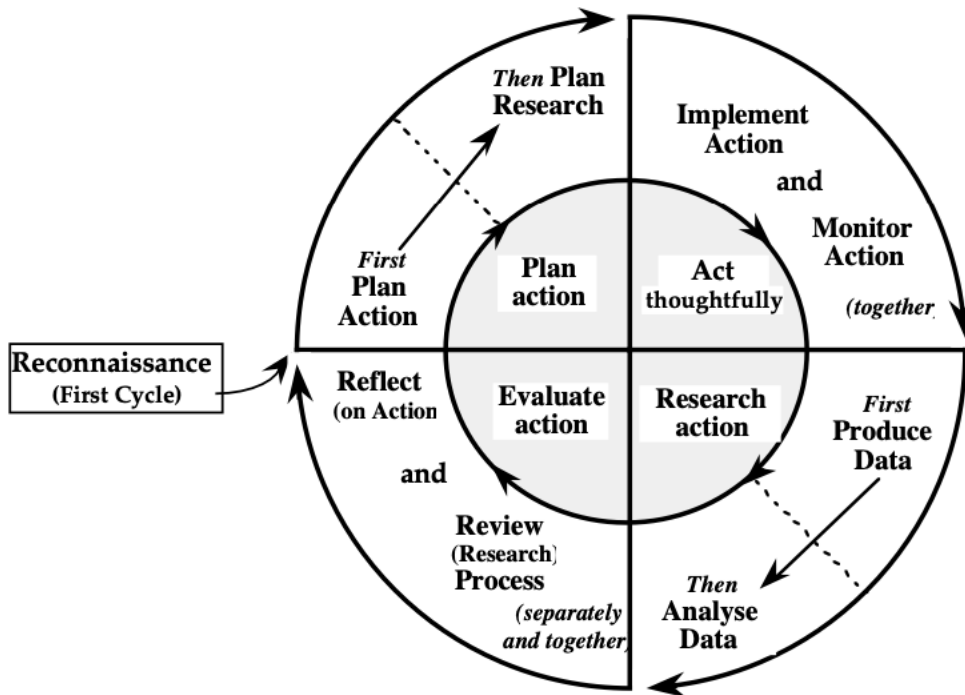


Figure 3. A graphic presenting the full action research cycle proposed by Tripp (1995).

### 3.4 Action research criticisms

Considering that the action research process intimately involves the teacher, the author of this paper played a dual role of teacher-researcher. This has benefits due to the ease of adjusting lessons according to the needs of the class based upon in-depth knowledge and capabilities of the students. This means the teacher-researcher is continually applying reflection-in-action on the class throughout the lessons almost at ease (McAteer, 2013). However, McAteer (2013) does emphasise that the practitioner needs to practice 'professional sensitivity', particularly during the initial stages of the data collection period. This means the practitioner needs to enhance their observational skills and become vigilant in observing the unexpected and becoming open to new phenomena that may occur. Another issue that is not exclusive to action research is *bias*. Bias is a wide-ranging term and is identified differently dependent upon the paradigm or methodology, however, in the end, the

research is searching for truth or trustworthiness of the data presented (Casey et al. 2017). Regarding action research, the practitioner is central to the study, therefore there are some issues of bias the researcher needs to be aware of. Newby (2014) indicates the following possible sources of bias: *Observer influence*, whereby just the presence of an observer can cause a sample to act differently. *Self-practice criticality* refers to practitioners being open and critical of their own practice. *Biased sampling* can occur if the practitioner implements the intervention on certain students due to their familiarity with their students. The sample needs to be representative of the general population. McAteer (2013) adds that the study needs to present a *range of perspectives* to indicate that the researcher's views and interpretations have been challenged throughout the research process. McNiff (2016) encourages action research practitioners to question their own actions and outcome evaluations to ensure biased conclusions have not occurred. A benefit of action research is the practitioner-centred approach where an investigation of one's own practice in their own environment is occurring. Although this comes with the benefit of insider knowledge, it can also be a detriment to obtaining unbiased conclusions. As has been mentioned previously, Cohen et al. (2018) detail numerous other challenges associated with qualitative research. One being that the participants may not be able to define the 'real' situation in question through a conscious or unconscious distortion of information. Considering the participants do not have a monopoly over the knowledge of the situation, their interpretation of the situation is at the mercy of their own perception of reality. These types of studies are difficult to *replicate*, a further issue of qualitative research, due to the uniqueness of each type of qualitative study. However, Myers (2000) does stress that accurate documentation of the methods used and attention to a rigorous study can ensure validity. Lastly, due to the very

nature of qualitative research, striving to understand the world from participants' viewpoints, it is difficult to generalize findings from such intimate and unique situations (Cohen, et al. 2018). From a positivist quantitative sense, *generalization* allows findings to create and explain universal laws that can be generalized to the population, to their reality and their environment (Carminati, 2018). Myers (2000), however, confirms that small qualitative studies are not suitable for the traditional interpretation of generalization where findings should be able to be applied to universal law. But rather the strength of qualitative research lies in its ability to discover meaning and understanding (Carminati, 2018) and to pass that knowledge to the reader through reports that are descriptive and illustrative (Myers, 2000). This allows the reader to truly engage and understand the literature. Therefore, the primary aim of this study is not to apply findings towards the general population but rather to critically examine and improve this author's personal practices. As Myers (2000, p. 4) states:

*"In such situations, small qualitative studies can gain a more personal understanding of the phenomenon and the results can potentially contribute valuable knowledge to the community".*

### 3.5 Study sample

For the actual study, research participants were divided into the population and the sample. The population consisted of the grade 5 cohort, aged 10-11 years of age, consisting of 96 students evenly divided into 4 classes. The sample was selected by simple random sampling with gender and ability level stratification. Simple random sampling's strength is its simplicity and the equal opportunity it gives for each piece of data to be selected (Newby, 2014). For this study, an online random number generator was used. Stratification allows for the sample to be categorised into characteristically similar homogenous groups according to the needs of the study

(Cohen et al. 2018). For this study, the sample was stratified according to their class, gender, and then ability levels. The sample's ability levels were determined according to their International Schools Assessment (ISA) results. The eventual sample consisted of 12 students, with 6 girls and 6 boys of 3 different ability levels (low, middle, high). This sample size was settled upon due to the author's available time and resources. Due to the author choosing a mixed methods approach, amongst other qualitative data collection methods, semi-structured interviews were used. Wengraf (2001) mentions the depth and richness of data that can be collected through this method, although it is time-consuming due to the need of planning, conducting, transcribing, coding, and analysing post-interview. The action research approach of this study required the author to be actively involved in teaching and researching. Concluding, the sample consists of a suitable and manageable cross-section of the population to get a good understanding of the intervention's effects.

### 3.6 Project-based learning as the intervention

Project-based learning has claimed to improve academic performance (Terada, 2021), increase student motivation and engagement (Larmer et al. 2015), and provide the necessary opportunities to develop relevant 21<sup>st</sup> century skills (Bell, 2010). PBL is the intervention within this action research study to address the research questions. The author monitored engagement levels through weekly feedback forms and student observations to inform subsequent cycles during the data collection period. As an example, Table 2 below details the logistical schedule of the Track and Field unit along with the action research data collection cycles.



Cycle	Unit Week	Action Research Tasks	Lesson Plan
1	0	<ul style="list-style-type: none"> <li>– Reconnaissance phase</li> <li>– Determine project needs</li> <li>– Complete literature review</li> <li>– Plan unit and second cycle</li> <li>– Complete first round of interviews and Grit Questionnaires</li> </ul>	
2	1	<ul style="list-style-type: none"> <li>– Implement plan</li> <li>– Population complete feedback form</li> <li>– Author observes sample's collaboration levels</li> </ul>	<ul style="list-style-type: none"> <li>– Introduce the unit</li> <li>– First attempts of events</li> <li>– Airdrop PowerPoints to students</li> </ul>
	2	<ul style="list-style-type: none"> <li>– Plan third cycle based upon data gathered</li> </ul>	<ul style="list-style-type: none"> <li>– Complete first attempts</li> <li>– Students explore PowerPoints</li> <li>– Students record First Attempts data</li> </ul>
3	3	<ul style="list-style-type: none"> <li>– Implement plan</li> <li>– Population complete feedback form</li> <li>– Author observes sample's collaboration levels</li> <li>– Plan fourth cycle based upon data gathered</li> </ul>	<ul style="list-style-type: none"> <li>– Unpack Central Idea</li> <li>– Expose Driving Question (DQ)</li> <li>– Students choose events (<i>Formative</i>)</li> <li>– Students discuss solutions to DQ</li> <li>– Students train for their events</li> </ul>
	4		<ul style="list-style-type: none"> <li>– Students create training plans based upon event choices (<i>Formative</i>)</li> <li>– Students search for appropriate resources</li> <li>– Students use training plan to train</li> </ul>
4	5	<ul style="list-style-type: none"> <li>– Population complete feedback form</li> <li>– Author observes sample's collaboration levels</li> </ul>	<ul style="list-style-type: none"> <li>– Students provide feedback to one another on training plan and train together</li> </ul>
	6	<ul style="list-style-type: none"> <li>– Plan final cycle based upon data gathered</li> </ul>	<ul style="list-style-type: none"> <li>– Students review DQ and solutions</li> <li>– Prepare for the Carnival using DQ solutions</li> </ul>
5	7	<ul style="list-style-type: none"> <li>– Population complete feedback form</li> <li>– Author observes sample's collaboration levels</li> </ul>	<ul style="list-style-type: none"> <li>– Track and Field Carnival</li> <li>– Students complete final reflection of the unit</li> </ul>
	8	<ul style="list-style-type: none"> <li>– Sample create additional training plan</li> <li>– Sample repeat Grit Scale Questionnaire</li> <li>– Sample participates in final interview</li> <li>– Author consolidates data</li> </ul>	<ul style="list-style-type: none"> <li>– Teacher completes reflection of the unit</li> </ul>

Table 2. The logistical schedule and action research cycle overview.

### 3.7 Unit synopsis

Within this study, the project was for students to prepare to compete in the school's annual school track and field competition. The unit extended over 7 weeks with a total of 14 lessons. The first 4 lessons were dedicated to introducing the students to the unit and undertaking the initial testing for each of the 6 events. The following week was set aside for students to unpack the driving question, devise possible solutions, and to begin getting familiar with the events. The events were divided into 3 categories. The *track* events were the 50m and 400m runs, the *jump* events were the high jump and long jump, and the *throw* events were the javelin and shot put. Students then chose one event from each category resulting in a total of 3 events that they would be training for and competing in. For the next 6 lessons students spent time designing, executing, and refining their training programs to be ready for the competition while continually revisiting the driving question. Throughout the unit, students had access to a PowerPoint presentation (refer to Appendix A) created by the author that allowed the students to start their inquiry. The unit's final week consisted of the actual track and field competition.

### 3.8 Instruments

*Weekly survey.* To determine engagement levels, the population of 96 students responded to a 3-question survey at the completion of their final lesson of the week. As this was part of usual classroom practice unfamiliarity with the process was not an issue. The questions were designed to ensure quick and easy responses as per Newby's (2014) guidelines, where he indicates to 'keep it simple' (pg. 310). When designing the survey questions the target population needed to be considered, specifically their age and reading levels. In this author's context, the target population's grasp of the English language also needed to be kept in mind due to the

school body mainly having English as an additional language. In addition, questions used were to contain one issue to avoid overwhelming the respondent. Along with the questions being short, the survey itself contained just enough questions to collect appropriate data, while avoiding respondent fatigue. Appendix B provides an example of the weekly survey. The author elected to use an ordinal scale for responses to determine an opinion or an attitude relevant to the question being asked (Cohen et al. 2018). However, a criticism of using a descriptive ordinal scale is the lack of a uniform scale between the different values. Different survey responders may interpret 'okay' and 'good' differently dependent upon the context of the question. Treiman (2009) informs us that ordinal variables can be placed in an order dependent upon the dimension and context of the research.

*Semi-structured interview.* For the study, it was necessary to get an in-depth feel for the sample's experience with the PBL intervention, thus a qualitative interpretive approach was needed. As Newby (2014) points out, interviews allow for a rich data set and allow for further questioning to get a better understanding of the interviewee's paradigm. Wengraf (2001) concurs by stating that a well-planned and executed interview can provide an enhanced view of reality. The sample members were invited to participate in a 10-minute interview at the start of the unit to allow the author to understand their PE experience prior to the implementation of the intervention. Appendix C provides an example of the interview schedule. At the conclusion of the 7-week unit, the sample members were invited for their final interview to get a feel for their PE experience with the PBL intervention. A semi-structured interview format was elected for this, considering the balance it provides in terms of flexibility and structure (Wengraf, 2001). For this, a list of questions is prepared ahead of time but in such a way that they are open-ended, can be

reordered, as well as allowing for probing if needed (Cohen et al. 2018). The interview for this study was developed using the CRQ-TQ-IQ model (Refer to Figure 4) proposed by Wengraf (2001, pg. 63) where the research purpose is developed into central research questions (CRQ), the CRQ is broken down into target questions (TQ), and eventually into interview questions (IQ) of which are used for the interview. This model suits the study considering that the design of this study is based around an overall project aim with the project research questions framing the study.

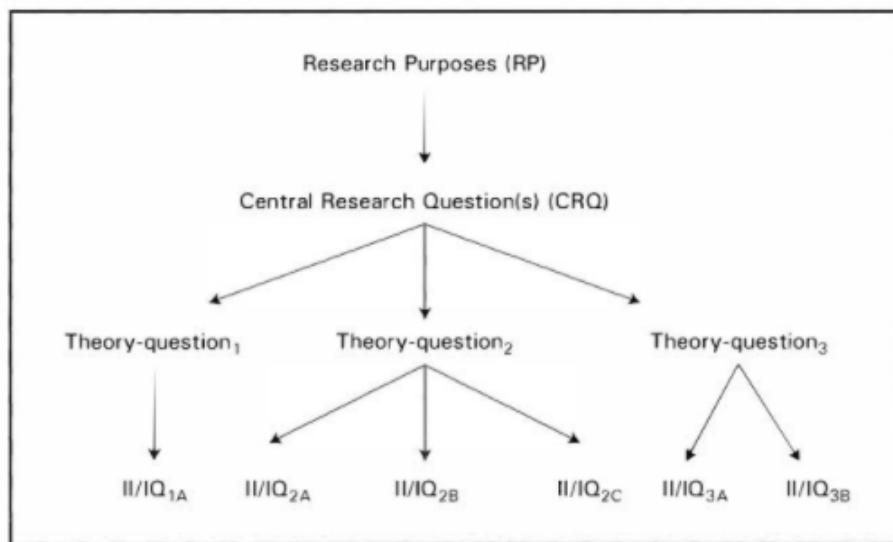


Figure 4. A graphic presenting the CRQ-TQ-IQ model for semi-structured interview design (Wengraf, 2001, pg. 63)

Ethics will be discussed later in this chapter, however the interviews were audio recorded and then transcribed with permission from the sample's primary caregivers. Notes about topics covered, feelings, and anything else of significance were made immediately at the completion of the interview following Wengraf's (2001) recommendations to ensure a thorough recording of the interview that the audio recording could not capture.

*8-Item Grit Scale.* Grit appears to have become a widely acknowledged 21<sup>st</sup> century skill (Lamb et al. 2017) and has been interpreted as the push for long-term goals through perseverance and passion (Duckworth and Quinn, 2009). Despite setbacks and the lack of positive feedback, a person with the appropriate level of grit usually sets long-term goals and continually pursues them (Bashant, 2014). This study used the 8-item Grit Scale developed by Duckworth and Quinn (2009). This was administered to the sample at the commencement of the first cycle and then readministered at the end of the final cycle. Appendix D provides an example of the grit scale used for the study. This was done to determine whether there was any effect on grit levels through the intervention. Although the author acknowledges there could be multiple variables relevant to an increase in grit levels, Larmer et al. (2015) mentions that PBL can develop grit. This is because projects, at school or in a real-world setting, will not always go to plan and setbacks will occur. School-based projects can help develop the necessary traits to allow students to succeed. However, despite Larmer et al.'s (2015) claims of PBL increasing students' grit levels, Pappano (2013) suggests that even though there is a substantial amount of evidence demonstrating the correlation between grit and student success, the research into increasing grit levels is still in its infancy. Furthermore, Duckworth and Quinn (2009) mention that it is unclear whether grit is consistent across all areas of a person's life.

*Structured Observations.* The sample members were observed according to their collaboration skills, which as mentioned previously by Lamb et al. (2017), is considered a critical 21<sup>st</sup> century skill. Throughout the observed lessons, the sample members were monitored according to a structured observation approach following an observation schedule. Appendix E provides the adopted observation criteria. As

Bell and Waters (2018) mention, observations following a structured approach allow the researcher to focus on phenomena relevant to their study rather than being distracted by unrelated or irrelevant occurrences. The observation schedule lists key elements of effective collaboration as described by Hesse et al. (2015).

*Communication* skills relate to the effectiveness of students exchanging information with one another that facilitates universal understanding within the group.

*Cooperation*, the second element, refers to the group being able to agree upon and execute a division of labour. The third and final element that was observed was whether students demonstrated *responsiveness*, which relates to students becoming actively and effectively involved in the joint activity. However, there have been criticisms that a structured approach to observations can lead to bias due to the researcher already deciding on what is to be observed. Researcher bias is a known risk within qualitative studies (Bell and Waters, 2018), which can occur due to the researcher having strong feelings about a topic. They may unintentionally or deliberately select literature supporting one perspective or use language that strongly opposes or favours one point of view. This author needed to be critical of what was observed, and to continually cross-reference observations made with the criteria sample questions. Despite these potential issues, Cohen et al. (2018) mention that due to the researcher knowing what is to be observed to support or refute the project's aims by taking note of the frequency and occurrence of collaboration elements, a structured observation approach was ideal for this situation.

*Student work assessment.* For the study, quantitative data was collected through an assessment of the sample's work. Their task required them to design a training program with the aim of enhancing an athlete's performance in their Track and Field unit. They were assessed on their critical thinking skills, which according to Lamb et

al. (2017) is a necessary skill to develop for the 21<sup>st</sup> century. Assessment was performed through a critical thinking rubric developed by the author and was available for the students to refer to when completing their task. Appendix F provides details of the rubric. Rubrics, according to Edutopia (2008), are useful due to their transparency as they allow students to become aware of what is expected of them and for their potential for consistency when it comes to marking. Furthermore, they are useful tools for formative assessments as they allow for the monitoring of student progress and can inform the next steps for the relevant learning experience. Moskal and Leydens (2000) mention that rubrics provide a guide for assessors to effectively analyse student efforts. When they are carefully designed, a rubric can produce valid and reliable results. However, issues relating to validity and reliability need to be addressed for them to be effective. To create a valid rubric, Moskal and Leydens (2000) state that the rubric needs to accurately reflect the *content* area, it needs to measure the intended *construct*, and lastly there needs to be *criterion-related evidence*, in other words, the rubric's results should be able to be generalized to other relevant areas. A reliable rubric needs to satisfy *inter-rater reliability* which refers to the issue of varying scores between different markers. Finally, *intra-rater reliability* refers to the continued objectivity of the assessor, where emotions or potential bias that could distort results are avoided. The potential for unreliability can be reduced by having clear, established criteria, and having the assessors regularly review the criteria during the marking process. This study's rubric was designed according to the steps described by Moskal and Leydens (2000) (refer to Figure 5), with the content informed from the IB's (2009) interpretation of critical thinking.

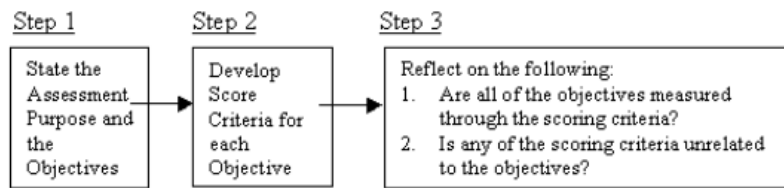


Figure 5. A graphic presenting the steps to evaluating the appropriateness of scoring categories to a stated purpose (Moskal and Leydens, 2000)

### 3.9 Triangulation: validity and reliability

Cohen et al. (2018) state that triangulation, particularly in the social sciences, allows a more comprehensive understanding of the intricacies of human behaviour.

Through the process of viewing relevant phenomena from different perspectives by using a variety of contrasting methods, researchers can be confident of their findings.

The mixed methods approach that this study adopted has an inherent strength relevant to triangulation. Bell and Waters (2018) extends this view by mentioning that through the combination of both quantitative and qualitative data, there are better opportunities for a deeper understanding of what is being studied compared with single method approach. Through the variety of data collection methods that this study utilised, the author was able to triangulate its findings, which allowed data to be validated from their different sources, with themes and patterns emerging from the data. The triangulation process allows researchers to ensure their study is reliable and valid (Newby, 2014). However, Cohen et al. (2018) warn that validity and reliability is never completely ensured, but rather that these threats can be mitigated through reliability tests such as the test-retest (Bell and Waters, 2018) or concurrent validity where sets of data correlate highly with one another regardless of the instrument used in the same study. During the developmental stage and pilot stage of this study, the data collection instruments used these measures to ensure they were valid and reliable. Specifically each of the data collection instruments was



measuring a specific element of the study, of which there was a mix of quantitative and qualitative methods, such as the surveys measuring engagement levels, and critical thinking being measured through the assessment of student work. These were then validated through the interviews where a thorough understanding of the sample's experience was achieved.

### 3.10 Methods of data analysis

Data analysis in social sciences allows the relevant study to expose to others what was seen and learned about human behaviour (Saldana, 2011). Throughout the data collection period, qualitative data was analysed soon after collection to discover whether themes or patterns were emerging.

*Semi-structured interview.* Through the active process of interview transcribing, observation coding and data categorising, the author had become cognitively sensitive to the data and was able to sense patterns and themes emerging in the data. By analysing early and frequently, the author could ensure that data was authentic and reliable. Wengraf (2001) highly recommends debriefing after an interview by practicing free-flow writing where feelings, senses, content, and anything of relevance to the interview is captured. This is separate to transcribing the interview since this process can capture what the audio recording does not. Post-transcription, the author used *in vivo coding* to analyse the transcribed interview where codes were made according to the language used by the participants (Saldana, 2011). This same approach was used for the author's debriefing notes. Codes can be single words or phrases and are selected according to the significance of what the participant is saying. These codes were then categorised according to

the author's judgements, and then used to create an overall narrative of the participants' PE experience.

*Structured Observations.* Continuing with qualitative analysis, the structured observations focused on the sub-skills relevant to collaboration. Once the author observed these behaviours, they were taken note of and given a relevant code. These codes were collated to give the author an understanding of what levels of collaboration was occurring. Furthermore, with reference to Hesse et al. (2015) breaking down the elements of collaboration into *communication, cooperation, and responsiveness*, the author was able to pinpoint areas needing attention to move towards enhanced levels of collaboration.

*Weekly surveys.* The weekly survey responses were regularly analysed to determine engagement levels during the intervention implementation. Furthermore, the survey responses were valuable sources of feedback that informed the various cycles of the action research process. This method allowed the quantification of qualitative entities. Students responded to questions related to their weekly experience, such as eagerness to participate, and interest in the Track and Field unit. These qualitative responses were considered to give the author a continuous source of data related to student engagement levels. These results were cross tabulated to determine relationships between variables (Treiman, 2009), such as the correlation between experience and engagement. Using cross-tabulation the author was able to present the survey data in a manner that was logical and simple to understand.

*Critical Thinking Rubric.* An ordinal scale was used to assess student work using terms such as emerging, developing, acquired, and accomplished to indicate level of

achievement for each of the skills related to critical thinking. Following a similar format to the weekly surveys, scores were collected and cross-tabulated as an effective means to present the relevant data. From here, the author was able to determine which areas of critical thinking, whether analysing, evaluating, or forming decisions, needed attention.

*Grit Scale.* The Grit Scale (Duckworth and Quinn, 2009) quantifies qualitative entities through a score sheet attached to a 5-point Likert-style questionnaire. The scores were calculated according to the directions of the Grit Scale provided by Duckworth and Quinn (2009). Each of the responses were assigned a value ranging from 1-5, then the scores were added up and divided by 8. A maximum score of 5 indicates extremely gritty, and a minimum 1 demonstrates low grit levels.

### 3.11 Ethics

This study paid close attention to the BERA (2018) guidelines for educational research to ensure procedures were “ethical, justifiable, and sound” (pg. 1).

Gatekeeper consent (Appendix G) was required to allow the study to occur within the institution. Considering the young age of the participants, consent was needed from their parents or guardians. Parents were emailed a *parent information sheet* and a *parent informed consent form* that provided key details of the study. Using a Frequently Asked Question (FAQ) format, parents were informed of the purpose of the study and its aim of determining the effectiveness of using project-based learning in physical education. There was an explicit mention of their child being randomly selected, participation in the study being voluntary, and that the child had an absolute right to withdraw from the study if so desired. Furthermore, details of the

role the child would play were provided along with how collected data would be kept confidential and stored separately from their consent forms. For the full versions of these forms, please refer to Appendixes H and I. BERA (2018) mentions that researchers should strive to ensure that the purpose and actions within the study are understood by the participants. Therefore, the sample members of the study were given a *participant information sheet* that detailed, in appropriate language, similar information to the parent information sheet (Appendix J). All documents were translated to Mandarin by the school's resident translator to ensure all relevant parties were as informed as possible about the study.

## Chapter 4: Data Analysis and Discussion

### 4.1 Introduction

This chapter presents analysed data through the study's research questions along with any patterns or themes that emerged during the data collection period or literature review.

As mentioned earlier, the population was the grade 5 cohort consisting of 96 students, with a sample of 12 students who were randomly selected according to gender and ability levels. For confidentiality, students and their classes were provided with pseudonyms as seen in Table 3.

	<b>High Ability</b>	<b>Middle Ability</b>	<b>Low Ability</b>
Class 1	Student 1	Student 2	Student 3
Class 2	Student 4	Student 5	Student 6
Class 3	Student 7	Student 8	Student 9
Class 4	Student 10	Student 11	Student 12

*Table 3. A table detailing how the sample was divided according to class and ability level*

### 4.2 Discussion and interpretation of data

#### **How can project-based learning be used to increase student engagement?**

It has been noted that PBL can enhance student engagement levels due to the authentic projects students can work on that require real-world skills (Larmer et al. 2015; Saavedra et al., 2021; Terada, 2021). The grade 5 population completed a weekly feedback form at the conclusion of their second PE lesson of the week. Figures 7, 8, and 9 indicates engagement levels throughout cycles 2-5 of the action research project where students responded to questions relating to their experience,

willingness to participate, and interest in the unit. There were some logistical and technical issues that will be discussed below relating to the irregular responses on the feedback form.

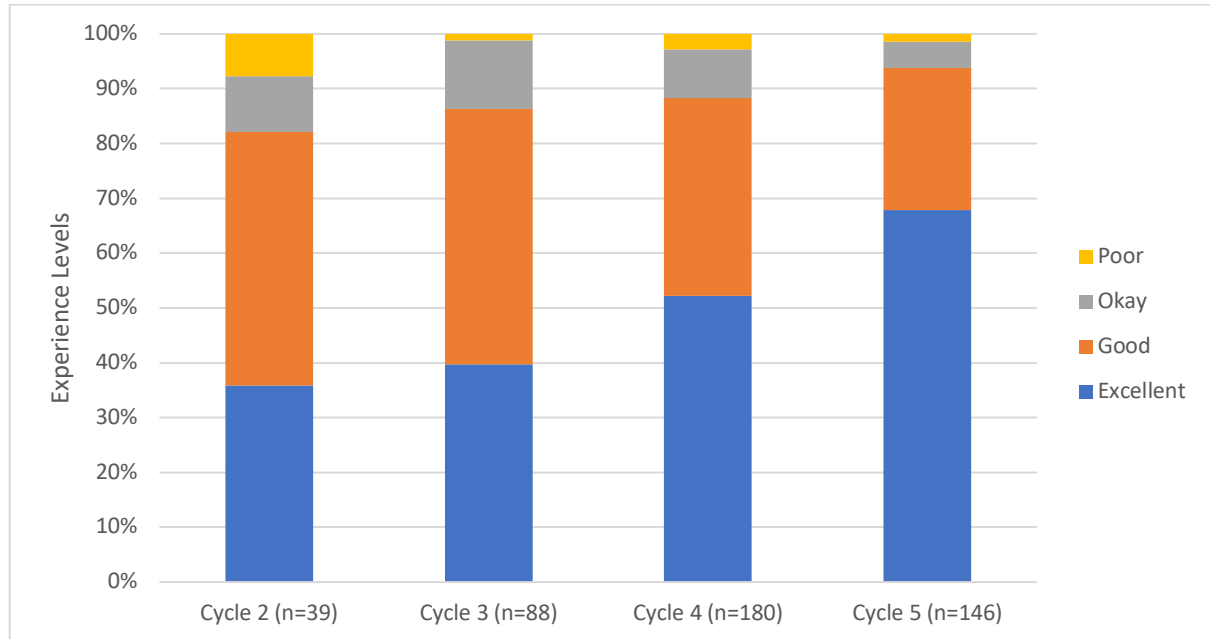


Figure 7. A stacked column graph demonstrating experience levels relating to enjoyment.

Figure 7 indicates that students had a positive experience of the unit. Guo et al. (2020) states that having a tangible goal or the production of artifacts that solve authentic problems is one of the six distinguishing features of PBL. This evidence is supported by Student 9 who said in his interview:

*“I kept trying and trying to jump as high as I could and my goal is to jump 1.25 meter... I was always practicing... ‘how can I jump high?’”*

In addition, Student 2 mentioned that having a realistic goal motivated him to improve.

*“I knew how to set a goal for me. Like not too hard, not too easy. Like just the goal which you can achieve.”*

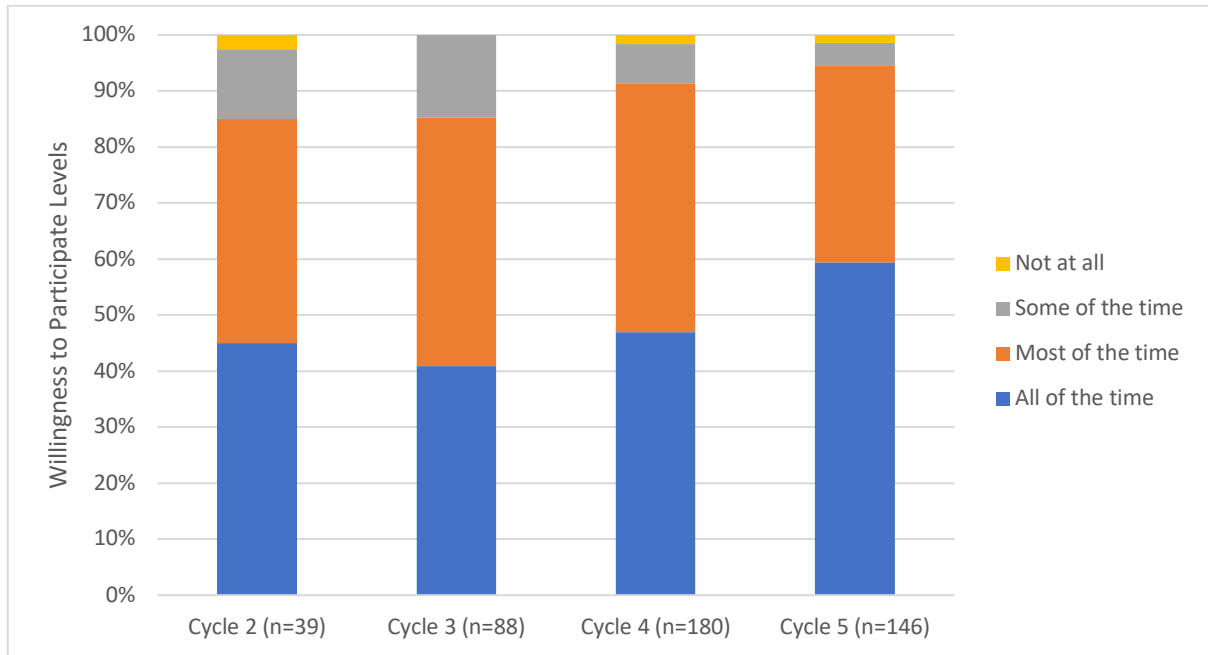


Figure 8. A stacked column graph demonstrating students' willingness to participate in the Track and Field unit.

Figure 8 demonstrates that students had a positive willingness to participate throughout the unit, indicating sound engagement levels. Axelson and Flick (2011) state that 'engagement' can be viewed as a "multidimensional construct" (pg. 41) combining behavioural, cognitive, and emotional elements. Student 5 stated that seeing herself improving was a key motivator for her to keep participating in the unit:

*"It makes me feel proud because I can try myself... I can be more better and my experience will get better."*

Having a genuine interest in a project, particularly one that speaks and relates to student concerns and issues, drives engagement levels (Coynne et al. 2016) to the point where students can become autonomous learners (Larmer et al. 2015). This can be seen in Student 10's interview:

*"I've practiced a lot on the, like the drills with the jumps... I've actually also watched some professionals do it... I slowed the video down and clip by clip to check... like studying from them."*

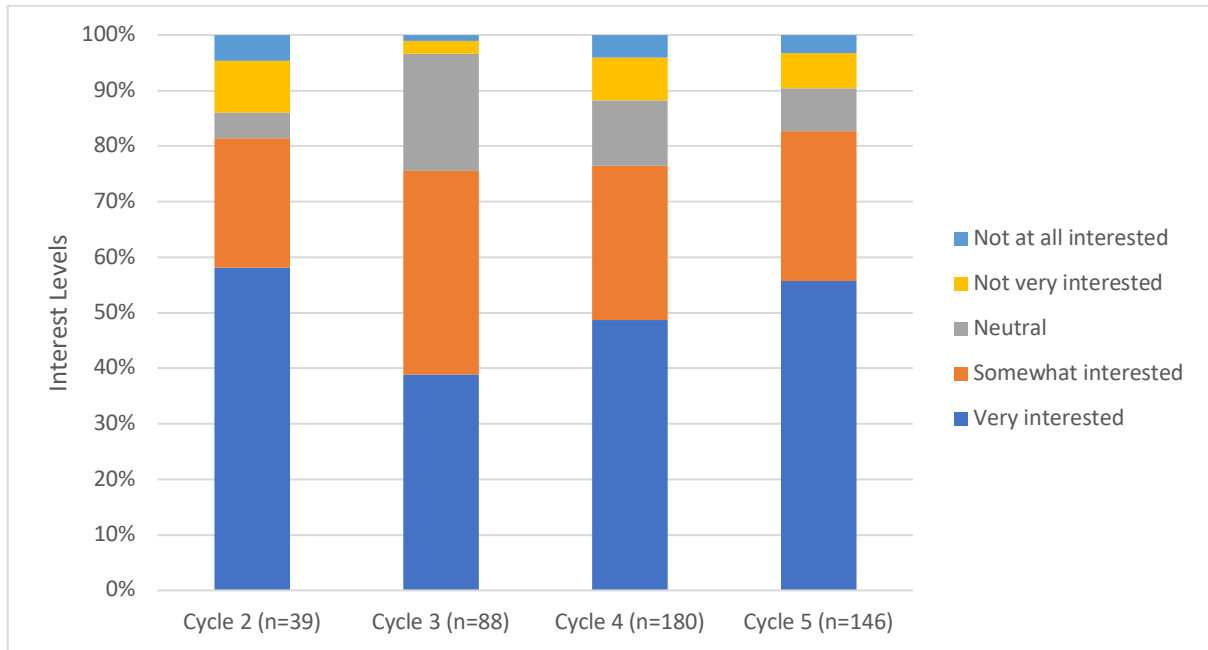


Figure 9. A stacked column graph demonstrating students' interest level in the Track and Field unit.

This student went beyond the material provided to him and actively searched for professionals to analyse. Similar comments were also heard from Student 1:

*"We need to know how the Olympic champions run and the moves they do. So you watch some videos on YouTube of how Bolt won the 2016 Berlin race... I can go further just like I have the extra power to go and search something."*

Table 4 presents the overall results of the weekly engagement surveys. It can be seen that 53% of students indicated that their PE experience was 'excellent', while 36% selected the 'good' option. The remaining options of 'okay', 'poor', and 'very poor' were 8%, 1%, and 2% respectively. Similar results were seen with the two remaining questions relating to willingness to participate and interest in the Track and Field unit, as seen in Table 4.



Survey Question	Responses	Number of Responses	Percentage
How was your experience with the PE lessons this week?	Excellent	242	53%
	Good	162	36%
	Okay	38	8%
	Poor	4	1%
	Very Poor	9	2%
In PE this week, were you eager to participate?	All of the time	222	49%
	Most of the time	188	41%
	Some of the time	37	8%
	Not at all	8	2%
Overall, how interested are you in this Track and Field unit?	Very interested	227	50%
	Somewhat interested	139	31%
	Neutral	56	12%
	Not very interested	15	3%
	Not at all interested	18	4%

Table 4. Student responses to the weekly feedback survey determining engagement levels.

Although it appears that the majority of students were positively engaged with the unit, there were exceptions. Student 8 stated she had an ‘okay’ time with the unit:

*“I don’t know how exactly to make the unit funner (sic). Cause training is exhausting. It’s like training is exhausting and tiring for me.”*

This student’s comments align with what Saavedra et al. (2021) mentioned with students experiencing “project fatigue” (pg. 32) where there needed to be some better balance between projects and other activities. Furthermore, Student 3 echoed Student 8’s comments by mentioning the following response when asked how the unit could be improved:

*“I think some games.”*

Despite these exceptions, the population's overall view of the unit was positive, which demonstrated that the majority of the students were engaged. However, as Axelson and Flick (2011) mentioned, some students may seem to be demonstrating behavioural traits linked with engagement but could be off-track, whereas others could appear to be disengaged and yet be focused on the relevant task. The teacher in this instance needs to be cognisant of what not only engages students but what motivates them, whether performance-based for a grade, or learner-oriented where the student is intrinsically motivated to learn. This leads us to our next research question where student motivation is explored.

### **How can project-based learning be used to encourage student motivation?**

Through student interviews, it was revealed that several of the sample were motivated to practice their relevant skills outside of usual PE class time, as Student 12 stated:

*"Like, I'm just thinking that, if I everyday train like that I would jump like 2 meters. I need to do like that so I sometimes do high knees at home... I do the other drills also, like the flight stretch."*

This student was motivated to ask her father for advice where they practiced together at home:

*"He asked me a lot of questions about the Javelin. What am I doing? How do I throw it and what position? I show it to him and then he just teaches me at home. We use little sticks to practice."*

When posed with the reasoning behind their decisions to perform extra practice, Student 10 claimed peer pressure as being an external motivator along with him claiming to be target-oriented:

*“So, like, I’m also very competitive and target-oriented... I actually felt very happy with my results... something that pushes me is like also kind of peer pressure.”*

Meanwhile, Student 12 found his future aspirations to be an Olympian enough of a motivator to continue practicing:

*“If I do very well, while I’m in the Olympics, China will think that, ‘oh, he is very good. We are the best, China is the best!’”*

Furthermore, Student 8 along with others discovered that their learning was not limited to PE but rather to other areas of their life. In this instance, this student was referring to her training plan that she developed herself which helped guide her training:

*“When we go to high school or university, we need to write a long essay... I can know now everything I do before I need a plan and then I can write my essay, we need a draft, and planning, what should I write.”*

These findings appear to concur with research indicating motivation levels may be negatively impacted if learning opportunities are not meaningful or relevant to the students (Larmer et al. 2015; Remijan, 2016). Student 3 commented:

*“PE makes me feel good because we do lots of fun things and it also PE, it’s not only for physical, it’s also for your life... Like in Track and Field, we learned how to be independent. And it also has tournaments to do teamwork and to do some plans to be ready.”*

On the other hand, not all students from the sample were willing to practice their skills beyond the PE classes. Out of the sample of 12 students, only 7 indicated that they performed some sort of training at home or at school outside of their usual PE times.

Having intrinsic motivation as an innate behaviour is valued as a 21<sup>st</sup> century skill as it allows individuals to persist in problem solving (Lamb, et al. 2017; Soland et al.

2013). PBL nurtures the process of learning by providing the intrinsic element of motivation as well as having a tangible end product to work towards providing the extrinsic aspect of motivation. This is a beneficial approach due to some studies identifying that academic motivation tends to decrease with age (Lamb et al. 2017; Larmer et al. 2015) and that understanding what motivates students seems to be an imperative to an engaging learning environment. In fact, there has been evidence that educational achievement is optimised when both types of motivation are used (Soland et al. 2013).

### **What benefits arise from implementing project-based learning in physical education for students?**

*“... using the right thing to help you complete your task. And the thing or tool that I use is the stopwatch and the laptop, and the laptop contains the PowerPoint that can help us... you need to use scientific ways, like if you are running the 50m, you need to do the plank that makes your core muscles get stronger and powerful.”*

Student 1's comment above demonstrated critical thinking skills by demonstrating research, analysis, skill application and informed decision-making, which Pill and SueSee (2017) recommend as being necessary in PE today. Furthermore, the ability to conduct critical thinking is highlighted in many reputable sources of what constitutes a 21<sup>st</sup> century skill (Anagün, 2018; Lamb et al. 2017; Koenig, 2011; Soland et al. 2013). Pill and SueSee (2017) also add that critical thinking skills can be developed in PE by teachers and students posing questions, creating solutions, and reflecting, all the while developing necessary personal and social skills. These strategies are vital to the success of PBL, which appears to have the potential for nurturing critical thinking.

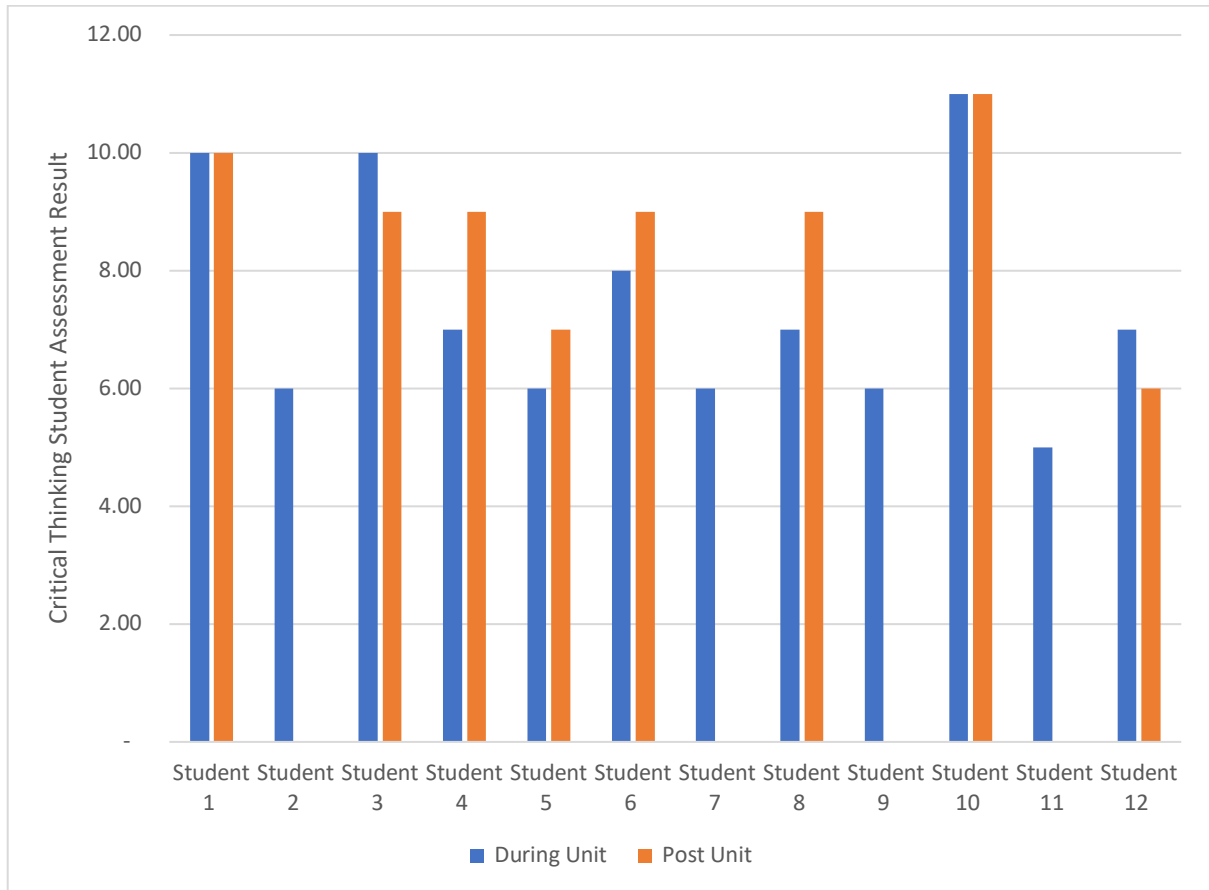


Figure 10. Critical thinking assessment scores during the unit and post-unit.

However, as seen in Figure 10, the quantitative data does not seem to suggest any significant difference in critical thinking skills despite the PBL intervention. While 4 students demonstrated some improvements, 2 remained the same, and 2 exhibited a decline. There seems to be no clear evidence of impact on students' critical thinking performance. Students 2, 7, 9, and 11 were unable to submit their assessment. Table 5 indicates there was improvement in overall critical thinking when observing the mean. However, a reduction in the sample size for the post-unit analysis could be a factor in this result.

	<b>Conditions</b>	<b>N</b>	<b>Mean Critical Thinking Result</b>	<b>Standard Deviation</b>
Critical Thinking Assessment Results	Pre-Unit	12	7.42	1.93
	Post-Unit	8	8.75	1.58

*Table 5. Mean critical thinking assessment results and standard deviations of the pre- and post-unit critical thinking assessment.*

Statistical analysis was undertaken to determine whether there was a relationship between ability levels and critical thinking development. A 1-tailed t-test was conducted to compare the critical thinking assessment results and ability levels.

<b>Critical Thinking Assessment Responders</b>	<b>Conditions</b>	<b>N</b>	<b>Mean Critical Thinking Result</b>	<b>P-Value (p&lt;0.05)</b>
High Ability Sample	Pre-Unit	4	8.50	Not significant
	Post-Unit	3	10.00	
Middle Ability Sample	Pre-Unit	4	6.00	Not significant
	Post-Unit	2	8.00	
Low Ability Sample	Pre-Unit	4	7.75	Not significant
	Post-Unit	3	8.00	

*Table 6. A table determining significant differences on critical thinking results in relation to ability levels.*

Although Table 5 indicates some improvement, statistical analysis seems to suggest that the improvements were not significant along all ability sample groups as presented in Table 6.

However, using the qualitative student interviews, the above quote from Student 1 seemed to suggest an improvement in his ability to problem solve his way to improving his skills by forming appropriate decisions in selecting the appropriate

tools and exercises. When referring to the IB's (2018) interpretation of critical thinking, this student exhibited analysis skills and the ability to form decisions.

Meanwhile, in a comment mentioned earlier Student 10 demonstrated superior analysis skills by explaining his process of breaking down professional athlete's skills:

*"I slowed the video down and clip by clip to check... like studying from them."*

Student 4 revealed his ability to critical think by revising his understandings due to new information through the reflection process. He was also able to synthesize new understandings by combining relevant information:

*"... but also reflecting, for example, reflecting the problems and mistakes we've done in the activities and find a solution to improve on it... research it online, for example, if I want to improve all of my 50m starts, then I need to, find information from the PowerPoint and then train by making my own plans... Like the Inverted C Throw, after combining all of the information... I can improve my lengths, like so on the shot puts."*

Despite the lack of clear evidence with the quantitative data through the assessment of the student's training plans, the qualitative evidence from the interviews seemed to exhibit evidence of critical thinking being present.

### **What influence does project-based learning have on student behaviour?**

During the data collection period of the study this research question was explored through structured observations, a Grit scale questionnaire, and semi-structured interviews.

*"So, in the real society... you need to make your own choices. You might choose the wrong choices, but then you need to reflect and never give up, which is grit. And sometimes life can be difficult, but you need to get over it. And maybe one day you'll find the successing (sic) part."*

Student 4 realized that the teacher was there to provide guidance and suggestions, not to provide strict instructions. Students made their own decisions with the material provided to them. This is one of the hallmarks of PBL where the teacher is a facilitator of learning due to this approach being based on constructivist and student-centred ideals (Coyne et al. 2016; Guo et al. 2020; Larmer et al. 2015).

Student 6 echoed similar feelings:

*“We’re grade 5 now, so we start like doing things ourself, like, we didn’t let the teacher help us very much. We learn things ourself, like a new strategy of learning things.”*

Due to the nature of the Track and Field unit, independence was emphasized to promote self-management skills, such as time management, and organizational skills, but also to replicate an authentic environment for their public product, their carnival. Therefore, project groups were not set, but rather students could choose to work independently, in partners, or in groups. Student voice and choice is one distinguishing feature of PBL (Hastie, et al. 2017) but also is one strategy to promote student engagement (Larmer et al. 2015). Being able to collaborate is viewed as a critical 21<sup>st</sup> century skill as stated in Lamb et al. (2017) as well as Soland et al. (2013) who state that the emphasis on communication and collaboration in the workforce has caused an increased focus of these skills within schools.

Based on structured observations, the sample members were observed to mainly work with partners of their choice. Generally, in this instance, students would naturally elect to work within their friendship circle, whether a small group or partners. Using Hesse et al.’s (2015) elements of effective collaboration, these being communication, cooperation, and responsiveness, these small groups or



partnerships largely satisfied the criteria for collaboration. It can be assumed that this was due to these relationships being formed prior to the unit where social constructs and dynamics had been previously navigated. However, there are exceptions to this situation from what was stated by Student 9:

*“My training was not very good. Sometimes I was like playing with some of my friends.”*

In other instances, students of different friendship groups were observed helping each other with the common goal of improving their same chosen skill. As Student 2 mentioned:

*“Like (Student 1) helping part, like I learned how to let others help me, and also I will help others.”*

Furthermore, Student 4 was observed collaborating with another individual at the shotput area where feedback was shared, and measurements were taken for each other. A similar observation was seen with Student 11 however with a small group rather than in pairs at the javelin station. This type of individual, partner, or group dynamics was observed regularly throughout the unit where students had the choice to choose which task they wanted to focus on and who, if they wanted to, they could work with. However, a limitation of this study comes down to the nature of how the unit was structured. There was a lack of opportunity for students to practice their collaboration skills in assigned small groups where the need to navigate group dynamics would have been much more evident.

In relation to behavioural traits, the construct of grit has recently been emerging in literature (Bashant, 2014; Pappano, 2013). It has also recently been added in as a key skill for students to be explicitly taught within the IB (IB, 2018) although

according to Lamb et al. (2017) there is a lack of clear evidence to suggest directly developing grit levels would make an impact on student academic performance. Despite this view, Lamb et al. (2017) as well as Soland et al. (2013), have included grit as a desirable trait for the 21<sup>st</sup> century.

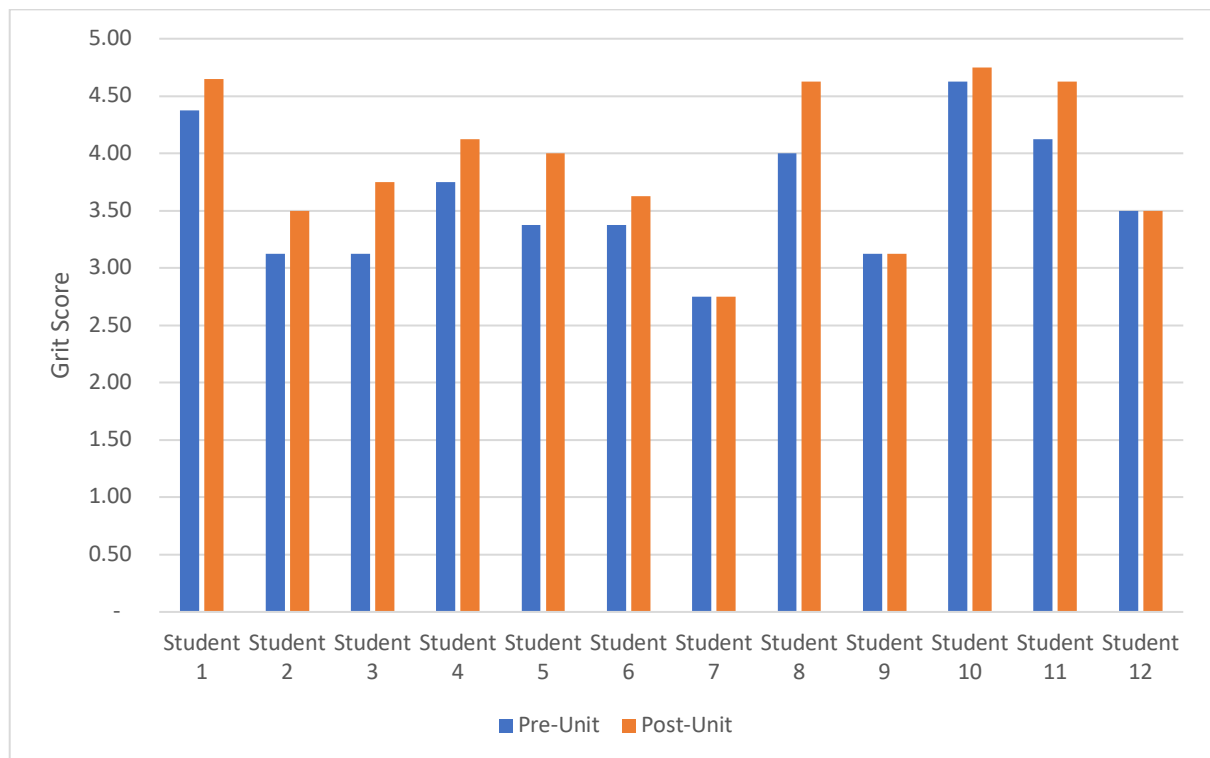


Figure 11. Clustered column graph to show raw grit scores collected pre-unit and post-unit

As can be seen in Figure 11, students completed the Grit-S questionnaire (Duckworth and Quinn, 2009) prior to the Track and Field unit and then soon after the completion of the unit. Out of the 12 students, 9 (75%) demonstrated an improvement in their grit levels with 3 remaining the same. Table 7 indicates the statistical analysis of the Grit-S questionnaire (Duckworth and Quinn, 2009), where overall the sample demonstrated some improvement in their grit levels.

	<b>Conditions</b>	<b>N</b>	<b>Mean Grit Score</b>	<b>Standard Deviation</b>
Grit-S Results	Pre-Unit	12	3.60	0.57
	Post-Unit	12	3.92	0.66

*Table 7. A table demonstrating the mean grit scores and standard deviations of the pre- and post-unit Grit-S self-report.*

To determine if there was a relationship between ability levels and grit levels,, statistical analysis was undertaken through the use of a 1-tailed T-test.

<b>Grit-S Responders</b>	<b>Conditions</b>	<b>N</b>	<b>Mean Grit Score</b>	<b>P-Value (p&lt;0.05)</b>
High Ability Sample	Pre-Unit	4	3.88	Significant
	Post-Unit	4	4.07	
Middle Ability Sample	Pre-Unit	4	3.66	Significant
	Post-Unit	4	4.19	
Low Ability Sample	Pre-Unit	4	3.28	Not significant
	Post-Unit	4	3.50	

*Table 8. A table determining significant differences on Grit-S results in relation to ability levels.*

Table 8 indicates that the high and middle ability level portion of the sample demonstrated a statistically significant difference. However, despite the indicated improvements, the results suggest that there was no significant difference in overall grit scores for the low ability sample.

Grit was regularly used in student vernacular throughout the unit as well as being a prominent feature in the structured interviews:

*“... training needs perseverance, like, and you need to have grit in order to make achievement.”*  
(Student 4)

Student 1 used a superhero metaphor to help him connect with the concept of grit:

*“I would describe grit, it’s just like the superhero and laziness is the villain. And you need to have that strength to kill the villain and that strength, you have is a superhero power. So, the superhero is grit.”*

In fact, Student 10 stated that he really felt what it means to ‘not give up’:

*“All the way from grade 1 and 2 here, I always heard that not give up, but I don’t really feel it. I don’t know what exactly, cause it’s kind of like a, just a concept to me. So, I really experienced it too, like throughout this unit.”*

Student 10 demonstrated a potential limitation in this unit as it appears the students have knowledge of what grit is, considering that the term is familiar to them. However, as this student declares, it is only at this time that he truly experienced it. It is unclear how many other students experienced this concept to the same extent he did.

Despite this, the empirical data for the sample seems to suggest that the PBL intervention was successful in raising grit levels and the qualitative interviews appear to indicate a strong familiarity with the concept. These results uphold previous research indicating the potential for PBL to enhance grit levels (Reed and Jeremiah, 2017). Ivcevic and Brackett (2014) do not directly mention that grit can be enhanced through project-based learning, however they do note that PBL requires long-term commitment to tasks and projects where diligence and emotional management are necessary for project success. Meanwhile, Larmer (2014) explicitly declares that grit can be developed in students by exposing them to situations requiring it during lengthy, real-world, and challenging projects. Although this study’s data set seems to suggest a strong argument for PBL in developing grit levels, there was limited literature available specifically correlating PBL and grit.

This analysis chapter addressed the research questions by using evidence-backed data and literature gathered through a variety of sources. Each of the research

question responses has been put through the triangulation process to ensure data gathered was valid and reliable.

Chapter 5 brings together all the findings to present final conclusions on the impact project-based learning has on the development of key 21<sup>st</sup> century skills within physical education. Recommendations for further research are also presented.

## **Chapter 5: Conclusions**

### **5.1 Introduction**

The objective of this study was to determine the potential for the development of fundamental 21<sup>st</sup> century skills through the use of project-based learning in physical education within an international school in China. This final chapter provides an overview of this study's findings with reference to assessments presented in the literature review.

### **5.2 Summary of the main findings and conclusions**

#### **How can project-based learning be used to increase student engagement?**

The data from the weekly surveys found that the grade 5 population were overall engaged with 53% of the responses stating they had an excellent experience for each of the study weeks. In addition, 49% of responders were eager to participate all the time, and 50% stating they were very interested in the unit. Qualitative data results found from the structured interviews indicated the sample members had similar feelings with 10 students describing the unit with words such as, 'very fun', 'enjoy', and 'excited'. The 2 remaining students from the sample described the unit as, 'okay'. This data concurs with literature claiming that student engagement levels were improved when the PBL approach was used (Larmer et al. 2015; Krajcik, et al. 2021; Saavedra et al. 2021; Terada, 2021). Through authentic, meaningful, and student-driven projects, together with the strategic use of project milestones for guidance, students were able to create their own journey through the project development process, thus allowing for project ownership along with empowered learners. Therefore, this would support the conclusion that PBL can indeed engage

students and this study certainly concurs with Simonton et al. (2020) indicating that there is opportunity for PBL to be used in the PE setting.

### **How can project-based learning be used to encourage student motivation?**

The use of project-based learning in a Track and Field unit gave students the opportunity to develop their project in their own way through student voice and choice (Bell, 2010; Coyne et al. 2016; Larmer et al. 2015) as indicated in the literature review of this study. When students have ownership over their work this gives them a sense of control and agency, which subsequently promotes student motivation (Soland et al. 2013). Furthermore, interviews gave insight into student motivation through the disclosure of students practicing their relevant skills outside of PE lessons as well as with teacher observations of students gathering and training their skills during recess times. This suggests that within the PBL context, students were provided an incentive to put extra effort into their projects. However, evidence was not clear whether the motivation was intrinsic or extrinsic in nature. Although, Soland et al. (2013) do mention that there is evidence of improved academic performance when both intrinsic and extrinsic motivation are targeted, which PBL has the flexibility to do (Larmer et al. 2015). Although not representative of the overall sample, this comment by Student 10 indicated that at least he thought that his learning could be used in areas other than PE.

*“It helped me to like, on other projects in grade 5 happening. So, also like the grade 5 business and to also like keep on going, never give up on your ideas... After the track and field unit, I actually changed a lot... I won't think that I'm like working with no plans and because I'll set a clear plan and like also from, with homework, I'll tick them and clearly remind myself of what things are undone.”*

This adds strength to the argument that PBL can be adapted into the PE setting due to PBL's flexibility where key skills such as time management, motivation, and planning as well as behavioural traits such as perseverance and grit, can be

beneficial. This occurs while also giving students the opportunity to be active and to learn fundamental lifetime beneficial movement skills.

### **What benefits arise from implementing project-based learning in physical education for students?**

Although this study found minimal impact on critical thinking skills through quantitative data collection and analysis, the qualitative data suggested differently. Critical thinking assessment results analysis demonstrated no significant difference between the two testing periods, which contradicts research (Bell, 2010; Simonton et al. 2020) claiming otherwise. On the other hand, students interviewed demonstrated the capacity to problem solve their way throughout the project by analysing their relevant skills, creating and executing their training plans, and reflecting on their progress. As Student 4 remarked:

*“reflecting the problems and mistakes we’ve done in the activities and find a solution to improve on it.”*

The creation of the training plan required critical thinking skills to develop and was assessed according to the IB’s (2018) interpretation of critical thinking, being analysing, evaluating, and forming decisions. As Student 6 observed:

*“We can put our scores and exercise into the training plan so that we know, like every time when we open our training plan, we know what exactly we’re going to do.”*

This practice of planning and reflecting within this Track and Field unit supports expectations of what is required in a PBL unit according to the research of Coyne et al. (2016) who state that once confronted with the driving question of the project, students would commence creating their action plan to solve the project. Throughout



the project students would have ample opportunities to reflect on their learning and the effectiveness of their action plans.

### **What influence does project-based learning have on student behaviour?**

This study found that PBL enabled students to develop grit, a behavioural trait which is explained as a combination of passion and perseverance toward long-term goals (Duckworth and Quinn, 2009) and is found in literature (Lamb et al. 2017; Soland et al. 2013) stating its value as a 21<sup>st</sup> century skill. The High Ability and Middle Ability cohort of the sample demonstrated significant grit level enhancements. The Low Ability cohort did see some improvements, however statistical analysis indicated it was not significant. Student interviews indicated that grit was a fundamental part of their learning and could be used in other areas of their lives, as Student 10 mentioned:

*“And also, it (Track and Field unit) helped me to like, on other projects in grade 5 happening. So, also like the grade 5 business and to also like keep on going, never give up on our ideas.”*

Furthermore, data collected from the structured observations in relation to collaboration skills indicated positive albeit limited results. Considering the nature of the unit being mainly focused on independence, there were no assigned groups, but rather students were given the freedom to choose to work independently, with partners, or in groups. This approach reflects a fundamental element of PBL as indicated in the literature of Larmer et al. (2015) and Coyne et al. (2016) which refers to student voice and choice. Students were seen to predominantly work within their friendship circles, whether in pairs or small groups, and demonstrated the hallmarks of effective collaboration indicated by Hesse et al. (2015). However, due to the lack of assigned groups, student collaboration skills were rarely pushed to the limit.

Collaboration is viewed as a critical 21<sup>st</sup> century skill (Anagün, 2018; Lamb et al. 2017; Soland et al. 2013) and is claimed to be significantly developed through the PBL approach (Larmer et al. 2015).

### 5.3 Limitations

This study's objective was to determine whether key 21<sup>st</sup> century skills, namely critical thinking, collaboration, grit, and motivation, could be developed using a project-based learning (PBL) approach within the physical education (PE) environment. While the study produced largely positive results, there were limitations that need to be acknowledged. The methodological approach of action research has its limitations, namely the limited ability to generalize findings to universal law or to the population, particularly with this study's small sample size of 12 students. On the other hand, the strength of action research and this author's objective was to improve their own personal practice, for which small qualitative studies are more suitable (Myer, 2000).

In addition, the lack of consistent assigned groups during this unit limited the observation of the development of collaboration skills. It was difficult to draw conclusions on collaboration development when students were generally working within friendship circles.

### 5.4 Recommendations for future research

From this study, it is evident that there are further research opportunities available. These include investigating PBL within a different PE unit such as Invasion Games where students inquire into sports, such as basketball, football, and handball, etc. These sports rely heavily on teamwork where collaboration skills can be challenged

and investigated, a limitation of this study's unit as indicated previously. Pill and SueSee (2017) mentioned that through a game of 3 versus 3 keep-away ball game students were required to use critical thinking skills to investigate strategies to maintain possession of the ball. Such a study would aid PBL's image of being able to be used not only the PE setting but in a variety of units within the PE context.

Further research could also be conducted to include teacher's perspectives of PBL within PE, potentially through a case study. Considering the difficult predicament PE finds itself in (Kreschmann, 2014) and the need for reform within the subject to ensure relevancy (Crum, 2017), there is an opportunity for PBL to be utilised and investigated.

It was also noted that there is minimal research available on the correlation between PBL and grit, possibly due to their relatively recent emergence. As previously stated, grit is regularly considered a desirable trait for the 21<sup>st</sup> century (Lamb et al. 2017; Soland et al. 2013), with some literature claiming that grit can be enhanced through this learning approach (Larmer, 2014; Reed and Jeremiah, 2017). However, more needs to be done to indicate a strong correlation between PBL and grit.

Lastly, this study occurred in an international school catering for students from high socioeconomic status families where available equipment and facilities were sufficient for the unit to occur. Through a PE context, further research could reflect different population types from varying socioeconomic statuses to further validate the claim that PBL can be adapted to variety of settings (Larmer et al. 2015), regardless of socioeconomic status (Terada, 2021).

It is evident that there is ample opportunity for further research into the use of project-based learning in physical education, focused on the development of 21<sup>st</sup> century skills or otherwise. Nevertheless, this study followed an action research method where the enhancement of personal practice was emphasised. The study drew conclusions from a particular environment which would be difficult to replicate in other settings. Therefore, rather than using this as a definitive outcome, this study could be used to encourage interest for further research into project-based learning in physical education.

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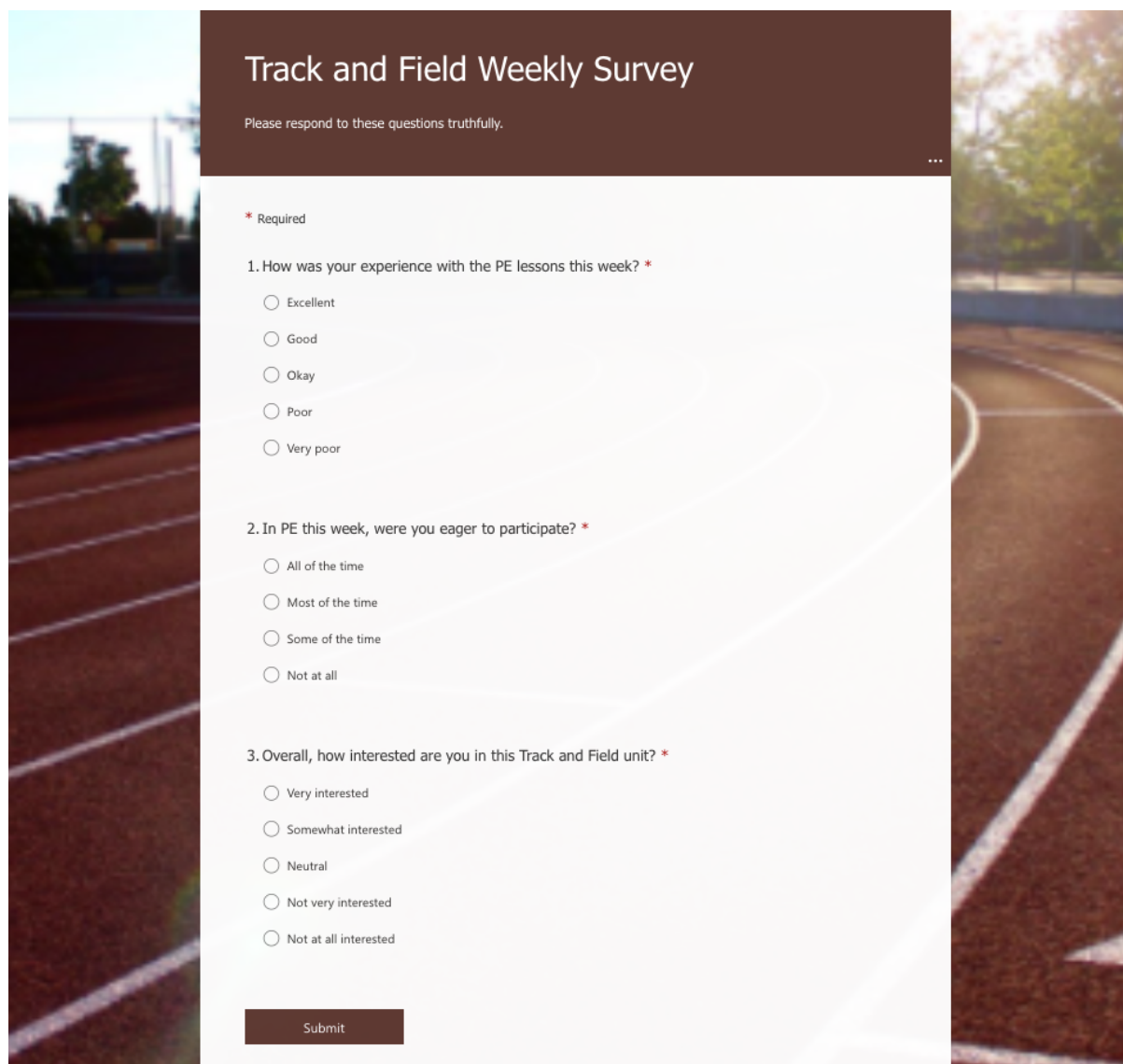
## Appendices

### Appendix A: Track and Field PowerPoint



[https://docs.google.com/presentation/d/1YakbAUQSTc0T0jB9G5Jq20HKAXnWdzfq/edit?usp=drive\\_web&oid=108880388958631370040&rtpof=true](https://docs.google.com/presentation/d/1YakbAUQSTc0T0jB9G5Jq20HKAXnWdzfq/edit?usp=drive_web&oid=108880388958631370040&rtpof=true)

## Appendix B: Weekly survey



**Track and Field Weekly Survey**

Please respond to these questions truthfully.

**\* Required**

1. How was your experience with the PE lessons this week? \*

- Excellent
- Good
- Okay
- Poor
- Very poor

2. In PE this week, were you eager to participate? \*

- All of the time
- Most of the time
- Some of the time
- Not at all

3. Overall, how interested are you in this Track and Field unit? \*

- Very interested
- Somewhat interested
- Neutral
- Not very interested
- Not at all interested

**Submit**

## Appendix C: Semi-structured interview schedule

### **Interview Schedule**

**Study Title:**

The Development of Key 21<sup>st</sup> Century Skills using Project-Based Learning in Physical Education

<b>First Interview</b>		
<b>To be done at the start of the unit</b>		
	<b>Question/ Response</b>	<b>Comments</b>
<b>1</b>	Can you describe your PE experience? - If prompt required: Describe anything about how you feel about PE or what you have learned, wherever suits you.	
<b>2</b>	What do you expect to experience in the Track and Field unit?	
<b>3</b>	What does the Track and Field unit need to have in order to make it engaging for you?	
<b>4</b>	What do you think you need to do in order to do the best you can in the Track and Field unit?	
<b>5</b>	How can the Track and Field unit help you become motivated to improve?	
<b>6</b>	What do you expect to learn in the Track and Field unit?	
<b>7</b>	What skills do you think you will learn that can be used beyond PE?	
<b>Interview Ends</b>		



<b>Final Interview</b> <b>To be done at the end of the unit</b>		
	<b>Question / Response</b>	<b>Comments</b>
<b>1</b>	Can you describe your PE experience? - If prompt required: Describe anything about how you feel about PE or what you have learned, wherever suits you.	
<b>2</b>	What can you tell me about the Track and Field unit? - If prompt required: Describe how you feel about the unit or what you have learned, anything about the unit.	
<b>3</b>	Can you describe your feelings when you are participating in the Track and Field unit?	
<b>4</b>	What makes you feel this way?	
<b>5</b>	Can you describe your experience with the Track and Field unit?	
<b>6</b>	What is it about the Track and Field unit that makes you feel that way?	
<b>7</b>	Optional – if responses go this way: - Are there other times out of PE classes that you practice your skills?	
<b>8</b>	Optional – if responses go this way: - Why do you practice outside of your PE classes?	
<b>9</b>	What have you learned from the Track and Field unit?	
<b>10</b>	Can you describe your training plans for your chosen events?	
<b>11</b>	What skills have you learned from this unit that you can use in other situations? Say, in your homeroom or in areas other than school?	
<b>Interview Ends</b>		

## Appendix D: Grit scale survey

### Grit Scale Survey:

For each of the following statements, please indicate how descriptive they are of you.

		Not at all like me (1)	(2)	(3)	(4)	Very much like me (5)
1.	New ideas and projects sometimes distract me from previous ones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Setbacks don't discourage me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	I have been obsessed with a certain idea or project for a short time but later lost interest.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	I am a hard worker.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	I often set a goal but later choose to pursue a different one.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	I have difficulty maintaining my focus on projects that take more than a few months to complete.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	I finish whatever I begin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	I am diligent. Definition: You show care and detail in your work and duties.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



## Appendix F: Critical thinking rubric

### Critical Thinking Summative Assessment Rubric

#### Study Title:

The Development of Key 21<sup>st</sup> Century Skills using Project-Based Learning in Physical Education

<b>Formative Assessment Task 1:</b> Select 3 events and indicate key points for each chosen event				
	<b>Emerging</b>	<b>Developing</b>	<b>Acquired</b>	<b>Accomplished</b>
<b>Analyzing</b>	Student is unable to identify any key points regarding their chosen events	Student can identify and describe 1-2 key points regarding their chosen events	Student can identify and describe 3 key points regarding their chosen events	Student can identify and describe 4 or more key points regarding their chosen events

<b>Formative Assessment Task 2:</b> Students identify strengths and areas of improvements in regards to their training in each event Students create a training plan designed to enhance their training for each event				
	<b>Emerging</b>	<b>Developing</b>	<b>Acquired</b>	<b>Accomplished</b>
<b>Analyzing</b>	Student is unable to accurately identify strengths and areas requiring improvement.	Student identifies strengths and areas requiring improvement to some degree.	Student identifies strengths and areas needing improvement.	Student is able to accurately identify and detail strengths and areas needing improvement.
<b>Evaluating</b>	Student does not specify a source to appropriately select their exercises.	Student uses 1-2 sources to select exercises. Sources are reasonable.	Student uses 2-3 sources to select exercises. Sources are reputable.	Students collect information from a variety of viable sources to create their own plan.
<b>Forming Decisions</b>	Student is unable to select appropriate exercises. The plan is not organized logically. The student is unable to justify their decisions.	Student selects some exercises that are appropriate. The plan is reasonably organized. Decisions are weakly justified.	Student selects appropriate exercises. Plans are organized effectively. The student is able to justify their decisions.	Student selects appropriate exercises and organizes their plans logically and with detail. The student is able to effectively justify their decisions.

## Appendix G: Gatekeeper letter

David Cooney  
[David.Cooney@bcis.cn](mailto:David.Cooney@bcis.cn)

### **The Development of Key 21<sup>st</sup> Century Skills using Project-Based Learning in Physical Education**

Dear Mr. Schafer,

I am currently in the final year of an MA Education degree at the University of Sunderland where I am required to conduct a small-scale research project. I am seeking your permission whether I can conduct this study at our school, Beijing City International School.

My study will focus on the development of critical 21st-century skills through the use of project-based learning in physical education. I will be seeking to determine whether project-based learning is a viable pedagogical model in physical education and whether it can be used to foster critical thinking and collaborative skills, along with grit, and motivation. All of which are deemed to be important skills and traits to possess in the current century.

My full sample will be all of the students in grade 5 with a randomly selected sub-sample of 12 students. All data collected will be anonymous. The project has been designed with several data collection instruments. The full sample will be completing a weekly 3-question survey whereas the sub-sample will be undertaking a more in-depth look at their PE experience involving a grit scale questionnaire, an interview, observations, and an additional summative reflection.

As mentioned previously, the full sample consisting of all of grade 5, will be completing a short, anonymous survey, which is part of my usual teaching practice. For this reason, I do not foresee any need for parental consent. However, participants in the sub-sample will be given an information sheet detailing their role in the study. Due to their young age, their parents/guardians' permission will be sought through an informed consent form. These consent forms will be stored securely and separately from collected data. Parents will also receive an information sheet explaining to them what the study will involve, and what their role and their child's role will be in the study.

It will be stressed to the sub-sample that participation in the study is voluntary and that they have the right to withdraw at any time. If this occurs, any data collected relevant to said participant will be destroyed.

Upon completion of the study, the results will be published in my thesis and then presented to the University.

The plans of this study have been presented and approved by the University of Sunderland Ethics Committee. If you wish to discuss this further, please do contact me by using the email listed above. Furthermore, I have listed the contact details of my supervisor and the Chair of the University of Sunderland Research Ethics Group below if you do wish to reach out to someone from the University.

Yours sincerely,  
*David Cooney*

#### Contacts for further information

Simon Sheard ([simon.sheard@sunderland.ac.uk](mailto:simon.sheard@sunderland.ac.uk))  
Thesis Supervisor, University of Sunderland

Dr. John Fulton ([john.fulton@sunderland.ac.uk](mailto:john.fulton@sunderland.ac.uk))  
Chair of the University of Sunderland Research Ethics Group, University of Sunderland

## Appendix H: Parent information sheet

### **Parent Information Sheet**

#### **Study Title:**

The Development of Key 21<sup>st</sup> Century Skills using Project-Based Learning in Physical Education

#### **What is the purpose of the study?**

The purpose of this study is to determine the effectiveness of using a project-based learning educational approach within physical education to develop critical 21st-century skills. It will assess the development of skills such as critical thinking and collaborative skills, along with grit, and motivation. Students will engage in a Track and Field unit as per normal but some students have been randomly selected to play a bigger role in the study.

#### **Why have I been approached?**

You have been approached because your child has been randomly selected to participate in the study at a larger capacity whereby I will need your consent to participate in the study.

#### **Does my child need to take part?**

No. Participation in the research is voluntary and consent can be withdrawn at any time. If initially you do give consent to allow your child to participate but then you or your child does not wish to continue, that is acceptable. Any data collected from your child to that point will be destroyed.

#### **What will happen to my child if they take part?**

Your child will be partaking in a Track and Field unit, where I will be observing and taking anecdotal notes as per normal along with the rest of the grade. In addition, your child will be completing the following:

- A 3-question weekly survey
- Two 10-minute interviews, one at the beginning of the unit and one at the end of the unit
- An 8-question questionnaire will be completed at the start and end of the unit
- A summative assessment

#### **What are the possible disadvantages and risks of taking part?**

There are no perceived disadvantages or risks involved in taking part in the study. The additional tasks mentioned above will take some extra time to do, but that is at a minimum.

#### **Will my child's involvement in this study be confidential?**

Any data collected from your child will be kept anonymously and stored separately from their consent form.

#### **What will happen to the results of the research study?**

Collected data from the observations, surveys, assessments, and questionnaires will be analyzed, which will then become part of my thesis for my Masters of Education degree. In regards to the interview, it will be transcribed and analyzed with the results becoming part of the thesis. Some elements of collected data will be quoted within the thesis. Upon this eventuality, this will be anonymously quoted.

**Who is organizing and funding the research?**

This research is organized by David Cooney who is a final year student at the University of Sunderland on the Masters of Education degree. This project is not externally funded.

**Who has reviewed the study?**

A department subcommittee of the University of Sunderland Research Ethics Committee has reviewed and approved the study.

**Who can I contact for further information?**

You can contact me, my thesis supervisor, or the Chair of the Ethics Committee for additional information regarding this study. Contact information is below.

David Cooney ([David.Cooney@bcis.cn](mailto:David.Cooney@bcis.cn))

Lead Teacher-Researcher, University of Sunderland

Simon Sheard ([Simon.Sheard@sunderland.ac.uk](mailto:Simon.Sheard@sunderland.ac.uk))

Thesis Supervisor, University of Sunderland

Dr. John Fulton ([John.Fulton@sunderland.ac.uk](mailto:John.Fulton@sunderland.ac.uk))

Chair of the University of Sunderland Research Ethics Group, University of Sunderland

## Appendix I: Parent informed consent

### **Parent/Guardian Informed Consent Form**

#### **Study Title:**

The Development of Key 21<sup>st</sup> Century Skills using Project-Based Learning in Physical Education

#### **Note:**

Please put a tick (✓) in the relevant box for each statement.

- 1** I have read the information sheet relating to the research and understand what is being asked of my child.  
 Yes  No
  
- 2** I consent to my child being a part of the study entitled, "The Development of Key 21<sup>st</sup> Century Skills using Project-Based Learning in Physical Education".  
 Yes  No
  
- 3** I understand that any data collected from my child will be kept confidential, and stored safely and securely. The data will be destroyed 6 months after the completion of the study.  
 Yes  No
  
- 4** I understand that there may be some extracts from my child's collected data that will be anonymously quoted in presentations, reports, or publications resulting from the research.  
 Yes  No
  
- 5** I understand that my child has the right to withdraw from the study without giving a reason at any time during the study itself. Any collected data from my child will be destroyed immediately.  
 Yes  No

Parent's Name: \_\_\_\_\_ Researcher's Name: \_\_\_\_\_

Parent's Signature: \_\_\_\_\_ Researcher's Signature: \_\_\_\_\_

Child's Name: \_\_\_\_\_



## Appendix J: Participant information sheet

### **Participant Information Sheet**

#### **Study Title:**

The Development of Key 21<sup>st</sup> Century Skills using Project-Based Learning in Physical Education

#### **What is the purpose of this project?**

This project aims to find out if the way Mr. David teaches PE can help students learn important skills that will help them in and beyond school. The important skills this project will explore are critical thinking, collaboration, grit, and motivation. This will occur in our Track and Field unit.

#### **Why have I been chosen?**

All of grade 5 will be taking part by completing a weekly survey. However, you have been chosen randomly where you will play a more important role in the project.

#### **Do I have to take part?**

No, you do not need to take part if you do not want to.

#### **What is my role in this project?**

For this project, you will be joining the Track and Field unit just like everyone else, but I will be taking notes and observing you. Also, you will be asked to complete these items:

- A 3-question weekly survey (this is the same survey that everyone in grade 5 does)
- Two 10-minute interviews, one at the beginning of the unit and one at the end of the unit
- An 8-question questionnaire will be completed at the start and end of the unit
- A summative assessment

#### **What disadvantages and risks are there to joining the project?**

There are no big risks in being part of the project but there is some additional work you will need to do. That extra work is listed in the previous question.

#### **What possible benefits will there be if I join the project?**

You will be helping Mr. David find out if PE can become an even more important class that can help students learn important skills. Everything we find out will help PE become better.

#### **Will my information be kept confidential?**

All the data Mr. David will collect from you is anonymous, which means no one knows it is your information.

#### **What happens if I want to leave the project?**

You are allowed to leave the project at any time. Any data Mr. David collected from you will be erased if you leave the project before it is completed.

#### **Who is organizing and paying for this project?**

Mr. David is organizing and paying for the project by himself.