



University of
**Southern
Queensland**

**AN EXPLORATION OF
PROJECT MANAGEMENT LEARNING IN
AUSTRALIAN PRIMARY SCHOOLS**

A thesis submitted by
Sante Delle-Vergini
(MBA, MA, MSc)

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ABSTRACT

Teachers in primary education have been utilising projects to deliver instructional content for over a century. As projects become increasingly complex, so too does the ability to manage them successfully. The project management discipline is uniquely positioned to provide the knowledge and skills to manage projects successfully. However, it is focused on the education and training of adults, not young children. To understand more about project management teaching in primary education, research was undertaken that resulted in three published articles. The first article presented a scoping literature review on teaching project management to primary school children. In the second article, seventeen project management experts utilised the Delphi method to gain consensus on the core components required for children to manage small and simple projects. In the third article, reflexive thematic analysis was used to analyse, interpret, and present the perspectives of thirteen Australian primary school teachers on children learning about project management. The findings from the first article revealed that while elements of project management are being taught in primary education, they do not constitute a holistic view of the knowledge and skills required for a child to manage a project successfully. The findings from the second article revealed that while children can and should learn about project management early in school, some skills are more important and difficult to learn than others. In the third article, the findings revealed that while teachers have a positive view of children learning project management, they also face issues inside and outside the classroom that impact their ability to teach project management effectively. Finally, the article presented several suggestions for improving ways of teaching project management, principally through the introduction of a simple but flexible project management learning framework. This research has implications for children in school, at home, in the community, and in their future working lives since projects are so pervasive throughout society. The interdisciplinary nature of the topic highlights the need for collaboration between the fields of project management and education to design, develop, and deliver comprehensive project management learning for young children. To succeed in the 21st century, children should learn project management holistically and as early as possible. It is hoped that this thesis and subsequent research on the topic will have a positive impact on the lives of children by teaching them how to manage their current and future projects more successfully.

CERTIFICATION OF THESIS

I, Sante Delle-Vergini, declare that the Thesis entitled *An Exploration of Project Management Learning in Australian Primary Schools* is not more than 100,000 words in length, including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. The thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Date: 14 September 2024

Endorsed by:

Dr Douglas Eacersall
Principal Supervisor

Dr Chris Dann
Associate Supervisor

Dr Mustafa Ally
Associate Supervisor

Dr Subrata Chakraborty
Associate Supervisor

Student and supervisors' signatures of endorsement are held at the University.

STATEMENT OF CONTRIBUTION

Articles	Authors	Sante Delle-Vergini authorship (%)
<p>Article 1 (in Chapter 2)</p> <p>Teaching project management to primary school children: A scoping review</p> <p>Published April 2023 in <i>The Australian Educational Researcher</i></p> <p>https://doi.org/10.1007/s13384-023-00627-7</p>	<p>Sante Delle-Vergini Douglas Eacersall Chris Dann Mustafa Ally Subrata Chakraborty</p>	<p>70%</p>
<p>Article 2 (in Chapter 3)</p> <p>Teaching project management to primary school children: Exploring the perspectives of project practitioners</p> <p>Published March 2023 in <i>Issues in Educational Research</i></p>	<p>Sante Delle-Vergini Mustafa Ally Douglas Eacersall Chris Dann Subrata Chakraborty</p>	<p>80%</p>
<p>Article 3 (in Chapter 4)</p> <p>Exploring the perspectives of Australian primary school teachers on students learning about project management</p> <p>Published September 2024 in <i>Issues in Educational Research</i></p>	<p>Sante Delle-Vergini Douglas Eacersall Chris Dann Mustafa Ally Subrata Chakraborty</p>	<p>90%</p>

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Dedication

This work is dedicated to, and inspired by, my children.

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ABBREVIATIONS

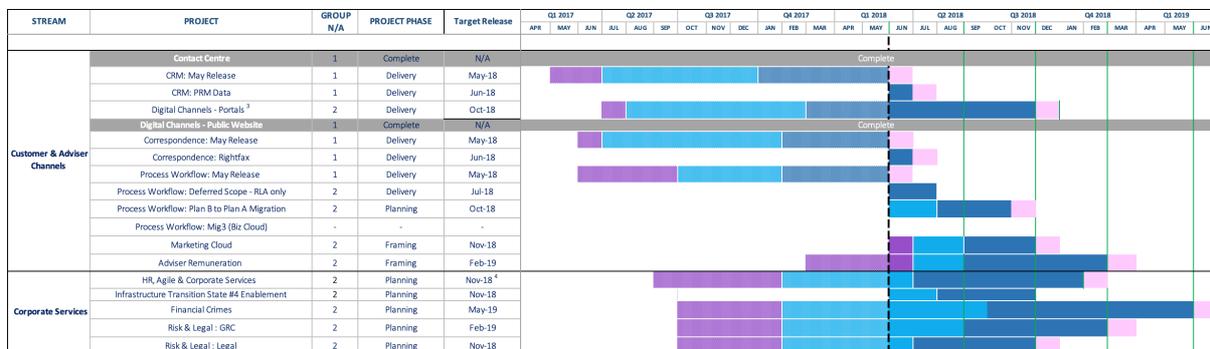
ACARA	Australian Curriculum, Assessment and Reporting Authority
AIPM	Australian Institute of Project Management
APM	Association for Project Management
BIE	Buck Institute for Education
COVID-19	Coronavirus disease
DTiF	Digital Technologies in Focus
ICSEA	Index of Community Socio-Educational Advantage
IPMA	International Project Management Association
ISO	International Organization for Standardization
JBI	Joanna Briggs Institute
KA	Knowledge area
LOTE	Language other than English
P21	Partnership for 21st Century Learning
PBL	Project-based learning
PMBOK	A Guide to the Project Management Body of Knowledge: PMBOK® Guide
PMI	Project Management Institute
PMIEF	Project Management Institute Educational Foundation
PMP	Project Management Professional
PRINCE2	Projects IN Controlled Environments
SME	Subject-Matter Expert
TA	Thematic Analysis
WBS	Work Breakdown Structure

CHAPTER 1: INTRODUCTION

Can or should young children learn a complex discipline such as project management? This question prompted a six-year journey culminating in this doctoral thesis at the University of Southern Queensland. It began in early 2018 when I was in my home office one evening working on a project for my employer. I was using a common project management tool called a Gantt chart (see Figure 1.1), which is a graphical representation of a project where activities are listed on the vertical axis, with dates displayed on the horizontal axis, and the durations for each activity displayed as horizontal bars with start and finish dates (Project Management Institute [PMI], 2021).

Figure 1.1

Typical project management Gantt chart



My 7-year-old daughter entered the room, saw the Gantt chart, and asked what it was. I replied that it was something to do with project management. She then asked if she could also learn project management. I replied that it was too difficult for children to learn and that she would not need it anyway. Before leaving the room, she said: “How can I learn about it if nobody teaches me?” Later that night, I recalled our conversation and decided to search for any information about children learning project management. What started as an initial search became a more intensive exploration over several weeks. Only anecdotal evidence of children

learning project management was available, but nothing that constituted a holistic approach to teaching children about project management. Further, I could not find any empirical studies that I could examine to see if they reflected the project management discipline. What followed was my enrolment in a doctoral program to explore this topic in much greater detail. As my research progressed, I slowly transformed from a sceptic about the ability or need for children to learn project management to an advocate who believes that it is not only possible but also essential for their success in the 21st century.

1.1 Background

The results of projects are all around us. They include the thesis you are currently reading, the device from which you may be reading it, the building in which you may be reading it, and almost every human-made thing that surrounds you. Projects have been delivering the products and services we want and need since ancient times (Bonner, 2021; Morris, 2012; Picciotto, 2020). Today, many organisations rely on projects to structure their work, and as a result, most employees are involved in project tasks of some kind (Konstantinou, 2015). Indeed, projects have become so prevalent in society that they affect what we do, how we speak, and who we are (Jensen et al., 2016; Lundin et al., 2015). This phenomenon is sometimes described as the *projectification* of society (Schoper & Ingason, 2019; Wagner et al., 2021). All projects must be managed by individuals who can apply the “...knowledge, skills, tools, and techniques to project activities to meet the project requirements” (PMI, 2021, p. 245). They also need to possess an appropriate balance of hard (technical) and soft (interpersonal) skills (International Organization for Standardization [ISO], 2020; PMI, 2021). Further, depending on the job role, they may also need specific certifications or educational qualifications. A 2020 study analysing the ideal project manager profile revealed that higher education in the project management field was seen as more desirable than certifications, experience, and even soft skills (Lutas et

al., 2020). However, while there is an abundance of literature regarding project management learning in higher education, the same cannot be said for children learning project management, particularly in primary education. Fortunately, the Australian Curriculum, Assessment and Reporting Authority (ACARA) mentions project management in the *Technologies* curriculum, viewing it as an important component that should be explicitly taught in primary education (Digital Technologies in Focus [DTiF], 2020) in every year of schooling (ACARA, 2012).

In 2015, the Australian Curriculum: Technologies was endorsed by the Australian Curriculum, Assessment and Reporting Authority following several years of design, development, and feedback (ACARA, 2024a). The Technologies curriculum includes two subjects: Design and Technologies, and Digital Technologies. The Australian government's large investment in digital education recognises the increasing association between technology and future prosperity (Digital Education Advisory Group, 2013). An overarching theme within the Technologies curriculum is "creating solutions for preferred futures" by investigating, designing, planning, managing, creating, and evaluating a range of solutions to real-world problems (ACARA, 2024b). This is an important aspect of the curriculum since it draws the student's attention to the impact of technological solutions in their future and their choice to influence that future through their own involvement in creating technological solutions. Moreover, these technological solutions are often delivered using projects. A project can be defined as "a temporary endeavor undertaken to create a unique product, service, or result" (PMI, 2021, p. 245). ACARA also links project work with the design and production of a solution (ACARA, 2022). Further, in the latest edition of the Australian Curriculum, project management is specifically mentioned within the Technologies curriculum as a core component in creating solutions (ACARA, 2024b).

Given the claims of the Australian Technologies curriculum and the prevalence of projects and project management in organisations and society in general, it would be reasonable

to assume that the discipline of project management is not only being taught in a comprehensive way to adults but also to children, including those in primary education. It would also be reasonable to assume that there would be sufficient empirical literature for a doctoral candidate to draw upon for their research. From the outset, these assumptions were difficult to substantiate, presenting a potential research gap and the need for further investigation.

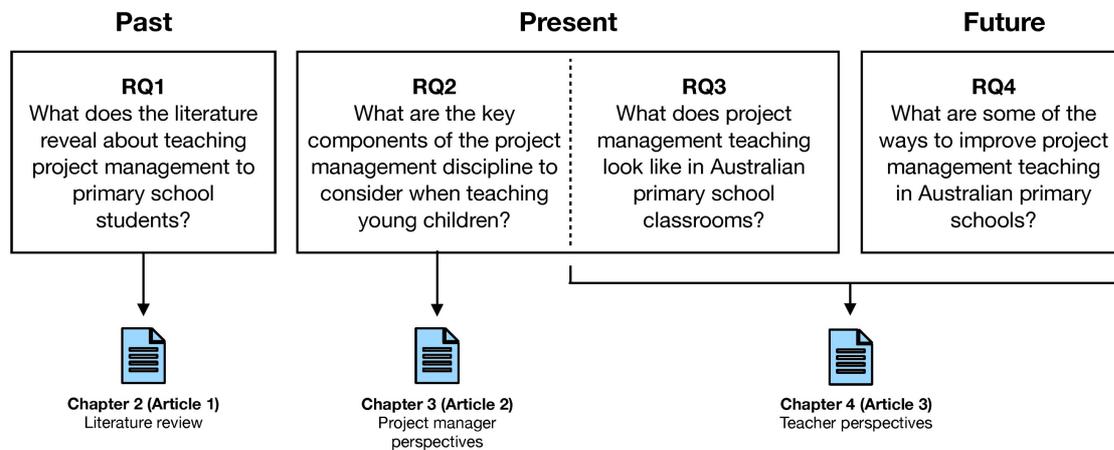
1.2 Research problem, aim and objectives

Organisations around the world deliver their products and services through projects (Konstantinou, 2015). Moreover, projects have become intrinsic to society and the way we live (Jensen et al., 2016). Without project management expertise, these projects have a higher chance of failure (PMI, 2017; Pratt, 2023). To increase expertise in the discipline, project management education, training, and certification programs provide viable avenues for adults to learn. However, it is unclear if or how children in primary education are learning about such a complex discipline as project management. While the Australian Technologies curriculum claims to teach project management in Australian primary schools, the research literature lacks empirical evidence to support these claims. The aim of this study is to explore project management learning in Australian primary schools. The research objectives are to explore the past, present, and possible future state of project management teaching in primary education.

Based on the research objectives, four research questions provide a roadmap for this thesis: i) What does the literature reveal about teaching project management to primary school students? ii) What are the key components of the project management discipline to consider when teaching young children? iii) What does project management teaching look like in Australian primary school classrooms? iv) What are some of the ways to improve project management teaching in Australian primary schools? Each research question can also be mapped to a research objective and thesis chapter (see Figure 1.2).

Figure 1.2

Mapping research questions to research objectives and thesis chapters

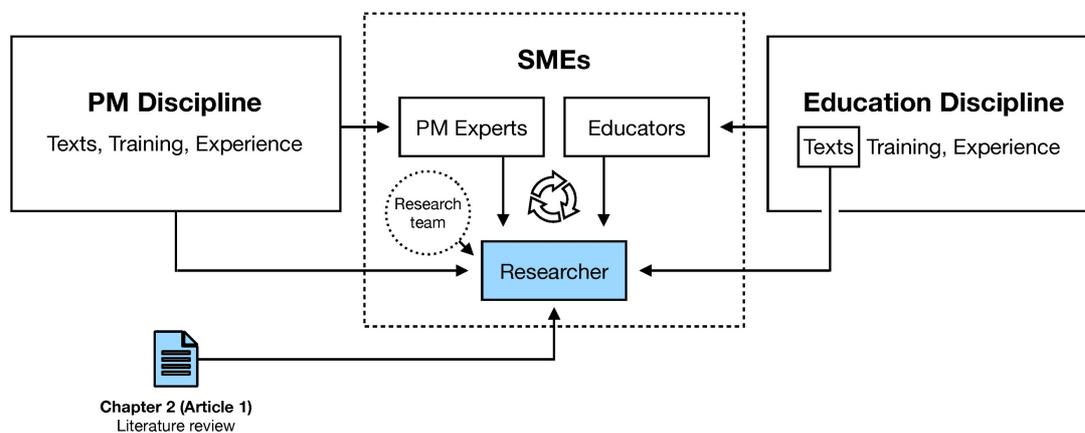


1.3 Research approach

Due to the research gap mentioned previously and the interdisciplinary nature of the research, it was necessary to engage with three main information sources to inform the researcher throughout this study: i) the extant literature, ii) project management experts, and iii) primary school educators. This relationship is illustrated in Figure 1.3.

Figure 1.3

Sources of information for the interdisciplinary research



The researcher drew upon published texts from the project management and education disciplines, as well as the knowledge and experience of SMEs (project management experts and educators) within each discipline, as expressed through their written and verbal responses. Their perspectives are presented in Chapters 3 and 4, respectively. The researcher's knowledge, skills, and experience as a project management professional with over twenty years in the field were also drawn upon and central to the research. Further, in addition to the literature review presented in Chapter 2, texts specific to each discipline, such as project management standards and competency frameworks from leading institutions, and various Australian curriculum documents, were major sources of analysis.

This research approach brings up the issue of positionality. As a member of the Project Management Institute, the researcher is, to a large extent, an "insider" of the project management community. However, the researcher is also an "outsider" of the teaching community, which was the focus of the study in Chapter 4. Therefore, it is fair to summarise the "researcher's position with an etic-emic continuum" (Salmons, 2022, p. 129) that fluctuates between the researcher as an outsider looking in and as an insider looking out.

Furthermore, the researcher's worldview plays a significant role in how this research was conceived, designed, analysed and presented. To answer the research questions, the researcher "should be free to choose the methods and procedures that best meet their needs" (Bloomberg & Volpe, 2019, p. 44). These methods can be either qualitative or quantitative, or a combination of both often referred to as mixed methods and aligned with a pragmatist worldview (Creswell & Creswell, 2018; Punch & Oancea, 2014).

1.4 Thesis structure

There are five chapters in this thesis: Chapter 1: Introduction, Chapter 2: Teaching project management to primary school children: a scoping review, Chapter 3: Teaching project

management to primary school children: Exploring the perspectives of project practitioners, Chapter 4: Exploring the perspectives of Australian primary school teachers on students learning about project management, and Chapter 5: Conclusion.

1.4.1 Chapter 2: Teaching project management to primary school children: a scoping review

As the initial literature review on the topic of teaching project management to primary school children, Chapter 2 became the foundation from which the remainder of the research project was constructed. Guided by the Joanna Briggs Institute (JBI) methodology for scoping review (Peters et al., 2020) and the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews (PRISMA-ScR) checklist developed by Tricco et al. (2018), the researcher selected a *scoping* literature review because it is a well-established method for searching the extent, range, and nature of emerging research fields or topics (Munn et al., 2018). While the review was conducted internationally, implications within an Australian context were also highlighted. The results produced 33 publication sources that were presented both descriptively and thematically, highlighting several project management activities, artefacts, and teaching approaches. Since no empirical studies of teaching project management to children were uncovered, the literature review provides a research foundation for future studies to build upon. A call is made for collaboration between project management practitioners and educators to develop best practices in teaching project management to children. The article associated with this chapter: ‘Teaching project management to primary school children: a scoping review’ (Delle-Vergini et al., 2023a), was published in *The Australian Educational Researcher*. Following the publication of this article in April 2023, a more recent literature search was conducted in April 2024 prior to the submission of this thesis. The search included the same academic databases and search string detailed in Chapter 2. The

results of the search did not produce any additional relevant articles aside from the two published articles associated with Chapters 2 and 3, respectively.

1.4.2 Chapter 3: Teaching project management to primary school children: Exploring the perspectives of project practitioners

Building upon the research foundation laid in Chapter 2, and as a response to the call for collaboration between project management practitioners and educators, a panel of 17 project management experts was engaged to explore their perceptions of children learning about project management. Using the iterative, anonymous, and consensus-building technique known as the Delphi method (Cuhls, 2023; Khodyakov et al., 2023), the panel selected and ranked the most important hard and soft skills necessary for children learning project management and, in their opinion, the level of difficulty of these skills for children to learn. This was an important step towards breaking down the complex discipline of project management into components that can be more easily understood and applied in primary education. Further, the hard and soft skills were plotted across four quadrants: High Importance / High Difficulty, High Importance / Low Difficulty, Low Importance / High Difficulty, and Low Importance / Low Difficulty. This was done to assist with scaffolding strategies that accommodate different year levels and learning abilities. The panel also agreed that teachers are best placed to deliver the instructional content required for children learning about project management. The chapter concludes with a call for researchers to study the perspectives of primary school teachers on the topic of teaching project management to children. The article associated with this chapter: ‘Teaching project management to primary school children: Exploring the perspectives of project practitioners’ (Delle-Vergini et al., 2023b), was published in *Issues in Educational Research*.

1.4.3 Chapter 4: Exploring the perspectives of Australian primary school teachers on students learning about project management

Building upon the research foundation laid in Chapter 2 (Delle-Vergini et al., 2023a), and as a response to the call in Chapter 3 to explore the perspectives of primary school educators (Delle-Vergini et al., 2023b), 13 Australian primary school teachers representing ten schools across three Australian States were engaged to understand their thoughts and experiences of teaching project management to children. Drawing on Braun and Clarke's (2022) process of reflexive thematic analysis, two topic summaries and four themes present a story of the state of project management in Australian primary schools. This includes the perceptions of teachers about children learning project management, project management activities and artefacts utilised in the classroom, challenges that teachers and students face when learning project management, and some recommendations for ways to improve the teaching of project management to children. The chapter concludes with a call for researchers, educators, and project management professionals to develop a simple learning framework to assist teachers in instructing young students in the discipline of project management. The article associated with this chapter: 'Exploring the perspectives of Australian primary school teachers on students learning about project management' (Delle-Vergini et al., 2024), was published in *Issues in Educational Research*.

1.4.4 Chapter 5: Conclusion

In this final chapter, a summary of the contributions of the thesis to the fields of project management and education is made. The implications for the project management discipline, educators, researchers, children, and society are also briefly discussed. The chapter concludes by highlighting some of the limitations of the research and, finally, the future research opportunities available on the topic of teaching project management in primary education.

CHAPTER 2: TEACHING PROJECT MANAGEMENT TO PRIMARY SCHOOL CHILDREN: A SCOPING REVIEW

This chapter is principally an incorporation of the article ‘Teaching project management to primary school children: a scoping review’, which was published in *The Australian Educational Researcher* in April 2023.

2.1 Introduction

An initial literature search on the topic of teaching project management to primary school children was conducted. Although there were many articles discussing elements of project management being taught to young children, there were no empirical studies examining comprehensive approaches to teaching them how to manage projects from beginning to end. To situate this research in the extant literature, a scoping literature review was performed using the Joanna Briggs Institute (JBI) methodology for scoping reviews (Peters et al., 2020).

The chapter begins by highlighting the importance of projects in children’s education for over a century. Projects are also the primary form of structuring work, and as such, organisations rely on employees with project management skills. These individuals will require education and training, with some educational institutions suggesting that learning project management should commence in early childhood and continue as a life and career skill.

The scoping review identified and analysed 33 literature sources. Seventeen project management elements within four project life cycle phases were examined, and the results discussed both descriptively and thematically. While the results revealed that primary school children are exposed to project management activities, artefacts, and skills, through various teaching approaches, there was no literature discussing a holistic approach that covered the full project management life cycle from beginning to end. The chapter concludes with a call for

teachers and project practitioners to collaborate on more comprehensive approaches to teaching project management in contrast to less comprehensive approaches that focus on project management skills in isolation. The key contribution of this chapter is that it is the inaugural literature review on the topic of teaching project management to primary school children, which sets the foundation for future research.



Teaching project management to primary school children: a scoping review

Sante Delle-Vergini¹ · Douglas Eacersall² · Chris Dann³ · Mustafa Ally⁴ · Subrata Chakraborty^{5,6}

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Abstract

Teachers have used projects in children’s education for over a century. More recently, project management knowledge and skills have become essential when students manage technological solutions from inception to presentation. This paper presents the first scoping literature review on teaching project management to primary school students. A total of 33 publications between 2000 and 2022 were analysed and presented both descriptively and thematically. While the review did not identify any empirical studies of teaching project management to primary school students, it did reveal several examples of suggested teaching approaches, project management activity, and common elements associated with project management. The review concludes with a recommendation for researchers, educators, and project management practitioners to build upon this research by exploring the effectiveness of comprehensive approaches to teaching project management to primary school students. This paper represents a significant area of research as project management is one of the most critical skills for students to achieve success in the twenty-first century.

Keywords Project management · Teaching · Children · Primary school · Scoping review

Introduction

Using projects in children’s education dates back to the early twentieth century (Knoll, 2012; Pomelov, 2021) and was popularised by William Kilpatrick (Clark, 2006), one of the most influential figures in pedagogical progressivism (Mintz, 2016). Since then, teachers have increasingly used real-world projects to provide authentic learning experiences for their students (Pecore, 2015). More recently, teachers and researchers have begun to examine the pedagogies that surround

✉ Sante Delle-Vergini
sante.delle-vergini@usq.edu.au

Extended author information available on the last page of the article

projects that help teachers deliver multiple curriculum outcomes in a single learning activity. Given the prevalence of projects and the emphasis on curriculum outcomes, it is understandable that teachers may have less focus on the processes and skills involved in managing these projects. At the same time, as students take on more responsibility for their own projects, there will be a growing need to develop project management skills.

Project management can be defined as ‘the knowledge, skills, tools, and techniques to project activities to meet the project requirements’ (Project Management Institute [PMI], 2021, p. 245). It is a complex discipline that has evolved over several decades through leading institutions such as the Project Management Institute, the Association for Project Management, and the International Project Management Association. Like other disciplines, the field of project management has created a body of knowledge that is transferable to practice (Lalonde et al., 2010). Furthermore, as organisations continue to use projects as the primary form of structuring work, most employees will be involved in project-related activities of some kind in the workplace (Konstantinou, 2015). Of these, approximately 90 million individuals will be performing project management activities by 2027 (PMI, 2017c). As a result, many of these individuals will require education and training in project management.

Institutions such as PMI have developed methodologies, practices and standards that underpin many of the project management education and training programs available today (Cicmil & Gaggiotti, 2018). Some programs include short courses, degree programs, industry training, professional development, and the ‘global standard’ in project management certifications: the *Project Management Professional* (PMP) accreditation from PMI (Richardson & Jackson, 2019, p. 26). While the complexity of these programs varies greatly, the concepts and terminologies are generally targeted at the adult population, not children. Nevertheless, there is some evidence of project management teaching in secondary schools and youth non-profit organisations. In 2018, the Student Research Foundation (SRF) surveyed over 35,000 secondary school students across the United States and found that 25% of students reported that they had been taught project management skills (SRF, 2019). In the United States, two examples of initiatives to teach project management skills in secondary school include a pilot in a Washington State high school where students in Grades 9 to 12 were taught project management over one semester (Garfein & Noeldner, 2011), and the National Aeronautics and Space Administration (NASA) commissioning Texas A&M University to design and implement a project management course to assist students in six high schools to better manage their Science, Technology, Engineering and Math (STEM) projects (Morgan et al., 2013). In Hampshire, England, a secondary school became the first in the United Kingdom to implement a pilot program by the Project Management Institute Educational Foundation (PMIEF) to introduce project management principles to students (Robertson, 2012). Finally, JA (Junior Achievement) Europe, a large youth-serving non-profit organisation that prepares students for the workforce, received a grant totalling USD \$977 K from PMIEF to integrate project management learning into their youth programs (PMIEF, 2021). Although these examples of project management learning in secondary schools

are encouraging, primary school children should also learn how to manage projects as a life and career skill (Partnership for 21st Century Learning [P21], 2019, p. 7).

In Australia, young children are already exposed to projects and project management. In 2012, the Australian Curriculum, Assessment and Reporting Authority (ACARA) produced *The Shape of the Australian Curriculum: Technologies* (ACARA, 2012). The Technologies curriculum was designed to ensure that students capitalise on the learning and application of emerging technologies critical to twenty-first century living. An overarching theme within the curriculum is the potential students have to influence their future through developing technological solutions (ACARA, 2012). Project management learning in primary school classrooms is a key concept within the Australian Technologies curriculum, made evident by the title of ACARA's Digital Technologies in Focus (DTiF) publication: *Teaching and supporting project management in the classroom F-6* (DTiF, 2020). The curriculum claims that students will produce technological solutions by managing projects from inception to realisation and can be measured by comparing how successfully a project met original expectations (ACARA, 2012). ACARA believes that project management is 'an essential element in building students' capacity to more successfully innovate' and will be included in every year of schooling (ACARA, 2012, p. 10). This implies that teachers will develop opportunities for students to understand how to manage a project.

Despite ACARA's recommendation that project management should be explicitly taught within the Technologies curriculum (DTiF, 2020), a preliminary search of the literature, both nationally and internationally, found no comprehensive research studies on teaching project management in a primary school context. There was some evidence of project management activity identified through various pedagogical practices such as inquiry-based learning, problem-based learning, differentiated instruction, and particularly project-based learning. These included common project management activities such as planning, group work, producing a product, and presenting to an audience. However, these activities alone do not constitute a holistic view of the knowledge and skills required for a child to successfully manage a project from beginning to end. Project management integrates numerous elements that must be managed effectively (PMI, 2017a) by an individual with a set of core competencies (PMI, 2017b). This is made more complex by the various ages of children in primary school.

This raises some significant questions. If project management is such a complex discipline, how is it being taught to primary school children? What research has been conducted investigating comprehensive approaches to the teaching of project management to children in primary school? To explore these questions further, and to inform the Australian situation, an international scoping review was undertaken to: (i) investigate the body of literature regarding teaching project management in primary schools; (ii) identify approaches to the teaching of project management and related skills in the classroom; and, (iii) build a foundation of evidence to inform future research. This paper is the first scoping literature review investigating the teaching of project management to primary school children.

Methods

A scoping review methodology was selected to explore the literature as this type of review aims to examine the extent, range and nature of research on a particular topic, summarise and disseminate the findings, and identify any research gaps in the literature (Arksey & O'Malley, 2005). Due to the sparseness of literature on the topic, the research was driven by a broad research inquiry resulting in the following research question: What does the body of evidence reveal about teaching project management to children in primary school? The use of a scoping review provides more flexibility than a systematic review (Peterson et al., 2017) because it is more concerned with the characteristics and concepts within a study than a specific question that informs policy or practice (Munn et al., 2018). Further, the results should only focus on a descriptive account of available literature (Arksey & O'Malley, 2005).

Scoping reviews often present information in broad themes (Arksey & O'Malley, 2005; Rumrill et al., 2010). Two themes emerged from the initial search of the literature: project management elements, and teaching project management to primary school children. *Project management elements* describe the project management activities, processes, and artefacts typical of many projects. This was the predominant theme due to the sheer volume of project management elements identified in the initial search. *Teaching project management to primary school children* is the central topic of this research. This theme concerns specific claims that project management is or should be taught in primary schools.

This scoping review adheres to the Joanna Briggs Institute (JBI) methodology for scoping reviews (Peters et al., 2020) and is guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews (PRISMA-ScR) checklist (Tricco et al., 2018a). Lockwood et al. (2019) recommend the use of both resources when developing a scoping review. Further, a scoping review protocol was previously published by the authors of this paper (Delle-Vergini et al., 2023) to promote transparency and detail the objectives and methods of this review (Peters et al., 2020).

Inclusion criteria

The inclusion criteria were based on the PCC (population, concept, context) mnemonic, using the following phrases: children (population), teaching project management (concept), and primary school (context), which were also used to develop the scoping review article title and research question (Peters et al., 2020). Using the PCC mnemonic ensures a broader range of sources are considered compared to the population, intervention, comparator, outcome (PICO) mnemonic commonly used in systematic reviews (Lockwood et al., 2019). The *population* included studies that involved primary school students, regardless of gender or socio-economic status. The *concept* of this scoping review is teaching project management, while the *context* includes any public or private primary school that teaches or claims to teach project management to children or where children are engaged in project-related

activities that produce products and project management artefacts. As the age of primary school students can vary across countries and even between states, a range of 5–11 years of age was used during the screening process as this range is almost exclusively situated in a primary school setting. Information sources considered include qualitative, quantitative, and mixed-methods studies and reports. Journal articles, conference proceedings, dissertations, published books and grey literature from the years 2000 to 2022 were included to ensure the literature was relevant in twenty-first century classrooms. The validity of sources was achieved through the credibility of the institutions they were sourced from (i.e., Project Management Institute) and the academic databases mentioned in the next section.

Search strategy and source selection

As recommended by Morris et al. (2016), the search design and strategy involved a research librarian. Consistent with the JBI methodology, it involved three stages (Peters et al., 2020). During the first stage, an initial search of the following databases: Academic Search Ultimate, Business Source Ultimate, eBook Collection, Education Research Complete, E-Journals, ERIC (all via EBSCOhost Megafile Ultimate), Proquest One Academic, Web of Science, Scopus, and Google Scholar was conducted independently by two of the authors (SD, DE). The use of at least two reviewers to meet, discuss and select relevant sources is recommended by Levac et al. (2010). The search utilised synonyms and like terms derived from phrases located in the title of this paper, as detailed in Fig. 1. This search yielded 799 results.

The sources were then loaded into EndNote, and duplicates removed, yielding a total of 619 sources. On several occasions, the same two authors (SD, DE) met to discuss and agree on the items for inclusion and exclusion. A title and abstract examination of the 619 sources resulted in 586 exclusions, leaving a total of 33 sources for consideration. A full-text examination of these 33 sources commenced, resulting in 22 excludes (full text not found: $n=5$, project management concept missing: $n=11$, a language other than English: $n=2$, no primary school context: $n=3$, only teacher managing project: $n=1$), leaving a total of 11 included sources.

In the second stage, a manual search for other sources (i.e., websites) was performed. This process was necessary as the search of databases only produced limited sources. A handful of websites (i.e., Project Management Institute Educational Foundation, Buck Institute for Education) produced content in the form of reports, videos, blogs, and recommendations for books that referenced project management teaching in primary schools. The process of searching these and other websites and

```
(child* OR student*) AND (teach* OR instruct* OR train* OR educat* OR learn*) AND ('project management' OR 'manag* project*' OR 'plan* project*' OR 'project-based learning' OR 'project based learning') AND ('primary school*' OR 'elementary school*')
```

Fig. 1 Search string

their content produced a further 20 sources, one of which was excluded after closer examination. The third and final stage examined the reference lists of the 11 database sources and 19 website sources which produced a further three sources.

This rigorous search strategy and source selection process produced a total of 33 sources that matched the inclusion criteria for this scoping review. The process is detailed in Fig. 2.

Data extraction and presentation

Despite the growing use of the JBI methodology and PRISMA-ScR checklist, a study by Khalil et al. (2020) discovered that of all the stages throughout the scoping review process, data extraction was the most inadequate. Data extraction was made difficult by the lack of explicit examples of approaches to teaching project management in primary schools. As such, it was necessary to identify and group project management elements to capture and understand the characteristics of the teaching of project management within the literature. The authors decided that the phases within a project life cycle were a logical choice to group the project management elements.

A project life cycle consists of phases of related project activity that a project passes through until it is completed (PMI, 2017a). While there is no universal agreement on project life cycle phases (Kerzner, 2022), the authors selected four project management process groups: *initiate*, *plan*, *execute*, and *close*, which reflect the four generic project life cycle phases: starting the project, organising and preparing, carrying out the work, and ending the project (PMI, 2017a). Each phase contains several project management elements that were used to map the results in tabular format (Thomas et al., 2017). The elements extracted were important in identifying the building blocks of project management and were largely derived from two key Project Management Institute publications: *A Guide to the Project Management Body of Knowledge: PMBOK® Guide* (PMI, 2017a), widely considered as ‘the gospel of project management’ (Kerzner, 2010, p. 169), and the *Project Manager Competency*

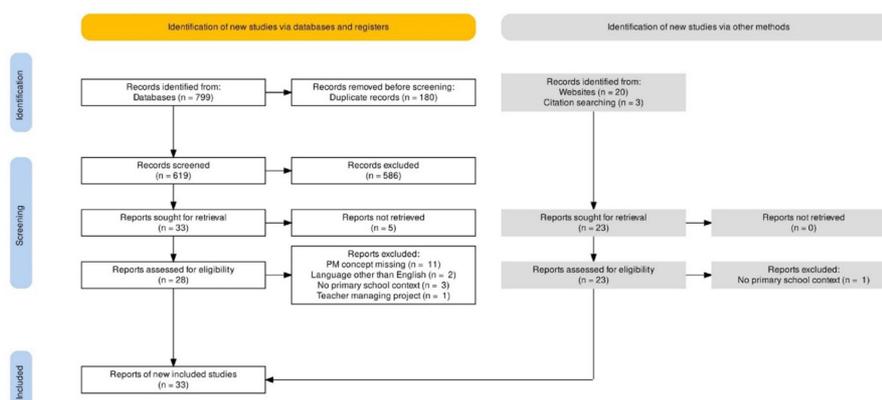


Fig. 2 Scoping review search and selection process

Development Framework (PMI, 2017b). Seventeen project management elements across four project lifecycle phases were used to capture evidence of project management activity.

Results

A comprehensive mapping of the 33 sources included in this scoping review and the project management elements identified in each source are provided in Table 1 of the Appendix and should be referred to throughout this paper. This section includes a descriptive overview of the results, followed by a thematic overview, as recommended by Levac et al. (2010). To supplement the numerical analysis in this paper, such as number counts and percentages, the authors used the following classification schemes: $\leq 33\%$ was interpreted as a low level of representation; 34–66% as a moderate level; and $\geq 67\%$ as a high level.

Descriptive overview

Due to the limited number of research articles discovered, the data extraction elements typical of a scoping review, such as study aims, population sample, methodology and key findings (Peters et al., 2020), were not available for most sources and thus were excluded from this scoping review.

- *Publication source* The scoping review sources consisted of a thesis ($n=1$), published books ($n=6$), journal articles ($n=7$), web documents ($n=7$), government documents ($n=2$), conference proceedings ($n=1$), videos ($n=3$), and blogs ($n=6$). Of the seven journal articles, one could not be confirmed as peer-reviewed (D’Orio, 2009).
- *Year of publication* The inclusion criteria prohibited sources published earlier than the year 2000. In chronological order, sources were published in the year 2000 ($n=2$), 2002 ($n=1$), 2005 ($n=1$), 2008 ($n=1$), 2009 ($n=2$), 2010 ($n=1$), 2012 ($n=1$), 2013 ($n=1$), 2014 ($n=4$), 2015 ($n=3$), 2016 ($n=3$), 2017 ($n=3$), 2018 ($n=6$), 2019 ($n=1$), 2020 ($n=2$), and 2022 ($n=1$). It is uncertain exactly when ACARA (2022) was published, as there are multiple versions, but version 8.4 of the Australian Technologies curriculum (Foundation to Year 6) is the latest version as of writing this article.
- *Project management elements by phase* Only 19 (57.6%) sources contained at least one element in each of the four phases (initiate, plan, execute, close). The initiation phase contained 103 of 231 (44.6%) possible elements identified across 33 sources. The planning phase contained 80 of 132 (60.6%) possible elements. The execution phase contained 62 of 132 (47.0%) possible elements. Finally, the closing phase contained 26 of 66 (39.4%) possible elements. Of the 561 project management elements possible across all sources and phases, only 271 (48.3%) were present.

- *Project management elements by publication type and source* Of the 17 project management elements available, government documents (30 of 34; 88.2%), web documents (107 of 153; 69.9%) and books (71 of 102; 69.6%) contained a high level, followed by a moderate level for theses (10 of 17; 58.8%), and journal articles (54 of 119; 45.4%), and a low level for videos (12 of 51; 23.5%), conference proceedings (4 of 17; 23.5%) and blogs (13 of 102; 12.7%). Nine sources (27.3%) contained a high level of elements (12 elements and above), 13 sources (39.4%) contained a moderate level (6–11 elements), and 11 sources (33.3%) contained a low level (5 elements and below). Only three elements were identified in a high number of sources: constraints ($n=26$; 78.8%), and both project management tools/artefacts ($n=23$; 69.7%) and activities/tasks ($n=23$; 69.7%).
- *Thematic alignment* The two themes presented in this paper were identified in a number of sources. Project management elements ($n=30$; 90.9%), and teaching project management to primary school children ($n=14$; 42.4%).

Thematic overview

Two themes emerged from the review of the literature: project management elements, and teaching project management to primary school children. Each theme is briefly described in the *Methods* section.

Project management elements

Seventeen elements provided evidence of project management activity within the literature, the people and processes involved, the artefacts used in managing projects, and the products produced during those projects. These elements were categorised into four groups representing common phases within a project lifecycle: initiate, plan, execute, and close.

Initiate Phase This phase only contained 103 of 231 (44.6%) possible elements across all sources. Only one source contained all seven elements (PMIEF, 2014a). ACARA (2022), DTiF (2020), and Fleer (2016) each contained six elements; while Boss and Larmer (2018), Edwards (2000), Ginevri and Trilling (2017), PMIEF (2015a), Project Management Institute: Portugal (PMI-Portugal, 2020), and Railsback (2002) all contained five elements. Four sources (Lenz, 2016; Modzelewski & Urias, 2017; PMIEF, 2014b; Vander Ark, 2018) contained no elements. The percentage of sources where each element was identified is illustrated in Fig. 3.

The most predominant element identified within this phase was *constraints* ($n=26$; 78.8%). Constraints within a project typically include time, scope, and cost (PMIEF, 2015a) and should be considered to see how they might affect the project (Portz, 2014). Time was the leading constraint and described in several ways, such as managing time or time management (Buck Institute for Education [BIE], 2018; Boss & Larmer, 2018; Ginevri & Trilling, 2017; Lenz, 2018; Trilling & Fadel, 2009), keeping on track (Bell, 2010; Maher & Yoo, 2017; Railsback, 2002), deadlines (DTiF, 2020; Krajcovicova & Capay, 2012; McCain, 2005; PMIEF, 2015a), timelines (ACARA, 2022; DTiF, 2020; Edwards, 2000; Railsback, 2002),

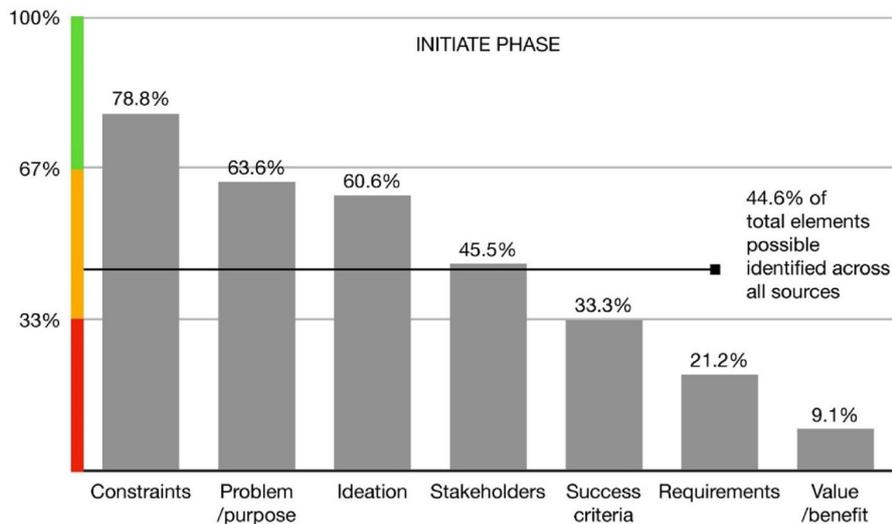


Fig. 3 Project management elements of the initiate phase identified in sources

and schedules (DTiF, 2020; Ginevri & Trilling, 2017; PMIEF, 2014a, 2015a). Time management was the number one difficulty faced by students in projects according to Akinoglu (2008). Scope (Boss & Larmer, 2018; DTiF, 2020; Ginevri & Trilling, 2017; PMIEF, 2014a), cost or budget (ACARA, 2022; Fleer, 2016; Ginevri & Trilling, 2017), and quality (ACARA, 2022; DTiF, 2020; Fleer, 2016; Ginevri & Trilling, 2017; PMIEF, 2014a, 2015a) were mentioned less frequently than time constraints.

The next two prominent elements identified were *problem/purpose* ($n=21$; 63.6%) and *ideation* ($n=20$; 60.6%). Most projects in a school environment begin with a purpose (DTiF, 2020; Folsom, 2000; Railsback, 2002), question (Bell, 2010; BIE, 2018; Maher & Yoo, 2017; PMIEF, 2014a, 2015a; Trilling & Fadel, 2009), or problem that needs to be solved (Akinoglu, 2008; Boss & Krauss, 2014; Fleer, 2016; PMI-Portugal, 2020; Reitzig, 2019). Ideation occurs when students ‘explore, analyse and develop ideas’ (ACARA, 2022, p. 6) and illustrate these ideas (Maher & Yoo, 2017) through activities such as brainstorming (Project Management Institute: North Italy Chapter [PMI-NIC], 2015; PMIEF, 2013, 2015b; Portz, 2014) and mind mapping (Ginevri & Trilling, 2017; PMIEF, 2014a).

Like problem/purpose and ideation, the *stakeholder* element had a moderate level of representation ($n=15$; 45.5%). A stakeholder is an individual or group interested in the project (PMIEF, 2015b). DTiF (2020) recognised the importance of reporting to, and receiving feedback from, stakeholders. In the context of a primary school project, sources that mentioned stakeholders often referred to them as teachers, parents, or community members (Bell, 2010; Edwards, 2000; French, 2018; Maher & Yoo, 2017; Railsback, 2002). Some sources referred to a stakeholder as a client (Boss & Larmer, 2018; DTiF, 2020; Fleer, 2016; Ginevri & Trilling, 2017; PMIEF, 2014a). One source even described a stakeholder analysis process: ‘The students

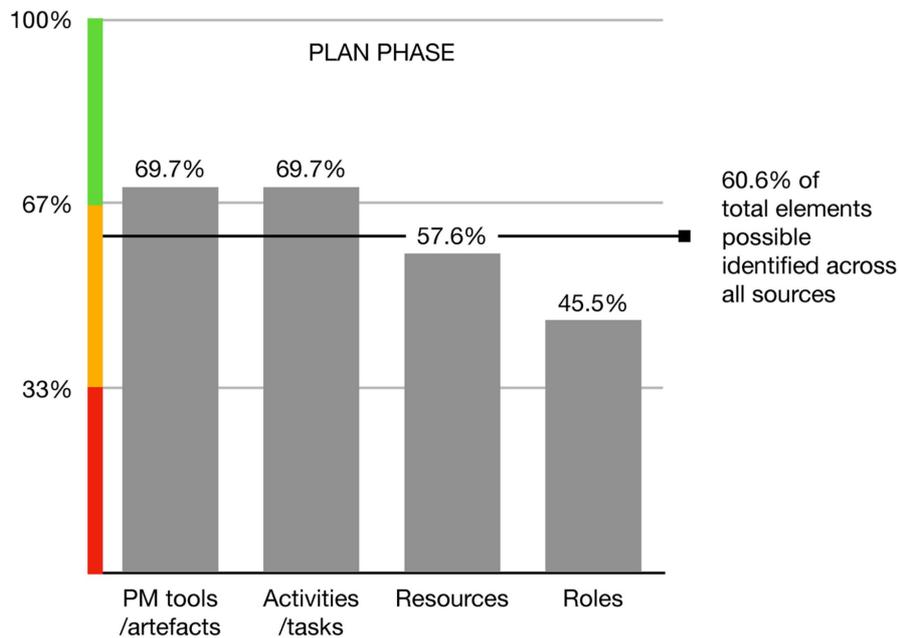


Fig. 4 Project management elements of the plan phase identified in sources

also filled out a stakeholders table that identified each person with a key interest in the project, their role, what they wanted from the project team, and how the team planned on giving them what they needed' (PMIEF, 2014a, p. 17).

The final three elements: *success criteria*, *requirements*, and *value/benefit*, had a low representation across the sources. Although the success criteria element was the best of the three ($n=11$; 33.3%), requirements ($n=7$; 21.2%) and value/benefit ($n=3$; 9.1%) were significantly lower.

Plan phase This phase had the highest representation of project management elements compared to other phases, with 80 of 132 (60.6%) possible elements identified, making it the only phase to score above 50%. Twelve sources (ACARA, 2022; Boss & Krauss, 2014; Boss & Larmer, 2018; DTiF, 2020; Edwards, 2000; Fler, 2016; Ginevri & Trilling, 2017; Krajcovicova & Capay, 2012; PMI-Portugal, 2020; PMIEF, 2014a, 2015a; Portz, 2014) included all four project management elements (tools/artefacts, activities/tasks, resources, and roles) in this phase. There were no elements with a low level of representation across all sources, as detailed in Fig. 4.

Project management *tools/artefacts* and *activities/tasks* were two elements that had a high level of representation across sources ($n=23$; 69.7%). Project management tools/artefacts are any items that assist project team members in conducting project management activities. While the list of items can be extensive depending on the size and complexity of the project, several sources cited what is arguably the most important document or artefact in every project: the project plan (ACARA, 2022; Akinoglu, 2008; Boss & Krauss, 2014; Boss & Larmer, 2018; DTiF, 2020), or master plan (Edwards, 2000). Other project management tools and artefacts

identified were task boards, project walls, project journals (Boss & Krauss, 2014), Gantt charts, contingency plans, risk registers, work breakdown structure, communication plan (DTiF, 2020), visual maps, project binders, resource plans, project goal statement (Edwards, 2000), posters, mind maps, process diaries (Fleer, 2016), activity tree, project traffic light (Ginevri & Trilling, 2017; PMI-NIC, 2015; PMI-Portugal, 2020; PMIEF, 2014a, 2015b), project organisation chart (PMIEF, 2014a), project scoring rubric and task lists (Portz, 2014).

Activities/tasks were used interchangeably by several sources (BIE, 2018; Edwards, 2000; Ginevri & Trilling, 2017; Larskikh et al., 2016; Maher & Yoo, 2017). The purpose of this element is to define all the necessary activities or tasks to complete the project (PMI-Portugal, 2020; Portz, 2014). Edwards (2000, p. 63) calls on students to 'think through the activities they must complete to meet their project goal...compose a master list of activities...which need to be broken out into smaller tasks'. The concept of an *Activity Tree* (Ginevri & Trilling, 2017; PMI-NIC, 2015; PMI-Portugal, 2020; PMIEF, 2014a, 2015b) provides a graphical representation of the tasks necessary to complete the project. Each leaf on the tree represents an activity or task. These tasks are then assigned deadlines and owners (Ginevri & Trilling, 2017) with a 'logical sequence of steps they (students) intend to follow to accomplish the tasks' (McCain, 2005, p. 59).

Both *resources* ($n = 19$; 57.6%) and *roles* ($n = 15$; 45.5%) were moderately represented. Project resources include people (Edwards, 2000; Fleer, 2016); equipment, tools, materials, funding, technology, books (PMIEF, 2015a), whiteboards, cameras, USB drives, computers, printers, scanners, data projector, internet (Krajcovicova & Capay, 2012), components (ACARA, 2022), and supplies (Folsom, 2000). Students are encouraged to consider why resources are necessary and how they will be managed for each activity (Nodzynska et al., 2018).

During a project, students 'negotiate roles and responsibilities' (ACARA, 2022, p. 57), with roles defined for both individuals and groups (DTiF, 2020). School projects leverage the abilities and strengths of individual team members when assigning roles (Fleer, 2016; Reitzig, 2019) and provide opportunities for students to take on leadership roles (Trilling & Fadel, 2009). Some sources also recognised the dual nature of roles and responsibilities in project work (ACARA, 2022; DTiF, 2020; Railsback, 2002).

Execute Phase The execute phase contained 62 of 132 (47.0%) possible elements across all sources. Students spend most of their time during the execution phase of the project (PMIEF, 2014a). Only three sources (DTiF, 2020; Fleer, 2016; Ginevri & Trilling, 2017) included all four elements (project manager, project products, present products, and risk) in this phase. None of the elements had a high representation across sources, as detailed in Fig. 5.

The first two elements identified within the execution phase are *project products* and *present products*. Two-thirds of the sources ($n = 22$; 66.7%) demonstrated that a product of some kind was the end result of projects undertaken in the primary school classroom. Other terms that reflected a product included scale model (Boss &

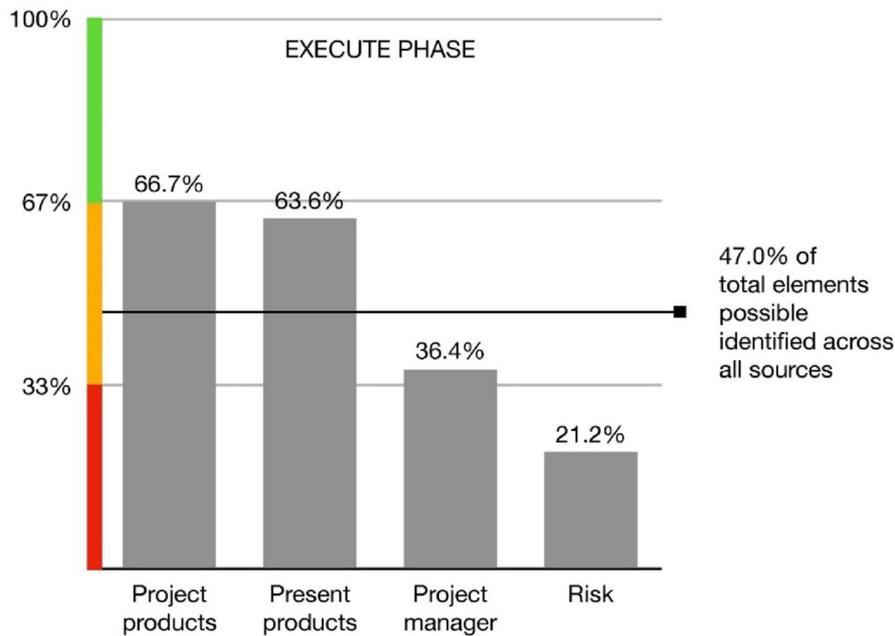


Fig. 5 Project management elements of the execute phase identified in sources

Larmer, 2018; French, 2018), prototype (Ginevri & Trilling, 2017; PMIEF, 2015a), solution (ACARA, 2022; PMIEF, 2015a; Reitzig, 2019), service (PMIEF, 2015a), and design (Reitzig, 2019). In every source where a project product was identified, it was a tangible product. As Railsback (2002, p. 10) points out, a tangible product is an important feature of authentic classroom projects and should be shared with an intended audience. The presentation of project products was evident in many sources ($n=21$; 63.6). Whether it was a presentation (BIE, 2018; Edwards, 2000; Fler, 2016; Folsom, 2000; Maher & Yoo, 2017; Railsback, 2002), contest/competition (Akinoglu, 2008; Reitzig, 2019), performance (Bell, 2010), showcase (Reitzig, 2019), exhibition or portfolio (Maher & Yoo, 2017), a final product of some kind was presented to interested stakeholders.

The *project manager* is responsible for ensuring that the project meets its goals (PMIEF, 2014a, p. 41). However, this element was only moderately represented ($n=12$; 36.4%). ACARA (2022, p. 52) states that ‘students manage projects independently and collaboratively from conception to realisation’. Two sources (Boss & Larmer, 2018; Larskikh et al., 2016) specifically refer to students as project managers, while one (DTiF, 2020) refers to students managing their own projects. However, some sources appear to suggest that students should manage projects independently once they enter secondary school. Fler (2016, p. 233) argues that students can manage their projects but should build upon the concepts of project management

in primary school and then become more independent in secondary school. This gradual progression to independently managing projects is supported by Ginevri and Trilling (2017, p. 51): ‘As project learning experiences grow, so does the need for students to take more control of the entire project management processes.’ Other sources discussed student involvement in the process of managing projects without specifically referring to them as a project manager or managing their own individual projects (BIE, 2018; Folsom, 2000; Lenz, 2016; Maher & Yoo, 2017). A handful of sources ($n=4$) referred to teachers playing the role of a project manager (Boss & Krauss, 2014; Boss & Larmer, 2018; DTiF, 2020; Folsom, 2000) in addition to students.

The final element is *risk*. This element was identified in a low number of sources ($n=7$; 21.2%). Some sources understood the importance of identifying and managing risks in the project management process. The project team should identify risks (PMI-Portugal, 2020), create a list of risks (Ginevri & Trilling, 2017) or risk register (DTiF, 2020), manage the risks (ACARA, 2022), and consider creating a risk management or backup plan (Fleer, 2016).

Close Phase This phase contained 26 of 66 (39.4%) possible elements across all sources. This scoping review searched for two elements in the closing phase: *review/reflect* and *archive project*. Given the temporary nature of projects, they must eventually be closed. One of the final activities for a project team is to discuss and document the lessons learned (PMIEF, 2015b). Five sources (Boss & Krauss, 2014; Boss & Larmer, 2018; DTiF, 2020; Edwards, 2000; PMIEF, 2014a) included both elements, while 12 sources did not refer to either element (Fig. 6).

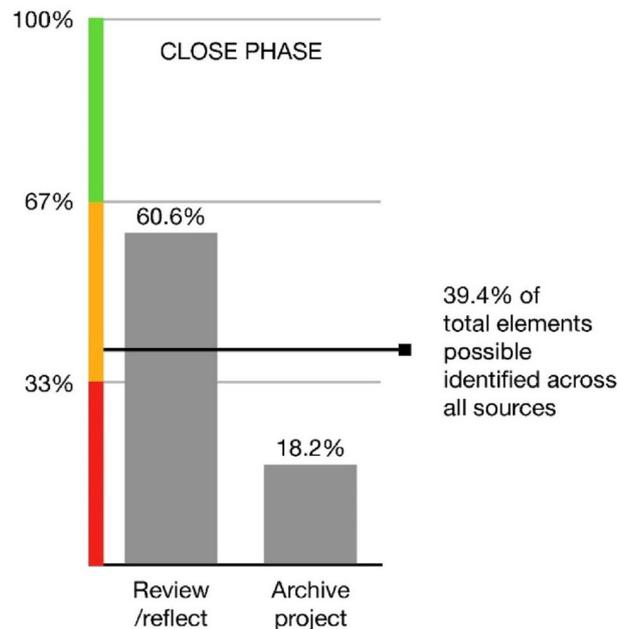


Fig. 6 Project management elements of the close phase identified in sources

A moderate level of sources ($n=20$; 60.6%) included or recommended a review/reflect process. The project review process involves feedback from stakeholders, celebrating project success, informal and formal recognition, and self-reflection, which ‘may hold the most important learning experiences in the whole project’ (Ginevri & Trilling, 2017, p. 53). The quality of the project results can be analysed (Larskikh et al., 2016), lessons learned reviewed (PMIEF, 2015a), and project processes improved (Boss & Krauss, 2014). Further, reflecting on how successful the project was in meeting the client’s needs (ACARA, 2022) and suggestions for improvement can make the next project even better (Edwards, 2000, p. 82). The Buck Institute for Education suggests that the review and reflection process will assist students to ‘retain project content and skills longer, develop a greater sense of control over their own education, and build confidence in themselves’ (BIE, 2018, p. 5). As such, the entire review process can often be applied to future projects (Trilling & Fadel, 2009).

The archive project element, where project artefacts or products are stored away for future use or showcasing, was one of the lowest performing of all 17 elements ($n=6$; 18.2%). While several sources throughout the review/reflect process produced material that could be archived, only six sources were clear about the need to document project success/failure, performance, and lessons learned for future use (Boss & Krauss, 2014; Boss & Larmer, 2018; D’Orio, 2009; DTiF, 2020; Edwards, 2000; PMIEF, 2014a). These archives can be used to discuss previous projects (DTiF, 2020), review artefacts, and recall certain challenges (Boss & Larmer, 2018) that can inform future projects.

Teaching project management to primary school children

Despite a wide range of project management elements and activities identified in this review, no empirical studies of comprehensive approaches to teaching project management to primary school children were identified. A moderate level of sources ($n=14$; 42.4%) described or promoted project management teaching in the classroom. Four sources (DTiF, 2020; Flear, 2016; PMI-NIC, 2015; PMIEF, 2015b) clearly identified project management teaching in a primary school setting, although DTiF (2020) and Flear (2016) briefly referred to a secondary school setting. Some sources discussed project management concepts that should be taught in the classroom (ACARA, 2022; Boss & Krauss, 2014; Boss & Larmer, 2018), while others provided evidence through photographs, project artefacts, or descriptions of actual project management activity (DTiF, 2020; Flear, 2016; Ginevri & Trilling, 2017; PMIEF, 2013, 2014a, 2015b). The only source with a clear definition of project management was ACARA (2022, p. 40), defining it as ‘a responsibility for planning, organising, controlling resources, monitoring timelines and activities, and completing a project to achieve a goal that meets identified criteria for judging success’.

Two government sources (ACARA, 2022; DTiF, 2020) recognised the importance of scaffolding techniques to transition primary school students through

increasingly complex project management concepts. The Australian Technologies curriculum is written in bands of year levels for primary school: Foundation to Year 2; Years 3 and 4; and Years 5 and 6 (ACARA, 2022). In Foundation to Year 2, and with teacher guidance, students plan simple steps to complete projects. In Years 3 and 4, students begin to clarify their ideas, manage their time, plan and sequence major steps, and identify project success criteria. In Years 5 and 6, students develop project plans, consider project resources, define roles, set milestones, and reflect on the success of their project product and how improvements in the project process can be made next time. This approach transitions project management learning from basic planning steps through to more complex activities such as analysing cost, time, scope, and quality constraints (ACARA, 2022). DTiF (2020) also suggested the use of templates and checklists that students can adapt to their own projects, with the teacher providing connections between theoretical principles and practical application of project management concepts. Scaffolding strategies like these may be necessary as some concepts, such as Gantt charts and Work Breakdown Structures, mentioned by multiple sources in the review, are too complicated for primary school children to understand (Nodzynska et al., 2018).

Several sources described various phases of a project lifecycle: Initiation, Planning, Execution, and Closing (PMI-Portugal, 2020); Creation, Planning, Execution/Control, and Closing (PMI-NIC, 2015; PMIEF, 2015b); Define, Plan, Do, and Review (PMIEF, 2014a, 2015a). DTiF (2020) listed Planning, Scheduling, Monitoring/Controlling, and Closing but did not include an initiation phase, although they listed several steps under *planning* that would normally belong to an initiation phase, such as defining the problem or need, determining the project objectives, and identifying who is involved in the project (Ginevri & Trilling, 2017; PMI-Portugal, 2020).

Six sources (DTiF, 2020; Ginevri & Trilling, 2017; PMI-NIC, 2015; PMI-Portugal, 2020; PMIEF, 2015a, 2015b) were prescriptive in their recommendations for teaching project management in primary schools, detailing numerous activities undertaken and artefacts produced throughout each phase of the project. In the initiation phase, these sources recognised that a key activity was to identify a problem or need and define the project objective. Other activities included generating ideas (PMIEF, 2015b), brainstorming (PMI-NIC, 2015; PMI-Portugal, 2020; PMIEF, 2015a, 2015b), the identification of stakeholders, determining the resources needed, project success criteria, project team, and deadlines (DTiF, 2020; Ginevri & Trilling, 2017; PMIEF, 2015a). Project management artefacts produced during this phase included resource lists (DTiF, 2020), project identity cards, mind maps (PMI-NIC, 2015; PMI-Portugal, 2020; PMIEF, 2015b), project definition document, and a teamwork agreement document (Ginevri & Trilling, 2017; PMIEF, 2015a).

In the planning phase, the same six sources included defining activities or tasks, roles and responsibilities, sequencing tasks, and assigning people to tasks. PMI-Portugal (2020) highlighted the importance of defining dependencies between tasks. Artefacts produced during this phase included activity trees, project calendars

(PMI-NIC, 2015; PMI-Portugal, 2020; PMIEF, 2015b), work plans and checklists (Ginevri & Trilling, 2017; PMIEF, 2015a), and a work breakdown structure (DTiF, 2020).

In the execution phase, monitoring the project progress and adjusting the plan were activities mentioned in all six sources. Reporting project progress was also important (DTiF, 2020), as was checking to see if the product met original expectations (Ginevri & Trilling, 2017). Project management artefacts identified in this phase included project traffic lights (PMI-NIC, 2015; PMI-Portugal, 2020; PMIEF, 2014a, 2015b) and meeting notes (Ginevri & Trilling, 2017; PMIEF, 2015a). Project traffic lights are used to gauge how project activities are progressing. Green signifies that the activity is progressing as expected; amber means that an activity could be delayed, and the project team should work to avoid the delay; and red means the activity is delayed and a solution should be implemented, such as adding resources, shortening the duration of activities, or simply accepting the delay (PMI-Portugal, 2020).

Finally, in the closing phase, all six sources agreed that capturing lessons learned was a key activity, while reviewing the project against success criteria (DTiF, 2020), discussing improvements in the project process (Ginevri & Trilling, 2017; PMI-NIC, 2015; PMIEF, 2015a), and celebrating project success (DTiF, 2020; PMI-Portugal, 2020) were also important. Boss and Krauss (2014) even included an assessment rubric that includes project management elements such as developing project plans, managing time, meeting milestones, and project reflection. A few sources described or showed evidence of a project wall that displayed common project management artefacts such as activity lists, project calendars, mind maps and a project identity card (PMI-Portugal, 2020; PMIEF, 2014a, 2015a). This allowed teachers and students to visualise the project as a whole and keep track of project progress.

Discussion

This scoping review identified the range of existing literature on teaching project management to primary school children. The review identified 33 sources containing data that met the pre-defined inclusion criteria. A distinction between this review and other scoping reviews in Education journals was the low number of journal articles ($n=7$) and high number of other sources ($n=26$), such as books, web documents, and blogs.

Several gaps in the literature were observed. Firstly, the review did not identify any empirical studies into the teaching of project management to primary school students, although it did reveal several examples of suggested approaches to teaching project management. For example, several sources described four main phases within the project lifecycle and the project management activities, processes, and artefacts produced within each phase (DTiF, 2020; Ginevri & Trilling, 2017; PMI-NIC, 2015; PMI-Portugal, 2020; PMIEF, 2014a, 2015a, 2015b). Students

need to plan, organise, control and monitor these activities and artefacts over the entire project lifecycle in order to achieve project success (ACARA, 2022). Further, scaffolded learning in a project environment was suggested by several sources (Bell, 2010; Boss & Larmer, 2018; DTiF, 2020; Maher & Yoo, 2017; Vander Ark, 2018) and, more specifically, as a way to introduce project management skills with increasing complexity at each year level (ACARA, 2022). Therefore, students are already engaged in the building blocks of project management. However, the lack of research studies highlights the need for more empirical investigation in this area. Qualitative and quantitative studies are required to examine the teaching of project management in primary schools, and the effectiveness of holistic approaches that seek to integrate the project management skills required for students to successfully manage a project from beginning to end in contrast to approaches that focus on these skills in isolation. This would enable a fuller understanding and informed approach to the development of such skills within the Australian Technologies curriculum.

Secondly, while the Technologies curriculum promotes the explicit teaching of project management in primary schools (DTiF, 2020), there is no empirical research into teachers' perspectives on how this should be achieved. Teachers' understanding of project management, and their views on how, when, and what exactly should be taught, impacts student learning. The review revealed some teacher experiences (Modzelewski & Urias, 2017) of using project management teaching resources promoted by PMIEF (PMI-NIC, 2015; PMIEF, 2014a, 2015a, 2015b), but these were anecdotal and not published in peer-reviewed journals.

Thirdly, project management is a professional discipline with complex processes and activities required for project success. This presents a dilemma. How can the technical and complex nature of project management be interpreted, modified, and presented to primary school students so that they understand all of the separate interconnecting parts, but also apply these in a holistic way to manage a project from beginning to end? While project management professionals may be the best choice to advise on the minimal core components required to manage simple projects, it is teachers that are best placed to jointly create and apply such a learning framework in the classroom. Further research is recommended on bridging the disciplines of education and project management so that each may inform the other in ways that further increase the development of the teaching of project management in primary school settings.

Limitations

The sparseness of peer-reviewed articles necessitated the search for other sources such as websites, web documents, videos, and blogs. While that search was extensive, it was not exhaustive due to the vast amount of information available on the internet. As a result, some relevant literature may have been excluded, which is the primary limitation reported in scoping reviews (Pham et al., 2014). The following limitations are related to the nature of scoping reviews. Although a rigorous process was applied using the

JBIM methodology, PRISMA-ScR checklist, and a scoping review protocol, scoping reviews do not appraise the quality of included studies (Grant & Booth, 2009; Levac et al., 2010; Rumrill et al., 2010). Grant and Booth (2009) believe that the absence of a quality assessment excludes scoping reviews from making recommendations for policy or practice. However, Tricco et al., (2018a, 2018b) argue that the purpose of scoping reviews is to characterise the literature rather than assess the quality of included studies. Further, scoping reviews are often a precursor to more rigorous knowledge synthesis methods, such as systematic reviews, which do assess quality (Munn et al., 2018; Peters et al., 2020). Finally, as the information presented in scoping reviews provides more breadth than depth, this review only sought to present the extent, range and nature of the literature rather than a detailed analysis (Tricco et al., 2016). Future research may narrow the focus of the topic to include more specific research questions.

Conclusion

This scoping review sets the foundation for a deeper discussion and further research on the topic of teaching project management to primary school children. While the literature revealed that project management is being taught to a certain degree in the primary school classroom, several unanswered questions remain. How can project management be taught holistically to enable students to manage a project successfully from beginning to end? What project management skills should be introduced to primary school children, and at which year level? What can the perspectives of educators add to the effective teaching of project management? Is there a role for project management practitioners to play in informing how project management is taught in a primary school setting? The lack of research studies highlights the need for more empirical investigation in this area. Qualitative and quantitative studies are needed that examine the teaching of project management in primary schools, and the effectiveness of comprehensive approaches to teaching project management in contrast to less comprehensive approaches that focus on these skills in isolation. It is hoped that this scoping review will assist researchers, educators, and project management practitioners to understand more fully the current literature on project management teaching approaches in primary schools. Collaboration between educators and project management practitioners may be the best approach to equip primary school students with the knowledge, skills, and behaviours to manage projects effectively in school, in the community, at work, and throughout life. This represents a significant area of research as project management is one of the most critical skills for students to achieve success in the twenty-first century.

Appendix

See Table 1.

Table 1 Project management elements and contextual information identified in reviewed sources

Author(s)	PM elements																		
	Initiate				Plan				Execute				Close						
	Prob-lem / pur-pose	Idea-tion	Stake-hold-ers	Require-ments	Con-straints	Suc-cess cri-te-ria	Value / ben-eft	PM tools / arte-facts	Activ-ities / tasks	Resources	Roles	Pro-ject man-ager (T)	Pro-ject man-ager (S)	Pro-ject prod-ucts	Pre-sent prod-ucts	Risk	Review / reflect	Archive project	
ACARA (2022)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Akinoglu (2008)	•			•	•		•	•		•				•					
Bell (2010)	•	•	•	•	•								•	•	•				
BIE (2018)	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•
Boss and Krauss (2014)	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•
Boss and Larmer (2018)	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•
D'Orio (2009)		•		•										•	•				•
DTIF (2020)	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•
Edwards (2000)	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•
Fleer (2016)	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•

Table 1 (continued)

Author(s)	PM elements															
	Initiate				Plan					Execute				Close		
Prob-lem / pur-pose	Idea-tion	Stake-hold-ers	Require-ments	Con-straints	Suc-cess cri-te-ria	Value / ben-eft	PM tools / arte-facts	Activ-ities / tasks	Resources	Roles	Pro-ject man-ager (T)	Pro-ject man-ager (S)	Pre-sent prod-ucts	Risk	Review / reflect	Archive project
Folsom (2000)	•			•	•		•	•	•		•	•	•			•
French (2018)		•		•			•						•			
Ginevri and Trilling (2017)	•	•		•	•		•	•	•	•	•	•	•			•
Krajcovicova and Capay (2012)	•			•			•	•	•				•			
Larskikh et al. (2016)	•		•	•			•	•	•				•			•
Lenz (2016)												•				
Lenz (2018)																
McCain (2005)	•		•	•	•		•	•	•				•			•

Table 1 (continued)

Author(s)	PM elements																
	Initiate					Plan				Execute				Close			
	Prob-lem / pur-pose	Idea-tion	Stake-hold-ers	Require-ments	Con-straints	Suc-cess / ben-eft	Value / ben-eft	PM tools / arte-facts	Activ-ities / tasks	Resources	Roles	Pro-ject man-ager (T)	Pro-ject man-ager (S)	Pre-sent prod-ucts	Risk	Review / reflect	Archive project
Mahe r and Yoo (2017)	•	•	•	•	•		•	•	•			•	•	•		•	
Mod-zelewski and Urtias (2017)																	
Nodzyska et al. (2018)					•			•	•	•							
PMI-NIC (2015)		•						•	•					•			
PMI-Portugal (2020)	•	•	•	•	•			•	•	•			•		•		
PMIEF (2013)		•															
PMIEF (2014a)	•	•	•	•	•		•	•	•	•			•	•	•		•
PMIEF (2014b)																	

Table 1 (continued)

Author(s)	PM elements																
	Initiate				Plan				Execute				Close				
	Prob-lem / pur-pose	Idea-tion	Stake-hold-ers	Require-ments	Con-straints	Suc-cess cri-teria	Value / ben-eft	PM tools / arte-facts	Activ-ities / tasks	Resources	Roles	Pro-ject man-ager (T)	Pro-ject man-ager (S)	Pre-sent prod-ucts	Risk	Review / reflect	Archive project
PMIEF (2015a)	•	•			•	•	•	•	•	•	•	•	•	•	•		
PMIEF (2015b)	•	•			•			•	•			•	•	•			
Portz (2014)	•				•	•		•	•	•	•		•				
Railsback (2002)	•		•		•	•		•	•	•	•	•	•	•	•		
Reitzig (2019)	•								•					•			
Trilling and Fadal (2009)	•				•				•					•			
Vander Ark (2018)																	

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Declarations

Competing interest The authors declare that they have no conflict of interest.

Ethical approval The development of the submitted manuscript adheres to ethical standards. The University of Southern Queensland's Human Research Ethics Committee has granted approval for this research. USQ HREC ID: H20REA139.

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Sante Delle-Vergini has a master's degree in project management and is certified as a Project Management Professional (PMP) with the Project Management Institute. He is currently enrolled in the Doctor of Philosophy program at the University of Southern Queensland, Australia. His research is focused on project management learning in childhood education.

Douglas Eacersall is a Learning Advisor in the Higher Degree Research program at the University of Southern Queensland, Australia. His research interests include higher education, research, training and development, student learning and development, technology enhanced learning, identity, masculinity, cultural identity, and popular culture.

Chris Dann is a Senior Lecturer in Curriculum and Pedagogy Digital Technology in the School of Education at the University of Southern Queensland, Australia. His research interests include machine learning, student satisfaction, feedback, adult learning, online learning design, educational assessment, enacted curriculum, student retention, and artificial intelligence.

Mustafa Ally is a Senior Lecturer in Information Systems in the School of Business at the University of Southern Queensland, Australia. His research interests include online payment systems, trust and online shopping, and technology adoption.

Subrata Chakraborty received his Ph.D. degree in decision support systems from Monash University, Australia. He is a Senior Lecturer with the School of Science and Technology, Faculty of Science, Agriculture, Business and Law, University of New England, Australia. He is also a Visiting Fellow with the Centre for Advanced Modelling and Geospatial Information Systems (CAMGIS) at the University of Technology Sydney (UTS), Australia. Previously, he worked as an Academic with the University of Southern Queensland, Charles Sturt University, Queensland University of Technology, and Monash University. His current research interests include deep learning, data analytics, machine learning, and image processing with decision support applications in diverse domains, including business, agriculture, transport, health, and education. He is a Certified Professional Senior Member of ACS and a Senior Member of IEEE.

Authors and Affiliations

Sante Delle-Vergini¹  · **Douglas Eacersall**²  · **Chris Dann**³  · **Mustafa Ally**⁴  · **Subrata Chakraborty**^{5,6} 

Douglas Eacersall
douglas.eacersall@usq.edu.au

Chris Dann
chris.dann@usq.edu.au

Mustafa Ally
mustafa.ally@usq.edu.au

Subrata Chakraborty
subrata.chakraborty@une.edu.au

¹ School of Management and Enterprise, University of Southern Queensland, 487-535 West Street, Toowoomba, QLD 4350, Australia

² Library Services, University of Southern Queensland, 487-535 West Street, Toowoomba, QLD 4350, Australia

³ School of Education, University of Southern Queensland, 37 Sinnathamby Boulevard, Springfield, QLD 4300, Australia

⁴ School of Management and Enterprise, University of Southern Queensland, 37 Sinnathamby Boulevard, Springfield, QLD 4300, Australia

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- ⁵ School of Science and Technology, Faculty of Science, Agriculture, Business and Law, University of New England, Elm Avenue, Armidale, NSW 2351, Australia
- ⁶ Centre for Advanced Modelling and Geospatial Information Systems (CAMGIS), Faculty of Engineering and Information Technology, University of Technology Sydney, Ultimo, NSW 2007, Australia

2.2 Links and implications

The scoping literature review presented in this chapter provided a response to the gap in the peer-reviewed literature on the topic of teaching project management to primary school children. It revealed some of the typical elements of project management that exist in the context of teaching this complex discipline to young children. The chapter also identified several important questions. Can such a complex discipline be taught to young children? If so, how can it be reduced and simplified to only those core components required for children to manage small and simple projects? Will those teaching children how to manage projects need to be trained in project management themselves? How can the two fields of education and project management collaborate to provide comprehensive ways of teaching children how to manage projects successfully? To answer these questions, SMEs from the fields of education and project management were engaged to understand their perspectives on the topic of teaching project management to children, and to answer specific questions related to their field of expertise. The first step in that process involved an exploration of the perspectives of project managers.

CHAPTER 3: TEACHING PROJECT MANAGEMENT TO PRIMARY SCHOOL CHILDREN: EXPLORING THE PERSPECTIVES OF PROJECT PRACTITIONERS

This chapter is principally an incorporation of the article ‘Teaching project management to primary school children: Exploring the perspectives of project practitioners’, which was published in *Issues in Educational Research* in March 2023.

3.1 Introduction

In the previous chapter, there was a recommendation for further research to bridge the gap between the education and project management professions so that each may inform the other on better ways of teaching project management to young children. More specifically, the perspectives of both educators and project management practitioners are required to identify and develop the skills necessary for children to manage simple projects. Building on the foundational scoping review in Chapter 2, this chapter presents the perspectives of project management experts; the first in a two-part series with the next chapter focusing on teacher perspectives.

The chapter begins by drawing on the literature about *explicit teaching*; a direct instructional teaching technique used to transfer domain-specific knowledge and skills such as mathematics, technology, and project management. The technical knowledge and interpersonal skills required for learning and applying project management is then categorised into hard skills and soft skills. Seventeen project management experts were solicited to identify the hard and soft skills necessary for managing projects and rank them in order of importance and difficulty for children to learn. Further, their perspectives on the topic of young children learning project management, when they should first learn it, where they should learn it, and who should teach

them, was explored in detail. Consensus among the panel of experts was achieved using the Delphi method (see Appendix II for the Delphi survey questions).

The chapter concludes by highlighting the limitation of only gathering the perspectives of project practitioners and calls upon researchers to fully explore the perspectives of educators to complete the interdisciplinary cycle. The key contribution of this chapter is that it is the first empirical study of teaching project management to young children from the perspectives of project management practitioners.

Teaching project management to primary school children: Exploring the perspectives of project practitioners

Sante Delle-Vergini, Mustafa Ally, Douglas Eacersall, Chris Dann

University of Southern Queensland, Australia

Subrata Chakraborty

University of New England, Australia

Project management knowledge and skills are an important component of the Australian Curriculum. The Australian Curriculum, Assessment and Reporting Authority calls for the explicit teaching of project management in primary school. However, it is uncertain if teachers possess the knowledge required to provide explicit teaching of project management, and to what extent it is being taught in primary school. To support the efforts of educators, seventeen project management experts were recruited to provide their perspectives. The Delphi method was used for consensus-building and the identification of core project management hard and soft skills. The findings revealed ten hard skills and twenty soft skills, ranked in order of importance and difficulty level, that children require to successfully manage projects. This study has significance for the project management profession by including the perspectives of industry practitioners on the skills required to successfully manage projects. It also provides educators with an evidence-based perspective for the design and delivery of project management content.

Introduction

The Australian Curriculum was designed to provide students with the knowledge and skills to navigate work and life in the 21st century (ACARA, 2012a). The curriculum includes a *Technologies* learning area that enables students to become successful innovators by creating technological solutions (ACARA, 2012b). Creating solutions is the central focus of the Technologies curriculum, and involves the use of computational, design and systems thinking (ACARA, 2012b). It also requires project management skills to plan, organise, control, and monitor projects to realise these solutions (ACARA, 2022a). As such, project management plays an important role in the Australian Technologies curriculum, as illustrated in Figure 1.

ACARA believes that project management should be addressed in every year of schooling (ACARA, 2012b, p. 10). Further, it should be taught through a model called *explicit teaching* (DTiF, 2020) which breaks down the delivery of content into small components, gradually releasing control from the teacher to the student as the latter gains mastery of each area (Ashman, 2019). Explicit teaching is one of several direct instructional techniques supported by cognitive load theory, which is particularly suited to “the acquisition of domain-specific knowledge via new instructional procedures” (Tricot & Sweller, 2014, p. 278). This is important because the knowledge and skills required in technical domains such as mathematics, science and technology are not intuitive to novices and must be obtained through explicit teaching (CESE, 2017), followed by students practising what they have been explicitly taught while receiving corrective feedback (Clark et al., 2012).

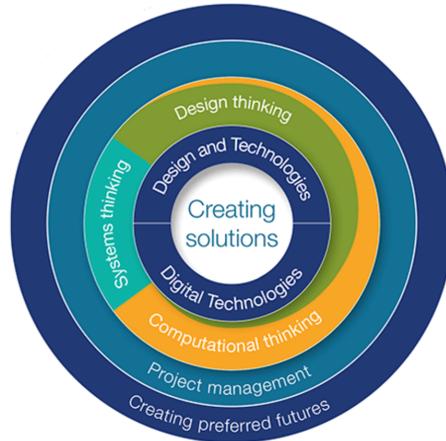


Figure 1: Project management role in the Australian Technologies curriculum
From ACARA (n.d.), Figure 1.

However, unlike mathematics, science, and technology, it is unclear if the level of knowledge required to provide explicit teaching in such a technical domain as project management is present in Australian primary schools. For direct instructional techniques to be effective, domain-specific content must be chosen carefully to avoid misconceptions, and include concrete examples that are expertly selected and sequenced (Turner, 2019). The interdisciplinary nature of the topic provides an additional challenge since the exploration of problems and questions are not limited to a single discipline (NAS et al., 2005). Understanding the pedagogical delivery of domain-specific content in primary school requires dialogue with educators. Equally important is an understanding of the domain being explicitly taught, in this case project management, through the perspectives of industry practitioners.

The Project Management Institute (PMI) defines project management as “the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (PMI, 2021, p. 245). It is a complex discipline with many integrated components that must be managed effectively to deliver successful projects (PMI, 2017a) and has evolved over the decades from leading institutions such as the Project Management Institute, International Project Management Association (IPMA), and Association for Project Management (APM). At the nucleus of every project is a project manager (Kerzner, 2022) who is responsible for producing agreed deliverables within the specified constraints of time, cost, scope, and quality (PRINCE2, 2017). These individuals require a range of core competencies that include both the technical knowledge specific to the discipline and the interpersonal skills required to manage and work with people in projects. One way to view these technical and interpersonal competencies is to categorise them into hard skills and soft skills.

Hard skills

Hard skills are the necessary abilities to perform a particular task or activity (Cimatti, 2016) and requires a high degree of domain-specific knowledge (Torres et al., 2020) and technical expertise (Marin-Zapata et al., 2021). Hard skills are synonymous with the technical skills required in project management (Zhang et al., 2013). The Project Management Institute has long been regarded as the leader in the project management industry (Drob & Zichil, 2013; Hodgson & Muzio, 2011; Richardson & Jackson, 2019). Its flagship publication: *A guide to the project management body of knowledge: PMBOK® guide* (PMBOK) (PMI, 2017a) is considered "the gospel of project management" (Kerzner, 2010, p. 169) and the technical standard within the industry (Creasy & Anantatmula, 2013; Starkweather & Stevenson, 2011; Wysocki, 2014). However, there are other leading publications too (APM, 2019; IPMA, 2018a, 2018b; PRINCE2, 2017). These standards provide a window into the ontology of the discipline (Morris et al., 2000).

The PMBOK includes ten *knowledge areas* that represent the hard skills required to learn the discipline (PMI, 2017a). They include integration management, scope management, schedule management, cost management, quality management, resource management, communications management, risk management, procurement management, and stakeholder management. These knowledge areas contain the required processes, practices, inputs, outputs, tools, and techniques to manage projects effectively and will also be referred to as hard skills throughout this paper. It is important to note that while there has been a shift from knowledge areas to *performance domains* in the latest version of the PMBOK (PMI, 2021), the latest edition of ISO's *International standard for project, programme and portfolio management* retains the knowledge areas, referring to them instead as *management practices* (ISO, 2020).

Table 1: Comparison of knowledge area rankings in previous studies

Rank	Zwikael (2009)	Rasid et al. (2014)	Javed et al. (2015)	Alwaly & Alawi (2020)
1	Time	Scope	Quality	Quality
2	Risk	Time	Time	Procurement
3	Scope	Cost	Communications	Integration
4	Human resource	Quality	Cost	Cost
5	Integration	Integration	Scope	Scope
6	Quality	Human resource	Stakeholder	Schedule
7	Communications	Communications	Integration	Resource
8	Cost	Procurement	Human resource	Stakeholder
9	Procurement	Risk	Procurement	Communications
10	n/a	n/a	Risk	Risk

Schedule Management was called Time Management prior to PMBOK version 6.

Resource Management was called Human Resource Management prior to PMBOK version 6.

PMBOK prior to version 5 did not contain Stakeholder Management; only nine knowledge areas.

Several studies over the past two decades (Table 1) have discussed project management hard skills by specifically referring to the PMBOK knowledge areas and ranking them in order of importance (Zwikael, 2009; Rasid et al., 2014; Javed et al., 2015; Alwaly & Alawi, 2020).

The studies in Table 1 indicate that the Time/Schedule, Scope, Quality and Cost knowledge areas are the most important hard skills within the discipline. They also align with what is commonly known in the project management profession as the *triple constraint*, where cost, time and quality are often traded off to achieve the project scope (APM, 2019; Schwalbe, 2019).

In a teaching context, hard skills are relatively straightforward to teach and assess compared to soft skills (Balcar, 2016; Lyu & Liu, 2021). Provided the teacher is knowledgeable in the particular hard skill they are explicitly teaching, that knowledge is “all the teachable skill that is required for expertise and competence” (Tricot & Sweller, 2014, p. 275).

Soft skills

There is no universal definition for soft skills (Matteson et al., 2016). However, in their systematic review on the topic, Marin-Zapata et al. (2021) identified two types of soft skills: intrapersonal and interpersonal. Intrapersonal soft skills include traits such as self-reflection, independence, and motivation. Interpersonal soft skills are those utilised when relating to other people, such as communication, collaboration, and conflict resolution. All soft skills are useful for life in general, but particularly in collaborative projects (Lyu & Liu, 2021).

In the project management discipline, soft skills refer to the behaviours, attitudes, and personality characteristics when managing projects (PMI, 2017c). In a study on project complexity, Azim et al. (2010) argued that projects consist of three main attributes: people, process, and product. With *people* being the most significant factor in project complexity, the authors posit that project managers must exhibit exceptional soft skills. While soft skills are not domain-specific (Torres et al., 2020) and can be used across multiple disciplines (Gale et al., 2017), they do enable the application of technical knowledge in the workplace (Hendarman & Cantner, 2017) and the ability for hard skills to adapt to change when required (Cimatti, 2016).

There has been criticism that project management institutions and their publications focus too heavily on the education and certification of hard skills, with soft skills relegated to triviality (Ewin et al., 2017; Pant & Baroudi, 2008; Petter & Randolph, 2009). To bridge this gap, these organisations have published project manager competency frameworks (APM, 2015; IPMA, 2018a; PMI, 2017c) that include both sets of skills. PMI's *Project manager competency development framework* (PMI, 2017c) includes three dimensions of competency: knowledge, performance, and personal. The *personal* dimension includes several soft skills such as active listening, communicating, building relationships, conflict management, influencing, problem-solving and motivation.

There have also been several peer-reviewed studies on the importance of soft skills in project management (Alvarenga et al., 2019; Creasy & Anantatmula, 2013; Davis, 2011; Keil et al., 2013; Muzio et al., 2007; Rezende & Blackwell, 2019; Skulmoski & Hartman, 2010; Stevenson & Starkweather, 2010; Zhang et al., 2013; Zuo et al., 2018). Table 2 includes three studies (Alvarenga et al., 2019; Keil et al., 2013; Zuo et al., 2018) that provide rankings for soft skills in project management. These studies clearly demonstrate that communication and leadership are the most important soft skills in project management.

Table 2: Comparison of soft skill rankings in previous studies

Rank	Keil et al. (2013)	Zuo et al. (2018)	Alvarenga et al. (2019)
1	Leadership	Teamwork/collaboration	Communication
2	Verbal communication	Cognitive skills	Commitment
3	Listening	Effective communication	Leadership
4	Written communication	Leadership	Decision making
5	People skills	Conflict management	Teamwork
6	Motivating others	Motivation	Negotiation
7	Negotiation	Adaptability	Conflict management
8	Organisation skills	Self-control	Customer relationship
9	Relationship building	Negotiation	Interpersonal relationship
10	Conflict management	Social awareness	Time management

Note. Keil et al. (2013) included hard skills in their ranking, which were omitted in this table. The ranking for Zuo et al. (2017) was an aggregate of 12 literature sources.

The project management discipline requires project managers to possess a combination of these hard and soft skills to manage projects successfully. A number of these skills have been discussed, identified, and ranked in the previous studies cited in Tables 1 and 2. However, these studies were limited by country, industry, a subsection of the project management discipline (i.e., planning phase), or included participants from only one membership chapter of the Project Management Institute. Further, these studies were not conducted within the context of teaching project management to children.

The purpose of this paper is to explore the perspectives of industry practitioners on young children learning project management, which hard skills and soft skills are most important in project management, and which ones might be difficult for young children to learn. It is the first empirical study on teaching project management to primary school children from the perspectives of project management practitioners. It is hoped that this paper will assist educators and policymakers to provide comprehensive teaching approaches for young students learning project management.

Methods

The following sections describes the process of identifying a panel of experts, the selection and ranking of hard skills and soft skills, and the consensus-building strategy known as the Delphi method.

Delphi method

At the centre of the research methodology is the Delphi method. Meredith and Mantel (2009, p. 83) defined the Delphi method as a "formalized method of group decision making that facilitates drawing on the knowledge of experts in the group". Keeney et al. (2011) asserted that a common theme of this method is reaching consensus, the assumption being that a consensus among a group of experts holds higher validity than an individual's opinion (Murry & Hammons, 1995). The Delphi method has a number of other characteristics with associated benefits. Firstly, there are multiple rounds that often produce richer data than surveys (Okoli & Pawlowski, 2004). Secondly, anonymity provides freedom of expression (Vernon, 2009) and reduces the negative effects of dominant personalities and group pressure (Chalmers & Armour, 2019) while promoting an environment that encourages equal voice (Cohen et al., 2007). Finally, group feedback from multiple rounds is provided back to each participant to inform their next response (Avella, 2016) and facilitate the outcome of consensus (Green, 2014). Participants in this study were also given pseudonyms to protect their privacy, and care was taken to mask their location (aside from country), religion, cultural background, and job titles, as advised by Saunders, Kitzinger and Kitzinger (2015).

Level of consensus

As advised by Chalmers and Armour (2019), we determined a target consensus rate for both hard skills and soft skills prior to the commencement of the Delphi study. In his review of the Delphi method, Vernon (2009) revealed that an agreement with 70% consensus was a common threshold, but values of 55% to 100% were also given. Delphi studies have often been terminated after achieving only a moderate consensus (Schmidt, 1997), or no consensus at all (Green, 2014; Keeney et al., 2011). Since the ten knowledge areas that constitute the hard skills utilised in project management were already pre-selected, a strong consensus would be sought. Regarding soft skills, we were less concerned about achieving a strong consensus on the ranking and more about identifying the most important soft skills. Therefore, a moderate consensus on ranking was deemed appropriate.

To assess the degree of consensus among participants, we used Kendall's coefficient of concordance (W) (Chalmers & Armour, 2019; Keil et al., 2013; Schmidt, 1997). Kendall's W values range from 0 to 1, with 1 indicating a perfect consensus, and 0 indicating no consensus at all (Okoli & Pawlowski, 2004). Each level of consensus can be interpreted using Schmidt's (1997) categorisation of Kendall's W . However, we elected to simplify the interpretation of Kendall's W by reducing Schmidt's (1997) categories from 5 to 3 sections of equal size. Therefore, a Kendall's W of ≤ 0.33 was interpreted as a weak consensus, 0.34 to 0.66 as a moderate consensus, and ≥ 0.67 as a strong consensus. The main reason for this modification was that a Kendall's W of 0.49, for example, would be interpreted as a moderate consensus in this study, rather than a weak consensus according to Schmidt's (1997). The categorisation for both Schmidt's (1997) and this study are detailed in Table 3.

Bootstrapped 95% confidence intervals were calculated for Kendall's W using 10,000 replications. Bootstrapping generates "a large number of resamples, based on the original

sample ... computing the statistics of interest in each sample" (Franco & Reisen, 2007, p. 549). Analyses were conducted in Microsoft Excel (2021) and R statistical program software (R Project, n.d.).

Table 3: Categorisation of consensus levels

Schmidt (1997)		This study	
Kendall's W	Interpretation	Kendall's W	Interpretation
0.10	Very weak		
0.30	Weak	≤ 0.33	Weak
0.50	Moderate	0.34 – 0.66	Moderate
0.70	Strong	≥ 0.67	Strong
0.90	Unusually strong		

Number of rounds

A maximum of three rounds is a common termination point in Delphi studies (Chalmers & Armour, 2019; Green, 2014; Novakowski & Wellar, 2008), especially given the rising attrition rates following each round (Keeney et al., 2011). To avoid *panel fatigue* as described by Novakowski and Wellar (2008, p. 1497), this study allowed for a maximum of three rounds and panellists were made fully aware of, and committed to, multiple rounds (Grisham, 2009).

Expert panel

One of the early steps in the Delphi method is the selection of a panel of experts (Murry & Hammons, 1995). Drawing on Murry and Hammons' (1995) interpretation of domain experts as having superior knowledge within the domain, relevant work experience, or belonging to a professional association, strict criteria for the selection of project management professionals were enforced. Our selection criteria required that each panellist must (i) be a member of PMI; (ii) be *Project Management Professional* (PMP) certified; and (iii) have at least ten years of project management experience. These criteria meet the requirements suggested by Murry and Hammons (1995). Firstly, PMI is widely accepted as one of the leading institutions representing the project management community (Drob & Zichil, 2013; Hodgson & Muzio, 2011; Richardson & Jackson, 2019). Professional membership to such an organisation would meet the first criterion. Secondly, the PMP accreditation is considered the "gold standard" in project management certifications (Richardson & Jackson, 2019, p. 26), and demonstrates a degree of mastery over the technical aspects of project management. With over one million PMP practitioners worldwide (PMI, 2020), organisations are beginning to use the qualification as the minimum entry requirement for employment as a project manager (Thomas, 2014), which is an indication of the stature and pervasiveness of the qualification. Finally, ten years of experience working as a project manager, combined with PMP accreditation and professional membership at PMI, are strong indicators of a high level of expertise.

Project managers were approached and recruited from the Project Management Institute, with seventeen agreeing to participate in the study. Table 4 summarises the demographic profiles (a more detailed demographic profile is provided in Appendix A).

Table 4: Demographic profiles of expert panel (N=17)

Variable	Freq.	
Project management experience (years)	10–19	7
	20–29	4
	30–39	6
Gender	Male	14
	Female	3
Continent	Asia	2
	Australia	3
	Europe	4
	North America	8

Results and discussion

This section presents the results of this study. It is grouped into four sections: (i) the important project management hard skills and their relative importance; (ii) the important project management soft skills and their relative importance; (iii) which category of skills are deemed more important and why; and (iv) the panel's views on young children learning project management, and where, when, and by whom, they should be taught.

Hard skills and their relative importance

In Round 1 of the Delphi study, panellists were asked to rank each PMBOK knowledge area (KA) in order of importance, with the top KA being most important and the bottom KA being least important. The top 5 KAs selected by the panel were communications, stakeholder, scope, risk, and integration. Panellists were also asked to explain the reasons for their top 5 selections. Their individual responses are detailed in Appendix B. The Kendall's W for Round 1 was calculated to be 0.45 (95% CI: 0.30 to 0.65), which represented a weak consensus according to Schmidt (1997), and a moderate consensus according to the categorisation scheme used in this study. There was strong evidence for agreement in this round (chi-squared (9) = 68.6, $p < 0.001$). Since the target consensus requiring a Kendall's W of at least 0.67 was not obtained, the process was escalated to the next round. In Round 2, there was a total of 15 participants (88.2% response rate). The ranking of KAs from Round 1 was presented to the panel for consideration. Nine (60.0%) panellists agreed with the ranking from Round 1, leaving it unchanged in Round 2, while 6 (40.0%) elected to change the ranking. After Round 2, Kendall's W was calculated at 0.87 (95% CI: 0.79 to 0.96), which represented a strong consensus according to both categorisation schemes in Table 3. There was strong evidence for agreement in this round (chi-squared (9) = 117.7, $p < 0.001$). The p-value, mean ranks, and Kendall's W for Rounds 1 and 2, along with the standard deviation for Round 2, are listed in Table 5.

Kendall's W almost doubled from 0.45 to 0.87 between rounds, which indicates a significant shift in agreement among panellists. With a final Kendall's W of 0.87, the target for consensus on the relative importance of hard skills was met.

Table 5: Initial and final ranking for knowledge areas

Rank	Knowledge area (KA)	Round 1 mean	Round 2 mean (SD)
1	Communications	2.65	1.20 (0.41)
2	Stakeholder	2.76	2.07 (0.46)
3	Scope	4.18	3.87 (1.25)
4	Risk	4.41	4.00 (0.53)
5	Integration	5.06	4.73 (1.62)
6	Resource	6.65	6.27 (1.87)
7	Schedule	6.29	6.47 (0.92)
8	Cost	7.00	7.93 (0.46)
9	Quality	7.12	8.60 (1.30)
10	Procurement	8.88	9.87 (0.52)
Kendall's W (95% CI)		0.45 (0.30 - 0.65)	0.87 (0.79 - 0.96)
p value		.001	<.001

Note. Round 1: N=17. Round 2: N=15.

While each KA is important, in the interests of brevity, the top 3 KAs will be discussed briefly. Communications management was the top-ranking KA according to the expert panel. Kerzner (2022, p. 228) defined communications management as "...the formal or informal process of conducting or supervising the exchange of information either upward, downward, laterally, or diagonally". An important KA within the PMBOK, it has the specific purpose of ensuring that a strategy is in place for effective communication between stakeholders and that the process of implementing that communication strategy is actually carried out (PMI, 2017a). Several panellists stated that project managers spend the vast majority of their time communicating (PM-03, PM-05, PM-09, PM-10) and that ineffective communication is a major cause of project failure (PM-02, PM-03, PM-12). In second place, stakeholder management was also deemed critical to project success (PM-01, PM-02, PM-03, PM-04, PM07, PM-08, PM-09, PM-13, PM-15). The stakeholder KA includes many concepts borne out of the communications KA (Schwalbe, 2019) and did not exist prior to the fifth edition of the PMBOK. This indicates the inextricable tie between the two KAs, and their significance by splitting the communications KA into two separate KAs. When asked why communications and stakeholder management were ranked at the top, PM-12 stated: "Because communication with stakeholders is critical to project success" with PM-05 adding that they are "at the heart of daily activity for PMs". Scope management was ranked in third place. In many respects, scope management is the foundation of project planning because it identifies, defines, and controls what is in and out of scope (APM, 2019).

In Round 2, panellists were asked which knowledge areas might be difficult for children aged between 5-11 years old to learn and apply in projects. The results are detailed in Table 6.

Cost and procurement management were ranked at 1 and 2 respectively in terms of learning difficulty. These two knowledge areas involve the financial, contractual, and sourcing side of projects. According to some participants, procurement management is "too complex and formal" (PM-06), "too abstract" (PM-03), and "simply not needed"

(PM-16). Cost management “requires financial literacy” (PM-07) and “budget management skills kids may not yet have” (PM-05). PM-08 believes that “the concept of money can be difficult for children. They may go in two completely different directions. They will either spend it as fast as they get it or save it and never spend”. PM-12 says that children are “not spending their [own] money, thus [they] don’t understand the need to create and stay within a budget and make trade-offs”. Interestingly, while cost and procurement management are the most difficult knowledge areas to learn and apply, they are also ranked low in order of importance, at 8 and 10 respectively (see Table 5). Therefore, they could be slowly introduced in the later years of primary school. The Australian mathematics curriculum encourages the development of consumer and financial literacy through activities such as creating budgets and financial plans, calculating percentages, and maximising value while purchasing goods and services (ACARA, 2022b). This presents an opportunity for primary school educators to introduce project cost and procurement management skills that align with the required mathematics curriculum for a student’s particular year level.

Table 6: Difficult knowledge areas for children to learn (N=15)

Rank	Knowledge area	Freq.	%
1	Cost	12	80.0
2	Procurement	10	66.7
3	Integration	9	60.0
4	Quality	6	40.0
5	Stakeholder	5	33.3
6	Risk	4	26.7
7	Schedule	4	26.7
8	Resource	2	13.3
9	Scope	1	6.7
10	Communications	0	0.0

In contrast to the previous example regarding cost and procurement management, communications and scope management are two knowledge areas that are very important in project management (ranked 1 and 3 respectively in Table 5) and least difficult to learn and apply (ranked 10 and 9 respectively in Table 6). Therefore, they should be introduced in the early years of primary school.

Understanding the important project management hard skills and which ones might be difficult for young children to learn can inform educators on how and when each skill is introduced to the student. It also highlights the knowledge areas that teachers may need to learn themselves in order to provide explicit teaching in the classroom. Whatever the structure and delivery of project management teaching looks like in the primary school classroom, educators will need to possess the relevant project management hard skills before explicitly teaching and assessing them.

Soft skills and their relative importance

In Round 1, panellists were asked to nominate up to 10 soft skills they believed were necessary to manage projects successfully. A total of 167 soft skills were submitted. Duplicates were removed, and some soft skills were grouped together. For example, when soft skills had nearly identical names but with a slight variation, the most frequently used term was selected. The term “motivating” (PM-15) was replaced with *motivation*, as the latter term was most often used by panellists. Skills that were unique, but shared a common category, were grouped into that category. For example, “effective communication” (PM-03, PM-04, PM-10), “communication skills” (PM-02, PM-09), “written communication” (PM-08), and “concise communication” (PM-12) were categorised as *communication*, which again, was the most frequent term used among panellists. This process reduced the original list of 167 soft skills down to 70.

The reduced list of 70 soft skills, and the number of times each was nominated in Round 1, was presented to panellists in Round 2. They were then asked to select 20 soft skills each, in no particular order, that they believed were most important. The results are detailed in Appendix C. In Round 3, there was a total of 14 participants (82.4% response rate). The top 20 soft skills nominated by the panel in Round 2 were presented to panellists and they were asked to rank each skill in order of importance. The results are detailed in Table 7.

Table 7: Top 20 soft skills in project management (N=14)

Rank	Soft skill	Mean
1	Communication	2.00
2	Leadership	2.43
3	Emotional intelligence	4.71
4	Influencing	7.64
5	Negotiation	7.71
6	Facilitation	8.64
7	Adaptability	9.71
8	Listening	9.71
9	Conflict management	10.07
10	Teamwork	10.21
11	Problem solving	10.21
12	Decision making	12.57
13	Empathy	13.00
14	Resilience	13.50
15	Cultural sensitivity	13.86
16	Motivation	13.93
17	Collaboration	14.29
18	Integrity	14.36
19	Creative thinking	15.50
20	Critical thinking	15.93
	Kendall's W	0.48
	p value	< .001

Kendall's W of 0.48 (95% CI: 0.40 to 0.67) revealed a moderate consensus on soft skills. As with the previous studies in Table 2, our panellists ranked communication and leadership at number 1 and 2 respectively. Emotional intelligence, which did not rank in the top 10 for any of the studies in Table 2, ranked at number 3 in this study. Emotional intelligence is the ability to perceive, express, and manage emotions in others and within ourselves (Cimatti, 2016) and is an underdeveloped soft skill in project management (Ewin et al., 2017). As with hard skills, we asked panellists to nominate which soft skills children aged between 5 and 11 years old might find difficult to learn and apply when managing projects. The results are detailed in Table 8.

Table 8: Difficult soft skills for children to learn (N=14)

Rank	Soft skill	Freq.	%
1	Cultural sensitivity	9	64.3
2	Conflict management	9	64.3
3	Facilitation	7	50.0
4	Empathy	6	42.9
5	Emotional intelligence	5	35.7
6	Leadership	4	28.6
7	Influencing	4	28.6
8	Resilience	4	28.6
9	Decision making	4	28.6
10	Critical thinking	4	28.6
11	Integrity	4	28.6
12	Negotiation	3	21.4
13	Listening	3	21.4
14	Motivation	2	14.3
15	Adaptability	1	7.1
16	Communication	0	0.0
17	Problem solving	0	0.0
18	Teamwork	0	0.0
19	Collaboration	0	0.0
20	Creative thinking	0	0.0

When comparing the results of Tables 7 and 8, several soft skills that are critical to project management are also difficult for children to learn and apply. Some of the soft skills in this category include emotional intelligence, facilitation, and conflict management. These would be areas for educators to focus on when teaching project management to children. Communication, problem solving, teamwork, collaboration, and creative thinking were not perceived as difficult to learn and apply by any of the panellists.

Teaching soft skills in the early years of primary school is a fundamental requirement (Cimatti, 2016). However, soft skills are difficult to develop and measure (Balcar, 2016). Matteson et al. (2016) suggested triangulating data from self, peer, and supervisor-reported data as an approach to measuring soft skills in an individual. However, this may not be appropriate in a primary school setting. While practitioners are best placed to identify and rank the soft skills required in project management, educators are critical in developing

and measuring them in primary school students. Further research is needed on the perspectives of primary school educators on how this might be achieved with respect to teaching project management.

Which skill set is more important: hard skills or soft skills?

Panellists were asked if they were teaching project management to children aged between 5 and 11 years old, which category of skills would they focus on. The results are detailed in Table 9.

Table 9: Which category of skills is more important (N=17)

Category	Freq.	%
Soft skills	11	64.7
Hard skills	2	11.8
Both are equally important	4	23.5

The majority of panellists (PM-01, PM-02, PM-03, PM-06, PM-08, PM-09, PM-11, PM-13, PM-14, PM-16, PM-17) believed that soft skills were more important for children to learn when managing projects. Four panellists (PM-05, PM-07, PM-10, PM-12) felt that learning both sets of skills was equally important, while two (PM-04, PM-15) nominated hard skills as the most important category. The next section describes the reasons behind some of the selections.

Regarding soft skills, PM-09 believed that "...hard skills are less important for project success. The PM does not have to be an expert in the field, his job is to make the team shine. This is achieved by developing and using soft skills". Therefore, "building the foundation of soft skills comes first" (PM-17). During "...the first years it is imperative [to develop] the foundational citizenship soft skills. The rest we learn, unlearn, and relearn all through our life" (PM-13). While both are important according to PM-03, "...a focus on soft skills learning at an early age will provide a much greater return on investment". Contrasting both sets of skills, PM-01 believed that while "...the technical analysis work involved in schedules, cost and risk management would be generally beyond a child of that age, it is the development of soft skills [that] are vital yet founded on rather simple concepts".

Only two panellists believed that hard skills should be the main focus when teaching project management to children. As PM-15 explained, primary school children are "...more likely to possess some of the soft-skills..." already, so the focus should be on "...imparting knowledge on technical skills." PM-04 also supported a focus on hard skills because "soft skills are acquired through experience, [and are] difficult to be taught".

While the authors of this paper believed that the majority of panellists would agree that both sets of skills were equally important, only four panellists (23.5%) held this view. PM-07 asserted that "there might be moments when one set of skills is more important than the other, but both sets are equally important in [the] long term". PM-12 stated that

“when someone is learning project management, they need to understand the ability to work with people (soft) and the science (hard) of being a PM”. PM-05 added that without “...emotional intelligence a PM cannot sustain... project outcomes... at the same time a PM with low levels of technical project management ... will fail even if he or she has high EI.” PM-07 extended their response to include an example within a school context:

I would teach them both to prepare them for real life assignments. Of course, the set of skills need to be chosen appropriately for their age, e.g., a school science project is a good example. I saw results of my daughter over the years, she is 14 now. If she does not have soft skills, getting on with the rest of their small project team is very hard. They learn soft skills on the go because otherwise they really can't cooperate. But without the hard skills, they actually can't deliver the assignment itself, e.g., the subject of their science project. (PM-07)

There is a dichotomy that exists between the two sets of skills. While project management hard skills may be the easiest to teach and assess, they require educators to master the technical areas of the discipline in order to explicitly teach them. Soft skills, on the other hand, may be more familiar to educators and pervasive across the entire Australian curriculum, but they are difficult to learn and measure.

Regardless of what is perceived as more or less important, and more or less difficult to learn and measure, both sets of skills are required to learn the project management discipline. Figure 2 provides a visual illustration of the 10 hard skills and 20 soft skills in project management from Tables 5, 6, 7, and 8, and their importance and learning difficulty for children aged between 5 and 11 years old.

Educators might consider the quadrants in Figure 2 when designing project management learning content for primary school children. For example, the skills in the high importance / low difficulty quadrant may be a better option in the early years of primary school, while the skills in the low importance / high difficulty quadrant might be better suited in the later years.

Children learning project management

The Australian Technologies curriculum is not alone in promoting project management learning in primary school. The *Partnership for 21st Century Learning* (P21), arguably the leading institution on 21st century learning, created a framework that focuses on the skills, knowledge and expertise required for children to successfully navigate life in the 21st century. Several soft skills cited in the P21 framework also appear in Table 7 of this paper.

Most significantly, the P21 framework specifically includes project management as a key 21st century skill (P21, 2019, p. 7). However, what is unclear in the literature is: (i) should primary school children even learn project management; (ii) what is the appropriate age to start learning the discipline; (iii) who should teach it; (iv) should those who teach it be trained; and (v) what is the best learning environment. The panel was asked a series of questions based on these queries.

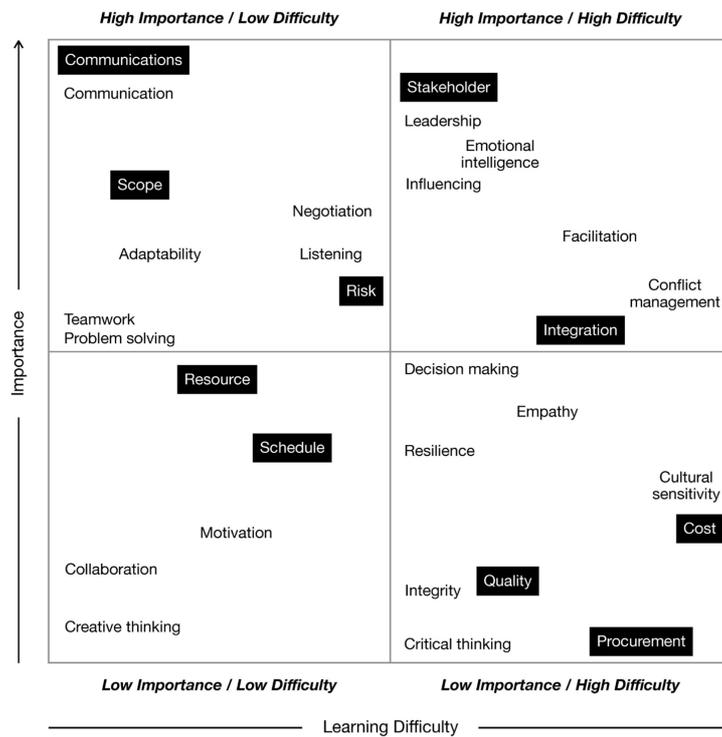


Figure 2: Importance vs learning difficulty of PM hard/soft skills
 Note. Text in black boxes indicate hard skills. Soft skills are in black text. While the positioning of skills is not precisely to scale, the priority order and quadrant allocation is reflective of the results.

Should children aged between 5 and 11 years old learn project management?

The results are detailed in Table 10. All but one panellist (94.1%) agreed that primary school children should learn project management and were asked to explain their response. PM-05 stated that project management is "...a life skill. Most important choices and plans in life involve the management of a de facto project. This includes their education, a job search, a wedding, etc." Learning the discipline "...prepares them for real life situations when they need to deliver results in teams" (PM-07). PM-12 added that "...whether you're leading a team or a member of one, everyone should understand what a project is and project management in general". The sole undecided panellist believed that children should focus on "...a task to deliver something somebody wants" rather than formal project management.

Table 10: Should children learn project management? (N=17)

	Yes	No	Undecided
n	16	0	1

Several panellists mentioned future careers as a benefit of learning project management early. “Success in any field requires a basic level of project management skills. As such, I strongly believe that learning PM skills will certainly help kids in their careers” (PM-15). PM-09 believed that society is transitioning to a “...projectised economy. Teaching project management to a child will help him not only in his career but also in his private life”. This sentiment was echoed by PM-03: “...starting the learning process at an early age will help kids to bootstrap their careers”. With organisations expected to rely on approximately ninety million project management-oriented roles by 2027, and an increasing gap between demand and supply for professionals to fill these roles (PMI, 2017b), project management skills will certainly be valuable to employers.

When should children first learn project management?

The results are presented in Table 11. Eleven panellists (64.7%) believed that the best time to start learning project management is between 5 and 11 years old, or primary school age. This age group has “...high potential in terms of thinking and doing” (PM-02), and is “...old enough to have overcome basic learning challenges and able to interact with one another in small groups towards a common goal” (PM-03). The “basic concepts of project management can be broken down for children of 5-11 years old which could become very helpful in school life for 12-17 years old...setting the foundations early is critical” (PM-01). One panellist, PM-13, simply stated: “the sooner the better”. Three panellists (PM-04, PM-09, PM-10) were more cautious, suggesting that project management learning may be better suited to secondary school, since “...you have enough knowledge to start diving [into] project management” (PM-09). Finally, PM-08 selected *any* age range: “...the toddler stage may be a little young, [but] all of the options make sense. Of course, the level of project management may be lighter for younger children, but there are skills they can start applying at any age”.

Table 11: When should children first learn project management? (N17)

	0 - 4	5 - 11	12 - 17	Any	Undecided
n	1	11	3	1	1

Who should teach project management to children?

The results are detailed in Table 12. Aside from a *teacher* or *parent*, one of the selection options for this question was a *PMP* certified practitioner, a qualification that all members of the expert panel hold. A strong consensus (70.6%) agreed that a schoolteacher is the best person to provide project management instruction to children. “At this age, you need someone with early childhood learning skills as they would likely know the best way to convey challenging concepts in an interesting manner. Kids at that age have very short attention spans” (PM-03). A teacher already has a “...strong relationship with the children

and is best placed to impart the level of knowledge being introduced at that age. The key will be designing a syllabus that is 100% aligned with children's capabilities" (PM-01).

Table 12: Who should teach project management to children? (N=17)

	Teacher	Parent	PMP	No reply
n	12	2	1	2

A few panellists did not think a teacher was the best option. However, if a "...parent is not available or willing, the second choice would be [a] teacher" (PM-08). The only panellist who felt that a PMP certified practitioner was most appropriate for teaching children was PM-10: "Project management is science. It is always great to learn it from a PMI professional".

Should schoolteachers and/or parents receive project management training if they are teaching children project management?

The results are detailed in Table 13. A large majority of the panel (82.4%) agreed that anyone who teaches project management to children should themselves be trained in the discipline. "It is fairly obvious, project management is a specialist discipline that must be learnt and ideally delivered before teaching anyone" (PM-01). A "qualified teacher [in] math or geography...must be trained in project management" (PM-11), and "...carefully developed and high-quality material should be provided to teachers and parents" (PM-15). The training should also "...align to the profession[s] curriculum" (PM-06), suggesting that pre-service teachers should have project management training incorporated into their syllabus. However, for educators already engaged in primary school teaching, this might involve professional development programs for example. Following training in project management, teachers could "...adapt the project language to the classrooms depending on children[s] potentiality" (PM-02). PM-08 is not certain that "...formal training is required for teachers to pass on these skills, especially the soft skills". This is an interesting point. As part of project management training and certification, even the PMP panellists in this study were not trained or tested on soft skills. As discussed earlier in this paper, the PMP certification exam is based only on the hard skills associated with the discipline.

Table 13: Should educators be trained in PM? (N=17)

	Yes	No	No reply
n	14	1	2

What is the best environment for children aged between 5 and 11 years old to learn project management?

The results are detailed in Table 14. The majority of panellists felt that a school environment was ideally suited to teaching project management to children. However, it is worth looking at some of the reasons why panellists selected different options.

Table 14: What is the best environment for children to learn project management?
(N=17)

	School	Home	Community	Work	Other	No reply
n	10	1	1	1	2	2

PM-12 selected *home* because it is "...a safe environment with the tools and support needed to do their work...". There are some presumptions in this statement that are beyond the scope of this paper, however, it is worth noting that many children may not have the home environment as described by PM-12. PM-14 felt that a community program might be a good option to work with an "...independent team". Finally, PM-08 and PM-15 had interesting responses to why they selected *other*: "I actually think any and all of these are good environments. I cannot choose because I think it would depend on the child's situation and what is available to them" (PM-08); "...a combination of environments should be used, with different types of content for each environment. It should ideally be a combination of school, home, and community programs. I believe that this combination may change from one culture to another" (PM-15).

Final thoughts from project practitioners

The final question to panellists gave them an opportunity to summarise their overall thoughts, feelings, and suggestions on the topic of teaching project management to primary school children. A few insightful responses are included in this section.

When learning something new, it is always best to focus first on what you do best and then expand on that. For example, expanding on empathy and emotional intelligence, the child can learn conflict resolution and negotiation. For the knowledge areas, several will come easier. Scope and quality are areas that I think they can learn first. Procurement and cost may be unfamiliar territory to many children. Some were not taught to use money at this age. Time management absolutely needs to be taught. This is an area that too many adults struggle with. Teaching a child this early may make the biggest impact in their lives over the other areas. I say this because my biggest struggle in work and personal relationships is the lack of time management by others. (PM-08)

Nothing is impossible to be learned, even at an early age. There are plenty of cases in history of talented children that mastered instruments, languages or mathematics before they were able to stand on two feet. Children could not possibly learn project management by reading PMBOK back-to-back. Instead, they should use resources that appeal to them. Simplicity would be a key requirement, and as visual as possible ... Informatic tools that allow gamification would be suitable to expand the kids' knowledge in PM ... In short, an approach that puts the weight on the practical side of project management and less in the theory, as simple and as visual as possible. (PM-09)

First, have the kids come up with their own project list. Choose the project team members with them, and then, as preparation for the training in project management techniques, in addition to basic guidance on technical aspects (scope, time, cost, quality management), go through the 20 [soft skill] items above with a slide on each item so they understand what each is and how this is important in project management. I am amazed,

delighted and uplifted by this [soft skills] list and that the profession has matured to the extent that the mathematical formulae, scientific techniques and measures we obsessed over in the 80s, 90s and early 00s have taken second place to human interaction principles. As an EI expert as applied to project management, this is something [that] brings tears to my eyes to see these things acknowledged, especially in connection with children. If kids master these principles, we will not only make project management a life skill, but they will be women and men of character, real contributors to social change. They will change the world. (PM-05)

Limitations

There were some limitations observed during this research. Firstly, all participants were recruited through the Project Management Institute. Sampling project managers from other project management organisations such as APM, IPMA, and AXELOS, may have provided broader representation. Secondly, although the hard skills in this paper were represented by the ten PMBOK knowledge areas, there are other project management institutions that publish their own texts that define and emphasise hard skills in alternative ways. Future researchers should consider these texts when selecting, ranking, and reaching consensus on the important hard skills in project management. Thirdly, while this paper focused on the important components of the project management discipline in a primary school context, it did not explore how such content might be structured and delivered in the classroom. Finally, and most significantly, only the perspectives of project management practitioners were presented and discussed in this paper. To fully explore the topic of teaching project management to children in primary school, the perspectives of educators must be included.

Conclusion

Project management is a technical discipline that requires a high degree of knowledge and skills. A panel of domain-specific experts was recruited to provide their perspectives on children learning project management in primary school. The results identified a list of ten hard skills and twenty soft skills in order of importance and difficulty for primary school children to learn and apply when managing projects. The panel also agreed that (i) the ideal age for children to learn project management is between 5 and 11 years old; (ii) the best place to learn project management is in a school environment; (iii) the best person to deliver the instructional content is a teacher in that school environment; and (iv) teachers ideally need training in the discipline of project management before providing explicit teaching to students.

There are several implications for both research and practice. Regarding the research community, this study represents an empirical journey to better understand how the teaching of project management can be successfully delivered into the primary school classroom. Future researchers could explore the perspectives of primary school educators, and their approaches to designing and delivering project management content for their students. For the project management discipline, children who learn the important hard and soft skills needed to successfully manage a project should become better project managers and team members as they enter the workforce. A cooperative effort between

educators, project management practitioners, and the research community, is required to provide primary school children with the best chance of learning this critical 21st century skill.

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Appendix A: Table A1

Full demographic profile and participation of each panel member						
ID	Country	Gender	Education	Experience (yrs)	Participation	
					Round 2	Round 3
PM-01	Australia	M	Bachelor	12	Yes	Yes
PM-02	Italy	M	Bachelor	35	Yes	Yes
PM-03	Canada	M	Masters	25	Yes	Yes
PM-04	Canada	M	Masters	17	Yes	Yes
PM-05	Canada	M	Undergrad.	30	Yes	Yes
PM-06	Australia	M	Masters	30	Yes	Yes
PM-07	Czech Rep.	F	Masters	20	Yes	Yes
PM-08	United States	F	Bachelor	15	Yes	Yes
PM-09	Netherlands	M	PhD	12	Yes	Yes
PM-10	India	M	Masters	14	No	No
PM-11	Canada	M	Bachelor	25	Yes	Yes
PM-12	United States	M	Masters	20	Yes	Yes
PM-13	Portugal	F	Masters	30	Yes	Yes
PM-14	United States	M	Masters	38	No	No
PM-15	India	M	Masters	31	Yes	No
PM-16	United States	M	Bachelor	10	Yes	Yes
PM-17	Australia	M	Masters	15	Yes	Yes

Appendix B: Table B1

Reasons for top 5 knowledge areas selected					
ID	1	2	3	4	5
PM-01	<i>Stakeholder</i> Unless you are successful in your key stakeholders' minds, every other measurement doesn't matter.	<i>Risk</i> Without risk management, you don't have a standard reasoning framework to explain why you think you may not hit the contractual milestone.	<i>Schedule</i> Everyone wants to know 'when'. The key planning tool to communicate to stakeholders is the schedule on when key items are occurring, how they may be linked to others and what might be the impact be of a delay.	<i>Scope</i> Projects are defined as a temporary organisation to get an outcome that effectively is not achievable in BAU. Scope provides a key measure of whether you have delivered against project goals.	<i>Quality</i> Quality provides a measure of whether your deliverables are of a standard that is acceptable to your stakeholder.
PM-02	<i>Communications</i> Poor, discontinuous and undifferentiated communication is the main cause of project failures.	<i>Risk</i> Risks (and opportunities) are frequently ignored, underestimated and managed in reactive/not proactive ways.	<i>Integration</i> Integration contains some essential processes such as Develop Project Charter and Integrated Change Control.	<i>Stakeholder</i> As well as for communication, effective stakeholder management is a critical success factor in most projects.	<i>Scope</i> Whatever the project complexity, scope management covers everything related to the "what" and the "how".
PM-03	<i>Stakeholder</i> Projects involve people and even if you deliver what was promised, if the stakeholders aren't happy your project was a failure.	<i>Resource</i> You can have a great project vision and an ideal solution approach but without resources (material, equipment and people) you can't deliver anything.	<i>Communications</i> 90+% of our time as PMs is spent communicating and this is often ranked as a key cause of project failures.	<i>Scope</i> Poor requirements and scope management is a leading cause of schedule delays, cost overruns, stakeholder dissatisfaction and failed projects.	<i>Quality</i> Quality is meeting all necessary requirements - those both explicitly and implicitly stated. It is not possible to achieve a project's outcomes without a focus on quality.
PM-04	<i>Integration</i> Integration Management is key as many processes interacts with each other.	<i>Risk</i> Risk ties to cost, schedule and quality.	<i>Stakeholder</i> Stakeholders management and engagement is key and could affect the project drastically if not managed properly.	<i>Communications</i> Communications management is key and could affect the project drastically if not managed properly.	<i>Scope</i> Scope is important as it affects all other KA's, especially cost and schedule, that's why it is ranked higher.
PM-05	<i>Communications</i> A PM is primarily a communicator.	<i>Scope</i> Scope management is of vital importance, though it could be said that scope, cost and schedule are of equal importance with client. Flexibility in one or two of these being determinants.	<i>Stakeholder</i> See previous response.	<i>Cost</i> See previous response.	<i>Schedule</i> PMs must be able to anticipate, plan, communicate and manage risks to scope, schedule and budget to succeed

Reasons for top 5 knowledge areas selected					
ID	1	2	3	4	5
PM-06	<i>Stakeholder</i> Need support from others to succeed.	<i>Communications</i> Need to keep everyone in the loop.	<i>Risk</i> Need to anticipate and solve problems.	<i>Resource</i> Need to manage money/people.	<i>Scope</i> Need to focus on scope.
PM-07	<i>Stakeholder</i> Stakeholder management is crucial for any project. Success of the project is not the deliverable itself, but sustainability of the change, acceptance of the change and materialisation of benefits of the change. In all of this, stakeholders play a crucial role.	<i>Communications</i> Communication management is the key for efficient team working and also interaction of the project team with its surroundings. If we want people to follow one direction, and make the best decisions for the project, we need to focus on having everyone on the same page.	<i>Risk</i> Being risk aware and making proactive actions significantly increases the probability of success for the whole project.	<i>Scope</i> I see this as result of good stakeholder and risk management. Scope management is very important but should not overweigh focus on the whole purpose of the project, which comes from stakeholder management.	<i>Quality</i> I see this area as the one which determines how we manage costs, resources, and deliver the scope in the best way possible.
PM-08	<i>Communications</i> I feel communication management affects many of the other areas directly. We need to manage communication properly to gather and manage scope, risk, stakeholders (of course), costs, schedules, procurement and resources.	<i>Scope</i> Managing the scope means managing what we deliver as a project. If the scope isn't set and managed properly for a project or a sprint, then how will you know what the end is?	<i>Risk</i> Risk is near and dear to my heart. Being able to identify and manage risks properly could mean the project succeeds or crashes and burns. This takes a lot of forethought and looking at the big picture with many scenarios.	<i>Stakeholder</i> If your stakeholders are not happy, how can a project succeed? We need our stakeholders to provide us information and to approve our project (depending on the stakeholder of course).	<i>Quality</i> Quality means not only does the end product perform but it also meets the stakeholders needs. If the quality was not properly managed and has suffered, the project may fail.
PM-09	<i>Stakeholder</i> Failing to identify important stakeholders leads to longer lead times, increased costs and likely impacts the quality of the overall outcome. The delivery of a successful project depends largely on selecting the right project stakeholders.	<i>Communications</i> A PM communicates about 80% of the time. Communication management is therefore key.	<i>Scope</i> The next three choices have to do with the typical project triple constraint: scope, schedule and cost. Scope is the most important of the three, since it is the one that is more tempting to "creep" by certain stakeholders.	<i>Schedule</i> Schedule management comes next. Typically, we work against deadlines. Budget is important, but it tends to offer more flexibility.	<i>Cost</i> Thus, budget management comes after scope and schedule management.

Reasons for top 5 knowledge areas selected					
ID	1	2	3	4	5
PM -10	<i>Scope</i> Correctly defined scope is the base for any project lifecycle. Any changes or scope creep is going to have a direct impact on the project deliverables (schedule, cost, quality).	<i>Communications</i> Project manager spend 90% of their time communicating with stakeholders. Clear and transparent communication always keeps stakeholders engaged.	<i>Stakeholder</i> Project is about change and for any change, the people side is very important.	<i>Schedule</i> Time has a direct impact on the business case of the project. For example, a delay in the launch of a new product is an opportunity for competitors.	<i>Risk</i> The early identification of threats and opportunities helps to increase the chances of a successful project.
PM -11	<i>Communications</i> Important for transparency; facilitates buy-in; keeps everyone informed.	<i>Integration</i> Gives you the big picture.	<i>Cost</i> Economy and cost control are important.	<i>Risk</i> Risk can impact cost, and cause failure to the project.	<i>Stakeholder</i> Getting everyone on board.
PM -12	<i>Communications</i> Communication is key. I've seen many projects fail due to poor communication. If you can't communicate, nothing else will get done.	<i>Stakeholder</i> I've had stakeholders end in-flight projects, resulting in millions of dollars of sunk costs.	<i>Integration</i> Integration pulls all other plans together.	<i>Scope</i> Need to understand "Done" from a scope standpoint; decisions can be made against that.	<i>Risk</i> Risks are everywhere! Not managed, they can grow out of proportion.
PM -13	<i>Integration</i> The first priority and focus of a PM is to balance the difference areas.	<i>Stakeholder</i> Managing stakeholders from their identification to strategies and implementation is key for success, as projects exist from people to people.	<i>Communications</i> Communication is a critical tool for success with stakeholders (including team and suppliers), especially if you consider that in today's global world, we have mostly virtual and multi-cultural projects.	<i>Risk</i> Risk identification and strategies to deal/mitigate issues with stakeholders and triple constraints.	<i>Procurement</i> Procurement is important, especially with stakeholder, but also regarding ethics and compliance to local regulations.
PM -14	<i>Integration</i> Knowing how pieces interact.	<i>Stakeholder</i> Keep the business champions engaged.	<i>Communications</i> Provide information up and down the value stream.	<i>Schedule</i> People want to know when things are going to happen.	<i>Scope</i> Make objectives obtainable.

Reasons for top 5 knowledge areas selected					
ID	1	2	3	4	5
PM -15	<i>Communications</i> I believe that effective communication (listening, speaking, writing, observing body language, gestures, etc.) is the most critical of all knowledge areas for project success.	<i>Stakeholder</i> Project success can be made or broken by people. It is vital to understand stakeholder expectations, risk tolerances, and dynamics between competing needs. To ensure success, PMs need to engage stakeholders throughout the project.	<i>Resource</i> To achieve success, PMs need to work hard to achieve an optimum combination of resources. In knowledge industries, there needs to be higher focus on human resources.	<i>Schedule</i> Today's competitive marketplaces require a "quick to market" mentality. As such, effective management of the project schedule deserves a place in the top five.	<i>Scope</i> Fuzzy requirements and scope creep were among the top 20 global failure factors in a research poll I carried out when writing my book. Hence, I added this knowledge area to my top five.
PM -16	<i>Communications</i> Communication is the basis of everything else.	<i>Stakeholder</i> Understanding the needs and intents of stakeholders, while keeping concise and open lines of communication, forges partnerships, trust, and enables opportunities to influence.	<i>Risk</i> Keeping tabs on identification, tracking, and ownership of risks is vitally important to maintaining a long-term, strategic view.	<i>Integration</i> Coordinated and organised oversight keeps the project wheels turning smoothly.	<i>Scope</i> So easy for scope to creep past the original intent. While we can recognise identification of future needs as the team learns more, it is with thoughtful scope management and prioritisation that the project delivers on its original intent.
PM -17	<i>Scope</i> Scope must be very clear and precise to eliminate issues of misinterpretation.	<i>Integration</i> It is the backbone of the entire project.	<i>Cost</i> Costing is the main part of the project to be executed.	<i>Schedule</i> Utilisation of resources and the timeframe of executing.	<i>Resource</i> Availability of resources.

Note. Some responses have been edited to correct grammar and improve clarity. Use web reader or PDF reader 'zoom in' function if necessary for improved readability.

Appendix C: Table C1

List of 70 soft skills and those nominated as most important					
Soft skill	f	Soft skill	f	Soft skill	f
Communication	14	Time management	5	Issue management	2
Leadership	11	Work ethic	5	Managing people	2
Negotiation	11	Respectful	5	Kindness	2
Emotional intelligence	11	Servant leadership	5	Open mindedness	1
Problem solving	10	Team building	4	Presentation	1
Influencing	10	Coaching	4	Detail focused	1
Conflict management	10	Self-confidence	4	Approachable	1
Listening	9	Fairness	4	Forecasting	1
Adaptability	9	Accountability	4	Humbleness	1
Facilitation	9	Political awareness	4	Relationship capital	1
Cultural sensitivity	9	Patience	4	Tough conversations	1
Teamwork	8	Relationship building	4	Simplicity	1
Resilience	8	Trustworthy	3	Citizenship	1

Decision making	8	Courage	3	Versatility	1
Critical thinking	8	Ability to learn	3	Flexibility	0
Empathy	7	Mentoring	3	Interpersonal	0
Motivation	7	Honesty	3	Artistic sensibility	0
Collaboration	7	Inspiring	3	Responsiveness	0
Creative thinking	7	Positivity	2	Autonomy	0
Integrity	7	Compassion	2	Aesthetic sensibility	0
Transparency	6	Analytical	2	Technological sensitivity	0
Persuasion	5	Calm	2	Advising	0
Organising	5	Decisiveness	2		
Social awareness	5	Responsible	2		

Sante Delle-Vergini is currently a PhD student at the University of Southern Queensland, Australia. His research focus is on project management learning in childhood education.

ORCID: <https://orcid.org/0000-0001-9762-0326>

Email: sante.delle-vergini@usq.edu.au

Dr Mustafa Ally is an Honorary Senior Lecturer in Information Systems in the School of Business at the University of Southern Queensland, Australia. His research interests include cryptocurrencies, blockchain technology, online payment systems, trust and online shopping, and technology adoption.

ORCID: <https://orcid.org/0000-0001-6370-3860>

Email: mustafa.ally@usq.edu.au

Dr Douglas Eacersall is a Senior Lecturer in Researcher Development and the Learning Advisor (Higher Degree Research) at the University of Southern Queensland, Australia. His research interests include higher education, researcher development, technology enhanced learning, identity and popular culture.

ORCID: <https://orcid.org/0000-0002-2674-1240>

Email: douglas.eacersall@usq.edu.au

Dr Chris Dann is a Senior Lecturer in Curriculum and Pedagogy Digital Technology in the School of Education at the University of Southern Queensland, Australia. His research interests include machine learning, student satisfaction, feedback, adult learning, online learning design, educational assessment, enacted curriculum, student retention, and artificial intelligence. ORCID: <https://orcid.org/0000-0001-7477-0305>

Email: chris.dann@usq.edu.au

Dr Subrata Chakraborty is a Senior Lecturer with the School of Science and Technology at the University of New England, Australia. He received his PhD in Decision Support Systems from Monash University, Australia. Dr Chakraborty is also a Visiting Fellow at the Centre for Advanced Modelling and Geospatial Information Systems (CAMGIS) at the University of Technology Sydney, Australia. His current research interests include data analytics, machine learning, image processing, and optimisation with decision support applications. ORCID: <https://orcid.org/0000-0002-0102-5424>

Email: subrata.chakraborty@une.edu.au

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3.2 Links and implications

This chapter explored the perspectives of project management experts regarding the teaching of project management to young children. It also presented the core components of this complex discipline in two main categories: ten hard skills and twenty soft skills, with each skill being ranked in order of importance and difficulty. This provided a perspective of what *should* be taught to children, according to these experts, to maximise their chances of success in managing small and simple projects. However, while the study in Chapter 3 assisted in demarcating the relevant content that can be applied when teaching project management to young children, it did not provide a view of what *is* being taught in Australian schools, or the perspectives of primary school educators. Teachers may have a very different outlook on teaching project management to children and the project management discipline. Their views are critical since they are the ones who will be teaching this complex discipline to children. As such, the next step in this interdisciplinary research journey is to explore the perspectives of Australian primary school teachers.

CHAPTER 4: EXPLORING THE PERSPECTIVES OF AUSTRALIAN PRIMARY SCHOOL TEACHERS ON STUDENTS LEARNING ABOUT PROJECT MANAGEMENT

This chapter is principally an incorporation of the article ‘Exploring the perspectives of Australian primary school teachers on students learning about project management’, which was published in *Issues in Educational Research* in September 2024.

4.1 Introduction

In the previous chapter, the perspectives of project managers were explored, revealing the key components of the project management discipline, as well as their importance and difficulty level for children to learn in primary education. However, the perspectives of educators are also required to understand if and how project management is being taught in Australian primary schools. Building upon the literature review conducted in Chapter 2 and the recommendations in Chapter 3, this chapter presents the perspectives of Australian school teachers about children learning project management. It is the second in a two-part series that began with the perspectives of project managers.

The chapter begins by highlighting the history of children learning with projects in primary education over the last century, and a brief summary of research in general on the discipline of project management. The chapter continues by discussing the Australian Technologies curriculum, and project management being specifically named as one of the core components for children creating technological solutions. Despite the mention of project management in the curriculum, several issues are raised about the focus and implementation of comprehensive project management teaching in Australian schools, evidenced by the Technologies curriculum documents and information from ACARA's *Digital Technologies in*

Focus team. Thirteen Australian primary school teachers across three States were solicited to understand their perspectives on children learning project management, identify some of the challenges, and make suggestions for improvement. Through reflexive thematic analysis, the chapter presents the first empirical peer-reviewed study of the state of project management learning in primary education. A sample of the interview dataset is available in Appendix V, while the entire survey dataset is available in Appendix VI.

The chapter concludes by highlighting some of the study's limitations and recommends developing a simple learning framework for teaching project management skills and concepts in primary education.

Exploring the perspectives of Australian primary school teachers on students learning about project management

Sante Delle-Vergini, Douglas Eacersall, Chris Dann, Mustafa Ally

University of Southern Queensland, Australia

Subrata Chakraborty

University of New England, Australia

Projects have been used in primary school education for over a century. As managing projects has become increasingly critical in the workplace, educators have an opportunity to prepare young children with the necessary project management knowledge and skills to succeed in the future. However, in the absence of empirical studies, it is difficult to know if, when and how this preparation is taking place. This study sought to explore the perspectives of Australian primary school teachers about children learning project management. Thirteen primary school teachers participated over a seven-month period. Qualitative data from interviews and surveys were transcribed and entered into *NVivo*. Reflexive thematic analysis was used to analyse, interpret, and present a story reflective of the teachers' experiences and thoughts. The results revealed several project management concepts being taught to students but fell short of a comprehensive approach to managing projects. While more challenges than benefits were reported by teachers, their recommendations for improving project management teaching in the future was the most important finding. As the first empirical study of primary school teachers and their perspectives on teaching project management, researchers and educators now have a foundation of knowledge to develop more comprehensive ways of teaching this important discipline to primary school students.

Introduction

Teachers and children have been using projects in primary schools for more than a century after it was popularised as the *project method* by leading educational progressivist William Heard Kilpatrick (Pomelov, 2021). In recent decades, learning with projects has evolved to become a powerful curriculum instruction technique known as *project-based learning* (Pecore, 2015), which is a "teaching method in which students learn by actively engaging in real-world and personally meaningful projects" (Buck Institute for Education, n.d.). It is grounded in constructivism (Jones, 2017; Lu et al., 2021; Pecore, 2015) where the primary focus is the process of learning itself (Phye, 1997). Outside the school environment, many organisations use these real-world projects to produce their products and services, with most of their employees involved in project-related work of some kind (Konstantinou, 2015). To varying degrees, all these projects need to be managed by individuals well-versed in *project management*, which is defined as "the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements" (Project Management Institute [PMI], 2021a, p. 245). Moreover, it is a complex discipline with multiple components that must be effectively managed through to the successful completion of the project (PMI, 2017).

While there has been an abundance of literature regarding the discipline of project management in practice, education, and research, it is focused primarily on adults within the workplace. Turner et al. (2012) studied the evolution of project management research by examining peer-reviewed articles in three leading project management research journals over a twenty-year period. Padalkar and Gopinath (2016) performed a systematic literature review spanning six decades of project management research. In the Asia-Pacific region, Young and Pasian (2015) published a series of monographs focused on project management research from an Asia-Pacific perspective. Within Australia, Young (2017) presented research from the Australian project management academic community. Some authors even studied the evolution of project management from ancient times to the present day (Bonner, 2021; Chiu, 2010; Kozak-Holland, 2011). In all of these, the topic of children learning project management was completely absent. In fact, as Delle-Vergini et al. (2023a) discovered in their international scoping review of teaching project management to primary school children, peer-reviewed articles on the topic were simply non-existent in the literature. While some elements of project management were found in primary school classrooms, a holistic approach to teaching project management to children was not evident.

Recognising the interdisciplinary nature of the topic, Delle-Vergini et al. (2023a) called upon educators and project management practitioners to collaborate on more comprehensive approaches to teaching project management to children, and to contribute to this new field in research literature. In a subsequent project, Delle-Vergini et al. (2023b) conducted an international Delphi study of project management experts in eight countries on their perceptions of children learning project management. The study found ten technical (hard) skills and twenty interpersonal (soft) skills that children need to develop in order to successfully manage a project from beginning to end. Further, some of these skills were more important than others for project success, and some were more difficult than others for children to learn. One of the key recommendations from the study was that further research should be conducted to explore the perceptions of primary school teachers since they are best placed to observe and comment on project management teaching within the classroom. While both studies from Delle-Vergini et al. (2023a, 2023b) were crucial in furthering our understanding of teaching project management in primary schools, they did not provide a clear view into the primary school classroom, nor the perceptions of primary school teachers on the topic.

Within an Australian context, the Australian Curriculum, Assessment and Reporting Authority (ACARA) considered project management to be an essential skill for students to learn at every year level as they will be required to manage projects from inception to completion (ACARA, 2012). Further, as noted in ACARA's *Digital Technologies in Focus* project, students "... may not initially come with the skills required to complete project work. They need to be explicitly taught any new knowledge, skills, techniques and strategies necessary for the project, then guided as they develop and practice the knowledge and skills and reflect upon their learning." (ACARA, 2020, p. 8). More specifically, they will be required to:

Students will develop skills to manage projects to successful completion through planning, organising and monitoring timelines, activities and the use of resources. This includes considering resources and constraints to develop resource, finance, work and time plans; assessing and managing risks; making decisions; controlling quality; evaluating processes and collaborating and communicating with others at different stages of the process. (ACARA, 2024)

The Australian Curriculum does not provide a framework or methodology for how teachers should teach project management to children. Further, the term *project management* is only mentioned a few times, and in just one of the eight learning areas (subjects) within the Australian Curriculum being in *Technologies* (ACARA, 2022). Therefore, it is unclear if, how, or to what level of comprehensiveness project management is being taught in the primary school classroom. From 2017 until 2021, ACARA was funded by the Australian Government to support the implementation of the Technologies learning area in over 160 schools across the country, which presumably would include implementing project management teaching. This nationwide initiative was called *Digital Technologies in Focus* (DTiF) (ACARA, 2023). In 2019, the principal investigator communicated with the DTiF implementation team to inquire if project management teaching in the classroom was a part of the program. The response was that collecting evidence of project management in schools was not a specific focus of the program. Subsequently, in 2020, DTiF published *Teaching and supporting project management in the classroom F-6* (ACARA, 2020). While the document detailed several project elements that should be included in a comprehensive approach to teaching children about project management, it did not contain empirical evidence of these teachings in the primary school classroom. Further, the document was partly adapted using a single source from 2002 (ACARA, 2020, p.6), a source that the research team was unable to recover. The DTiF team later advised the principal investigator that the purpose of the document was only to provide some background on project management to primary school teachers rather than a scaffolded approach to teaching project management.

The purpose of our article is to explore the perspectives of Australian primary school teachers on children learning about project management. The following research questions formed the foundation of this inquiry: (i) What does project management teaching look like in Australian primary school classrooms? (ii) What are some of the challenges of children learning about project management? (iii) How can educators improve ways of teaching project management to children? It is hoped that this study will inform educators and policymakers to explore comprehensive approaches to teaching project management to primary school children. It is the first empirical study of teaching project management to children from the perspective of primary school teachers.

Methods

The principal investigator views the world through the ontological lens of relativism, whereby there is no one universal truth or reality (Damico, 2019; Yin, 2018), and the epistemological stance of constructionism, where meaning is constructed within the

individual's mind through their engagement with the world (Behar-Horenstein, 2018); meaning and truth are not simply *out there* to be discovered (Sabnis & Newman, 2023).

In order to capture, analyse, interpret, and report on the perspectives of primary school teachers regarding children learning project management, we were guided by Braun and Clarke's (2022) process of *reflexive thematic analysis* (TA). TA is a flexible research approach that utilises coding procedures to develop meaning and identify patterns in data (Ozuem et al., 2022). It is a "...fully qualitative approach - involving the use of qualitative research techniques, underpinned by qualitative research values" (Braun et al., 2023, p. 25). However, unlike more traditional forms of TA, reflexive TA firmly situates the researcher at the centre of a collaborative knowledge creation process where the values, choices, beliefs, personal background, and philosophical assumptions of the researcher are critical tools in the research process (Braun & Clarke, 2022). Moreover, the constructionist researcher does not view "...reflexivity as an apology for the lack of objectivity in a research project" (Olmos-Vega et al., 2023, p. 242) but rather celebrates it. Renowned qualitative research author Robert K. Yin warned that reflexivity may produce an unwanted *colouring* of the interview process (Yin, 2018). However, it is precisely this multi-faceted colouring of knowledge co-production, partly facilitated by the influence of the principal investigator as a project management professional in collaboration with educators, that we sought and viewed as "...essential and inevitable, if not treasurable" (Leung, 2015, p. 324).

Participant and school selection

Since the aim of this study was to understand the perceptions of primary school teachers about children learning project management, a homogeneous sample of the Australian teaching population was sought. Homogeneous sampling is a form of purposive sampling (Bloomberg & Volpe, 2019; Punch & Oancea, 2014) whereby the target sample within a population shares some key characteristics (Saunders et al., 2023) such as, in this case, primary school teachers within Australia.

Table 1: Selection criteria

Criterion	
Schools	1. Geographical location: minimum 2 States/Territories 2. School type: government and non-government 3. Socio-educational background: high/medium/low ICSEA bands
Participants	1. Australian primary school teachers 2. Number of interviews: minimum 5

Note: ICSEA (Index of Community Socio-Educational Advantage) is a scale of socio-educational advantage that compares the educational advantage or disadvantage of each school (ACARA, 2015).

Selection criteria (see Table 1) were produced to ensure: (i) sample homogeneity among prospective participants (Velasco, 2022) that was "...typical of the population under study" (Creswell & Guetterman, 2019, p. 139); (ii) adequate representation across a range of

socio-educational backgrounds, geographical locations, and school types; and (iii) at least 5 interviews as recommended by Braun et al. (2019, p. 852) for effective thematic analysis. The selection process continued until all criteria were met.

The research team contacted approximately 75 schools over two months. *LinkedIn* was also used to identify potential participants. This resulted in 13 participants from 10 primary schools. A more detailed explanation of the recruitment process is provided in Appendix A. The participant demographics are detailed in Table 2, while school profiles are detailed in Table 3. Participants were anonymised through using identifiers (e.g., participant 1 is T-01, participant 2 is T-02, etc...) and de-identification of the data.

Table 2: Participant demographics

ID	School	Experience (years)	Participation	
			Survey	Interview
T-01	1	12	Yes	No
T-02	1	2	Yes	Yes
T-03	1	11	Yes	Yes
T-04	1	3	Yes	No
T-05	2	30	Yes	Yes
T-06	3	25	Yes	No
T-07	4	13	Yes	Yes
T-08	5	3	Yes	Yes
T-09	6	8	Yes	No
T-10	7	6	Yes	Yes
T-11	8	9	Yes	No
T-12	9	1	Yes	No
T-13	10	10	Yes	No

Table 3: School profiles

School	State	Sector	No. of Students	ICSEA		
				Value	Percentile	Band
1	VIC	Government	275	954	26	3
2	VIC	Non-gov	265	1109	87	6
3	VIC	Government	162	918	14	2
4	VIC	Non-gov	701	1087	81	6
5	VIC	Non-gov	59	1001	47	4
6	VIC	Non-gov	1995	966	31	3
7	QLD	Government	775	1161	97	7
8	VIC	Non-gov	329	1149	95	7
9	NSW	Government	566	1114	88	6
10	VIC	Government	326	1143	94	7

Data collection and analysis

Qualitative data from both the semi-structured interviews and surveys informed the research. The data collection phase lasted from November 2022 until June 2023. As the

audio for interviews was recorded with the permission of each participant, the principal investigator transcribed each interview and qualitative survey response, generating 19 files (6 interviews and 13 surveys). These files were then imported into *NVivo* as the primary analysis tool. As the dataset was analysed multiple times, the researcher moved from familiarisation and immersion in the data to a more critical engagement with the data (Braun & Clarke, 2022). Data extracts were eventually categorised into codes, and codes into themes, as a story began to take shape. Themes are the pinnacle of this story since they are reflective of the participant interviews and documents generated (Saldana, 2016). They did not emerge from the data but were instead created through the "situated analytic practice" (Braun & Clarke, 2022, p. 128) of the principal investigator's engagement with participants, the dataset, and reflexive techniques.

Findings and discussion

The three research questions underpinned the generation of themes and topic summaries. Unlike themes, which are abstract entities of shared meaning organised around a central concept, topic summaries simply report on the range of responses on a particular topic, "...kind of like an overview" (Braun & Clarke, 2022, p. 104). However, we believe they provide contextual relevance to the themes presented later in this paper. The mapping of the research questions to themes and topic summaries is illustrated in Figure 1.

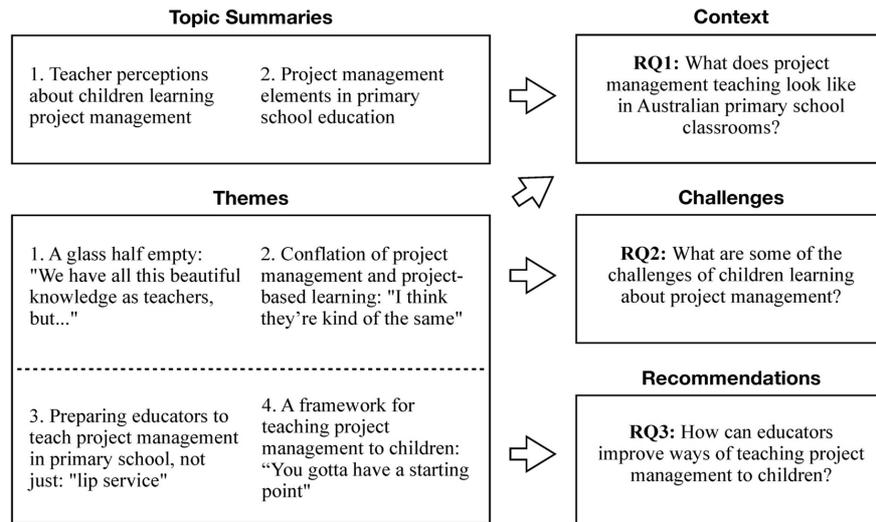


Figure 1: Mapping research questions to topic summaries and themes

A major part of identifying the themes from this research was the generation of two *topic summaries*: (i) teacher perceptions about children learning project management; and (ii) project management elements in primary school education. These topic summaries begin

to address the first research question: *What does project management teaching look like in Australian primary school classrooms?*

Teacher perceptions about children learning project management

Teachers were overwhelmingly supportive of children learning project management in primary school, as it is an "essential" (T-03, T-07) "life skill" (T-06, T-08) that will be required in the future (T-03, T-04, T-07). Some of the benefits of children learning project management include communications skills, teamwork (T-02, T-05, T-07, T-10, T-11), problem-solving, executive functioning skills, increased confidence (T-08), patience, conflict management, time management (T-05), creativity (T-02), collaboration (T-05, T-07), organisation skills (T-09), emotional intelligence (T-11), and leadership (T-03, T-09, T-10). Learning project management also provides a "practice platform" (T-10) for these and other soft skills to develop over time. Teachers felt that soft skills were as important (53.8%), if not more important (46.2%), for children to develop than the technical skills and knowledge required in project management. There were no teachers who believed that technical skills were more important than soft skills. By contrast, in the Delle-Vergini et al. (2023b) study of project management experts, 64.7% said that soft skills were more important for children to learn, 11.8% said technical skills, and 23.5% said both were equally important. While the project management literature has "...always focused on the hard [technical] skills deemed necessary to manage projects, relegating soft skills to the background" (Alvarenga et al., 2019, p. 287), young children also need to develop a range of soft skills in order to manage even the simplest projects.

One critical benefit of learning project management is to manage a project from "start to finish" (T-11). Children need to experience a number of different projects from start to completion to know what success and failure look like since most projects will result in one or the other (Kerzner, 2022). In this way, "...when a project comes to a conclusion...one can feel very happy and satisfied with a job well completed" (T-05). As children continue to develop project management and learn what makes a project successful, they will have the "...ability to approach any project in their life" (T-08). This does not just apply inside the classroom but outside the primary school as well, such as home projects (T-13), high school (T-11), higher education (T-07), "adulting in general" (T-03), and perhaps most importantly, their future careers (T-03, T-07, T-09, T-13).

Regarding future careers, T-13 asserted that "a lot of jobs have projects, so students need to be shown from an early age how to manage these". It is forecasted that by 2030, approximately 102 million project management-oriented employees performing both skilled and less formal project management roles will be required (PMI, 2021b, p. 4). The following quote from T-07 captures the importance of the skills mentioned in this section and how they apply to a child's future career:

The amount of skills that one obtains and exercises through project management is immeasurable. These skills are transferable to many workplaces. The development of independent thinkers and learners should be our ultimate goal. Project management is an avenue towards this. (T-07)

Not all teachers agreed as to exactly when a child should start learning about project management. Two teachers (T-09, T-11) were undecided as to whether or not primary school was a suitable starting point. However, when asked to select from only three age ranges in a subsequent question: 0-4 years, 5-11 years, or 12-17 years, both selected 5-11 years. While T-09 did not give a reason for being undecided, T-11 stated that although there is a need to teach children how to manage projects, they must develop their emotional intelligence and relationship-building skills to be successful in project management. Most teachers felt that 5-11 years old, or primary school age, was the best time to begin learning project management, with three teachers (T-03, T-05, T-13) claiming that children should start even earlier. In order to get teachers to be more specific as to when children should begin learning project management only within a primary school setting, we presented the three bands of year levels for the Australian primary school curriculum, which are: (i) Foundation to Year 2 (F-2); (ii) Years 3 and 4 (3-4); and (iii) Years 5 and 6 (5-6). Most teachers selected F-2, with five teachers (T-01, T-04, T-08, T-11, T-12) selecting 3-4, and one (T-10) selecting 5-6. The statement of two teachers (T-05, T-12) perfectly represents the majority view as: "the earlier, the better", with T-05 going one step further, adding:

Children of all ages are highly capable. There is no need to molycoddle children. Two-year-olds can empty dishwashers ... get themselves dressed, make their beds. We as adults limit children's abilities to explore their outside and inside environments. So hence, in the right primary school environment, there should be no holding back on children and their capabilities on managing projects. (T-05)

T-08 explained that some children hesitate when approaching a project. They often feel overwhelmed when faced with the daunting task of breaking down the various components of what they perceive to be a large project. These students can be self-critical, lack confidence and slide into the default position of "I can't do this". Learning project management can help these children to break down project components individually and "...promote a greater level of confidence" (T-08).

In the next section, we examine the primary school classroom to evidence project management *elements* that "... describe the project management activities, processes, and artefacts typical of many projects" (Delle-Vergini, 2023a, p. 4).

Project management elements in primary education

Participants described many different forms of projects within primary education. Projects allowed children to design a small business such as braiding, photography (T-07), or a stall/shop (T-02) where they considered business design, products, services, pricing, and resources. Other projects took the form of research/inquiries (T-03, T-05, T-08, T-10), trivia nights, athletics days (T-03), concerts, fundraisers (T-05), works of art (T-02, T-03, T-05), and community/charity initiatives (T-03, T-05). Most of these projects were initiated and driven by teachers, but some students also "... have little interests that they create their own projects around; they have an idea in their mind and they work towards making it" (T-08). Projects can also last from a couple of weeks (T-08) to a few years (T-05).

During project work, students are involved in several project management activities, such as project planning (T-02), budgeting (T-02, T-03, T-05, T-07, T-08), obtaining resources (T-07), defining roles and responsibilities (T-03, T-08), procurement (T-03), and presenting their projects to an audience (T-02, T-03, T-07, T-08). They also produce a number of project management artefacts, which are the outputs created during the project process (Richardson & Jackson, 2019), or more specifically, "... any items that assist project team members in conducting project management activities" (Delle-Vergini et al., 2023a, p. 10). These include checklists (T-03, T-08), templates (T-03), notebooks, project walls that visually display various aspects of a project (T-02), project calendars, traffic lights during inquiry projects where green would be for students who feel confident in a particular area and orange for when assistance may be needed, egg timers to "...help break the time down" (T-08), portfolios for documenting projects (T-03, T-05), and some kind of criteria to know when a project is successful or complete (T-02, T-03, T-07, T-08), such as an assessment rubric (T-08).

While it was encouraging to find teachers who felt it was important for children to learn project management, and that many project management elements are present in Australian primary school projects, a prolonged analysis of the entire survey/interview dataset produced four themes that we feel capture deeper insights, particularly regarding the main challenges and recommendations for effective teaching of project management to children. These themes are: (i) Glass half empty: "We have all this beautiful knowledge as teachers, but..."; (ii) Conflation of project management and project-based learning: "I think they're kind of the same"; (iii) Preparing educators to teach project management in primary school; not just "lip service"; and (iv) A framework for teaching project management to children: "You gotta have a starting point". The first two themes answer the first and second research questions: *What does project management teaching look like in Australian primary school classrooms? What are some of the challenges of children learning about project management?* The final two themes answer the third research question: *How can educators improve ways of teaching project management to children?*

A glass half empty: "We have all this beautiful knowledge as teachers, but..."

This first theme was named a *glass half empty* for two reasons: (i) an analysis of the dataset revealed more challenges than benefits when teaching project management to children; and (ii) we sensed that most teachers seemed resigned to the status quo, that the power for change was outside their control. While some of the challenges revolved around the students inside the classroom, which we will discuss in the first half of this section, we were surprised to find a significant degree of frustration exhibited by teachers when articulating the challenges they face outside the classroom, discussed in the second half.

Inside the classroom, children experienced a number of challenges when learning project management. Firstly, students have different learning styles. *Exploratory/guided*: T-02 said that "...some kids really love the exploration ...but then some kids ...need to be led". Other children are more adaptive and can swap between both styles without much difficulty. *Pace*: children also learn at different speeds, so some lesson plans cannot always follow the same timeline for everyone.

Secondly, children have different capabilities and dispositions. *Big personalities*: the classroom always has a number of "big personalities" (T-03) where the teacher sometimes needs to exercise a degree of behaviour management to promote effective teamwork. *Leadership*: there are also natural leaders that emerge in the class, and those that prefer to take a more passive role in projects (T-09). Sometimes, "...it will be 'ok I'm doing everything; I'm a leader'...so that's that explicit teaching of those soft skills as well what does leadership actually mean ...it doesn't mean you do everything" (T-03). *Room to grow*: in some other projects, peer learning and peer tutoring are actively encouraged. However, while both approaches can lead to increased knowledge and skills (Chen et al., 2020), some children will "...over-compensate for that [other] child to the point where they don't have the chance to push themselves to grow" (T-08). *Conflict*: T-05 pointed out that many children are sometimes risk averse and incapable of making a decision in a project because they have been "...wrapped in cotton wool" and not allowed to:

... have a little scrap with someone on the way or have a little "oh I don't like this and you don't like that and I don't want this colour" ...they're the interplays and working on the psychology of people that helps longitudinally with a better project result. (T-05)

Thirdly, some schools have a significant student population that is from a *language other than English* (LOTE) background. Since project management is a complex discipline with processes, activities and concepts that must be "...interpreted, modified, and presented to primary school students so that they understand all of the separate interconnecting parts" (Delle-Vergini et al., 2023a, p. 17), some LOTE students struggle with project management concepts and terminologies.

The challenges mentioned above can be improved through effective teacher intervention because teachers have a high degree of control over their classroom environment. However, they have less control over many of the challenges they face outside the classroom. *So much admin; too little time*: one teacher (T-08) expressed frustration with administrative tasks that took time away from quality teaching.

We have all this beautiful knowledge as teachers, but with...our administrative duties um we're not necessarily able to put effort and time into, you know, integrating project management...this isn't just me, it's like a lot of what I'm hearing online. (T-08)

Indeed, this sentiment is reflected throughout Australian primary and secondary schools. In a Grattan Institute survey of 5,000 Australian teachers, over 90% said they don't have enough time to prepare for effective teaching, with teachers frequently citing administrative duties as a major cause (Hunter et al., 2022). Similar results were found in a Monash University survey, adding that over 85% of teachers felt their workload was unmanageable (Longmuir et al., 2022). *Lacking home support; or pushy parents*: while schools are rich in support and resources needed for project work (T-10), this is not always the case in a student's home environment. Some children may not be able to rely on parents to have discussions or request resources regarding their projects. Conversely to a lack of support at home are parents who can be "...a bit too pushy" (T-08) regarding their child's

academic progress or involvement. Though some pushy parents mean well, they are "often described as detrimental to children" (Beauvais, 2017, p. 161).

Teaching the teacher: teachers need to master the technical skills of the project management discipline to be able to explicitly teach and assess them in children (Delle-Vergini et al., 2023b). "The more teachers are trained, the better they share that experience" (T-02) and "...best practice" (T-13). Teachers already possess some project management skills as they "...constantly manage many projects" (T-01), but they also need specific training "...with the view of teaching these skills to children" (T-09). However, our analysis revealed that project management skills are not explicitly taught to teachers in the field, nor to pre-service teachers for that matter. None of the teachers recalled any subjects or even topics on project management during their undergraduate education. This brings up an interesting question. If teachers are expected to explicitly teach project management to young children, as the Australian curriculum suggests, how can they do so if they are not explicitly taught themselves?

Finally, a significant challenge with teaching project management to children that was implicitly interwoven throughout the dataset but not explicitly articulated by teachers in our study, was the conflation of project management and project-based learning, deserving of its own theme and discussed in the next section.

Conflation of project management and project-based learning: "I think they're kind of the same"

Our second theme was not immediately evident during the interview process but became increasingly clear as we analysed the dataset. This theme was both surprising in that it was an unexpected discovery that appears to be non-existent in peer-reviewed literature, and refreshing in that it provides a unique insight into one of the barriers to effective teaching of project management to children. While project management and project-based learning share some of the same characteristics, such as a project being the centre of activity, they are differentiated by several factors, two of which will be briefly mentioned.

Firstly, in a project-based learning environment, as its name suggests, the primary purpose is an authentic learning journey for students (Kokotsaki et al., 2016) rather than the project itself (Henebery, 2020; Markula & Aksela, 2022). With project management, particularly in a work environment, the primary purpose is to successfully deliver a product, service or result (PMI, 2021a). Even ACARA (2022) agrees that project management is responsible for completing project goals that meet identified success criteria.

Secondly, with project-based learning, failure in managing the project or the product produced from that project is *not* looked upon negatively but viewed as an opportunity to learn (Project Management Institute - Northern Italy Chapter, 2015; Project Management Institute Educational Foundation, 2014). The same cannot always be said in a professional work environment. Failure in the workplace *is* looked upon negatively and can even have severe consequences for organisations and the community.

Some teachers were unsure of the difference between project management and project-based learning and sometimes responded with conflicting explanations to similar questions. T-03 said project management was "...a group of people working together for a common goal ...but um I don't know, it's hard to put into words". Later in the interview, the same participant expressed that with project management, "...I don't care how you get there, I care about the result", but with project-based learning, "...we're flipped, we don't care about the result, we care about how you get there". T-02 gave a similar response: "...I would say that [with] project-based learning...it's really a lot of learning...it's more about the process, whereas project management...you sought of know what you're looking for, for your outcomes". Others were less sure. T-05 said that: "...I think they're kind of bit of the same...there's an overlapping there". T-07 believes: "...the two go hand in hand really", while T-10 simple stated: "...I have no idea". While one teacher merged the two terms: "...the majority of our subjects have some element of project-based management" (T-07), another seemed to swap the two around:

I would assume project management [is] a great opportunity for children to test and problem solve like their skills and sort of identify what their own strengths and weaknesses are...I feel like in project-based learning your teacher might have a habit of jumping in and trying to push them towards a specific answer...to move the project on because of you know the timelines and constraints. (T-08)

Teachers also felt it was okay to make mistakes, to fail, even when talking about project management. T-02 said: "I mean you wanna try and have a positive outcome but it's ok if you don't because you're learning. No matter what happens, you're learning". T-05 added: "...we're very big about the mistake, make the mistake." T-08 goes a step further, explaining that as teachers allow students to become more autonomous in projects: "...let them just go, even if it means failure because obviously there's learning in that". This introduces somewhat of a dilemma. If children are told that failed projects are ok, are we really setting them up to succeed in the workplace since it is viewed so negatively there? Figure 2 highlights the main differences between project management and project-based learning.

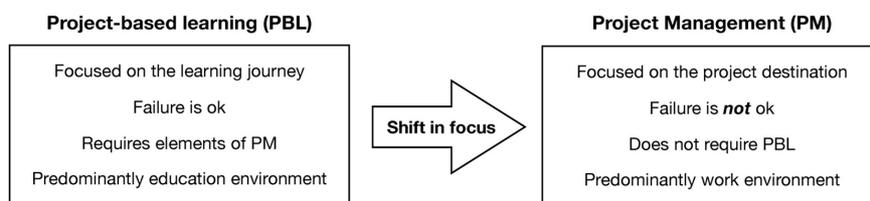


Figure 2: Key differences between project management and project-based learning

Project-based learning success is about the learning itself, while project management success "...is measured by product and project quality, timelines, budget, customer satisfaction, and achievement of intended outcomes" (PMI, 2021a, p. 224). For success in the future workforce, students learning about project management need to understand the

importance of these elements and their role in delivering successful project outcomes. That is not to say project-based learning should be replaced with project management teaching in primary school, or that in the initial teaching of project management, failure and mistakes should be actively discouraged. However, if project management best practice is the standard educators are aiming for, as is the case throughout the *real world* and in organisations that students will work for in the future, primary school students would benefit from the outcomes-based perspective that project management offers. As such, we concur with ACARA's recommendation that students should "undertake projects where the focus is [solely] on project management" (ACARA, 2020, p. 13).

Preparing educators to teach project management in primary school; not just "lip service"

Teachers suggested a range of possible solutions for preparing to teach children about project management. *Undergraduate education*: a teacher usually starts their journey at university while enrolled in an education degree. As some of our participants revealed, they are not taught a dedicated project management unit at university, or even as a topic within another subject. By incorporating it into teaching degrees, instead of just paying "...lip service to it" (T-03), it would teach "...important skills to pre-service teachers that will help them through their own careers and then also include ...a lens where you could use this to help teach your student ...but I think having a whole unit in a compact degree may not be the...greatest priority" (T-08). Further, "...more placement time" (T-02) at schools will assist undergraduates to see how project management is taught in the classroom. *Professional development*: while some teachers feel they "...do too many professional developments" (T-10), T-03 said that: "...teacher PD is essential to good quality programs", especially "...with project managers" (T-09). A professional development program will give the teacher "...resources that the teacher can reflect on to remind themselves of the processes within the project management" (T-08). *Mentorship*: "...a senior teacher that has project management experience [is] always the best way to learn" (T-02). Even training only "...experienced teachers who then mentor graduate teachers" (T-03) is a great way of "... practising those skills under the guidance of an effective teacher" (T-07).

While we have discussed several ways that educators might prepare for teaching project management to children, none of these approaches will be successful until leaders promote and incorporate project management teaching into the school ethos, as pointed out by the following two teachers: "...leadership have to be behind it and actively like following through with it" (T-07). Moreover, it must be "...ingrained within a school's philosophy" (T-03).

A framework for teaching project management to children: "You gotta have a starting point"

The final theme, in many ways, is a culmination of the perceptions, challenges, and recommendations of participants for improving the teaching of project management skills to primary school children. However, with the principal investigator intimately involved in

the interview process and dataset analysis, and through their lens as a project management professional, a conceptual structure or framework was beginning to form as this theme developed. While such a framework is beyond the scope of this study and requires further research to cultivate, it is an important result borne out of this theme's journey. Some important teacher perceptions for the development of a possible future framework for teaching project management to primary school children are discussed in this section.

Simplicity

While teachers used several words to describe ways of teaching project management to children more effectively, the emphasis was that any future framework should be *simple*. Some teachers felt a template was a good start: "I'd go a template absolutely, keep it simple, ten points, ten key areas" (T-05). Others mentioned checklists, posters, or "...a general outline" (T-02). As long as it is "...simplified cos you know teaching's a bit um you know saturated with information, but if you had a simplified poster that children could look at, but the teachers could also use...[it] would be useful" (T-08).

Multiple learning environments

When children learn project management skills, the school is not the only environment in which they can learn. Our survey revealed that only six of the thirteen teachers felt the school was the best place to learn such skills. T-10 said the workplace was better; two preferred a community setting (T-08, T-12), and four teachers (T-02, T-03, T-05, T-09) selected "other". Some reasons for selecting "other" included: "School would be [the] best place to receive explicit instruction. However [the] school could do some collaborative project with the community" (T-09). T-03 believed that there should be "a range of different experiences as well as integrating different environments to provide access to a range of opportunities and experts. The best projects I have seen move out of the classroom".

Flexibility

Some teachers expressed concerns that many frameworks are too prescriptive:

You don't want it to be too prescriptive ...there's so much prescription already, I would hate for it to be too you know ...'you have to do exactly this way', because then you lose that creative freedom ...maybe like a you know a recipe where they pick and choose. (T-02)

... or restrictive:

I'm in two minds, I think sometimes frameworks can be quite restrictive um myself I find that a lot of these kinds of frameworks...can be limiting to a project in some ways but at the same time without that framework where is your consistency and you're already working with people that may not necessarily feel competent in project management...you gotta have a starting point. (T-03)

Scaffolding

In an educational context, scaffolding refers to the process of intervention whereby a more experienced tutor assists a "...child or novice to solve a problem, carry out a task or

achieve a goal [that is] initially beyond the learner's capacity" (Wood et al., 1976, p. 90). However, over the last few decades, scaffolding approaches have progressed from an individual tutor and novice to a more distributed approach that includes "...multiple interactions between tools, artifacts, resources, and people in the learner's environment" (Puntambekar, 2022, p. 466). While our participants used terms such as *scaffolding* and *increments*, the overriding sentiment was that a learning framework should start off "...in a simple way, adding complexity and explicit skills as we go" (T-03). The Australian Curriculum states that it also supports the use of scaffolding approaches, specifically when teaching project management to primary school children (ACARA, 2020). These scaffolding approaches will need to consider project management activities that are appropriate for the level of development of the student while in primary school, but also as they transition into secondary school, where they will "work more independently of the teacher" (Fleer, 2016, p. 233) and be introduced to more advanced project management concepts. Some examples of project management learning in secondary school include Garfein & Noeldner (2011), Morgan et al. (2013), and Dawbin et al. (2021).

Multi-disciplinary collaboration

One of the most important factors in the development of a future learning framework would be the involvement of both educators and project management professionals. All but one of the teachers believed that both are required, citing that "teachers have the ability and means to model by example [the] management of a project" (T-07). However, due to the complexity of the project management discipline, and to ensure that the most critical components required to maximise project success are included in a learning framework, it is imperative that project management professionals are included in the process. T-06 said that "experts in the field would be best in developing a sequential framework with teacher feedback". T-03 agrees that "...both should collaborate ...to get the best outcomes".

In summary, if educators and project management professionals collaborate to develop a learning framework that simplifies complex project management technical skills and concepts, and schools incorporate project management learning into their ethos, young children will be able to experience the vast opportunities that come with learning and applying comprehensive project management skills within education and in their working and everyday lives.

Limitations and recommendations

There were several limitations that impacted this study. Firstly, while reflexive thematic analysis was an appropriate method for exploring the topic, it would have been helpful for a project management professional, such as the principal investigator, to observe project management activity in the primary school classroom. Due to time constraints, a lag in curriculum delivery resulting from the Covid-19 pandemic, and reluctance on behalf of the schools that we approached, in-class observation was not possible. This presents an opportunity to conduct future observational research, such as longitudinal and case studies. Secondly, despite a concerted effort being made to solicit participants for the

study, only thirteen ultimately took part from a pool of approximately eight hundred prospects, representing a 1.6% acceptance rate. Further, all the participants were female and from only three Australian States. While every effort was made for adequate representativeness using defined selection criteria, a larger cohort of both schools and participants may reveal additional insights unexplored in this study.

Finally, the use of *NVivo* became a little troublesome as the research progressed, particularly during theme development toward the end of the analysis phase. The researcher felt a level of disconnection with the data that was less evident when using more traditional forms of thematic analysis procedures in the past, such as whiteboards, sticky notes, and coloured highlighters. According to Maher et al. (2018), who experienced a similar disconnection when using *NVivo*, these manual forms of analysis allow for a more meaningful engagement with the data and, ultimately, the coding and thematic process. However, the authors acknowledge that software packages, such as *NVivo*, provide superior data management and retrieval options.

The sole recommendation from this study is a call to researchers, educators and project management professionals to collaborate on developing a simple project management learning framework that can assist teachers in instructing young children in complex project management technical skills and concepts.

Conclusion

Projects are pervasive in all sectors of society. They are also utilised in children's education as an instructional method for authentic learning. All projects need to be managed by capable individuals with the knowledge and skills to successfully manage a project from beginning to end. However, to date, the education and training of comprehensive project management skills have mostly been reserved for the adult population, as evident by the lack of empirical studies on children learning project management in school. Our study demonstrated that while children learn some elements of project management, it is hardly comprehensive enough to manage even a simple project from beginning to end. They also face a number of challenges, including different learning styles, varied personalities and capabilities, lack of home support, pushy parents, and limitations with language.

From a teaching perspective, although the Australian Curriculum expects teachers to explicitly teach project management to their students, they do not receive instruction in project management as undergraduates, are burdened by administrative tasks that consume project management learning opportunities, and often conflate project management with project-based learning. While teachers are still best placed to provide project management instruction to their students, they require a simple, flexible, and scaffolded framework for teaching complex project management skills and concepts to young children. They also agree that collaborating with project management professionals is the best way to develop such a framework. Despite the challenges and shortcomings of the state of project management teaching in Australian primary schools, children have a unique opportunity to put their best foot forward in the twenty-first century by learning a

multi-faceted discipline that they can use to successfully manage and deliver their most important projects at school, home, work, and in their personal lives.

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Appendix A: Participant recruitment process

The research team contacted approximately seventy-five schools over two months. Only two schools agreed to participate. The research team sent a consent form and participant information sheet to both schools containing an online survey link with a request for a follow-up optional interview. Five teachers across both schools agreed to participate in the survey, and three of these agreed to be interviewed. As the criteria in Table 1 were still not met, the principal investigator decided to use *LinkedIn* to solicit participants. A search for “primary school teacher” was performed in the *LinkedIn* search engine, producing over 1,000 profiles. Of these, approximately eight hundred were sent invitation requests (see below), as the remaining profiles did not appear to be primary school teachers. Over the next few months, the principal investigator was in direct communication with approximately thirty teachers, eight of whom agreed to participate, bringing the total number of those who agreed to participate in the study to thirteen. Since the selection criteria were also met at that point, no further search was conducted.

Invitation script

Hello <NAME>. I am completing a PhD about teaching project management to children. It's been really difficult to find teachers for the survey (15 minutes) and optional interview (30 minutes). If you have time for one or both, I would really appreciate it. I can send you more information about the survey and a link to participate if you are interested. Thanks.

Appendix B: Survey questions

1. Soft skills may be defined as "...a broad set of skills, competencies, behaviours, attitudes, and personal qualities that enable people to effectively navigate their environment, work well with others, perform well, and achieve their goals" (Lipmann et al., 2015, p. 15) [see References below]. As a teacher, please list up to 10 soft skills that you believe are important for children to successfully manage a project from beginning to end.
2. From your responses in Question 1, which soft skills, if any, may be difficult for primary school children to learn? Please list each soft skill in the boxes on the left-hand side and your reasoning for listing that soft skill on the right-hand side.

QUESTION 2

From your responses in Question 1, which soft skills, if any, may be difficult for primary school children to learn?

Note: Please list each soft skill in the boxes on the left-hand side and your reasoning for listing that soft skill on the right-hand side.

	Difficult soft skills for primary school children to learn	Why do you believe this soft skill is difficult for primary school children to learn?
Difficult Soft Skill #1	<input type="text"/>	<input type="text"/>
Difficult Soft Skill #2	<input type="text"/>	<input type="text"/>
Difficult Soft Skill #3	<input type="text"/>	<input type="text"/>
Difficult Soft Skill #4	<input type="text"/>	<input type="text"/>
Difficult Soft Skill #5	<input type="text"/>	<input type="text"/>
Difficult Soft Skill #6	<input type="text"/>	<input type="text"/>
Difficult Soft Skill #7	<input type="text"/>	<input type="text"/>
Difficult Soft Skill #8	<input type="text"/>	<input type="text"/>
Difficult Soft Skill #9	<input type="text"/>	<input type="text"/>
Difficult Soft Skill #10	<input type="text"/>	<input type="text"/>

Figure B1: Screenshot of survey question #2
(use 'zoom in' function of web or PDF reader to view)

3. From your responses in Question 1, which soft skills, if any, would NOT be difficult for primary school children to learn? Please list each soft skill in the boxes on the left-hand side and your reasoning for listing that soft skill on the right-hand side.
4. Should primary school children learn how to manage projects?
 Yes No Undecided
 After making your selection, please explain your reasoning for that choice in the box on the right-hand side.

5. When should children FIRST learn about managing projects?
 0-4 years 5-11 years 12-17 years
 After making your selection, please explain your reasoning for that choice in the box on the right-hand side.
6. If you selected 5-11 years old in the previous question, which Year level or band should primary school children FIRST learn how to manage a project?
 F-2 3-4 5-6
 After making your selection, please explain your reasoning for that choice in the box on the right-hand side.
7. Who is the best person to teach primary school children about managing projects?
 Teacher PM Expert Parent
 After making your selection, please explain your reasoning for that choice in the box on the right-hand side.
8. Which group is best to develop a learning framework for teaching primary school children how to manage projects?
 Teacher PM Expert Both
 After making your selection, please explain your reasoning for that choice in the box on the right-hand side.
9. Should the person teaching children how to manage projects receive project management training themselves?
 Yes No
 After making your selection, please explain your reasoning for that choice in the box on the right-hand side.
10. What is the best environment for children learning how to manage projects?
 School Home Community Workplace Other (specify)
 After making your selection, please explain your reasoning for that choice in the box on the right-hand side.
11. If primary school children learn how to manage projects, do you believe this will help them to be more successful in their future employment?
 Yes No
 After making your selection, please explain your reasoning for that choice in the box on the right-hand side.
12. If primary school children learn how to manage projects, do you believe this will help them to be more successful in their personal lives?
 Yes No
 After making your selection, please explain your reasoning for that choice in the box on the right-hand side.
13. Technical or hard skills may be defined as the necessary abilities to perform a particular task or activity (Cimatti, 2016) and requires a high degree of domain-specific knowledge (Torres et al., 2020) and technical expertise (Marin-Zapata et al., 2021). For primary school children learning how to manage projects, which skills are more important to focus on?
 Soft Skills Hard Skills Both are equally important
 After making your selection, please explain your reasoning for that choice in the box on the right-hand side.
14. If there are any final comments you wish to add, please do so in the box below.

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Appendix C: Interview questions

1. What is your understanding of project management (PM)?
2. What is your understanding of project-based learning (PBL)?
3. There are many similarities between PBL and PM. For example, they both involve a project, utilise project management skills, and produce a final product or result. Do you see any differences between PBL and project management?
 - 3.1 If so, what are the main differences in your opinion? Strengths and weaknesses?
4. Do your students participate in project work?
 - 4.1 If so, what kind of activities are they involved in?
 - 4.2 What skills are taught?
 - 4.3 How do you teach them these skills?
5. If your students are involved in project work, how are the projects structured and managed?
6. What kind of project artefacts are created or utilised by students in the classroom?
7. Are your students involved in managing their own projects?
 - 7.1 If so, what kind of activities specifically related to managing projects are they involved in?
 - 7.2 What skills are taught?
 - 7.3 How do you teach them these skills?
8. What are your views about primary school children learning how to manage projects from beginning to end?
9. Do you see any challenges or issues with children managing their own projects?
10. What more could be done to prepare preservice teachers to teach project management skills to primary school students?
11. Should there be a learning framework to assist in the teaching of project management skills to primary school students?
 - 11.1 If so, what would this framework look like?

Sante Delle-Vergini is a PhD student at the University of Southern Queensland, Australia. His research interests include project management, projects in society, 21st century skills, educational technology, online curriculum design, and artificial intelligence. ORCID: <https://orcid.org/0000-0001-9762-0326>
Email: sante.delle-vergini@unisq.edu.au

Dr Douglas Eacersall is a Senior Lecturer (Researcher Development and Applied AI) and Learning Advisor (Higher Degree by Research) at the University of Southern Queensland, Australia. His research interests include higher education, researcher development, applied artificial intelligence, and popular culture. ORCID: <https://orcid.org/0000-0002-2674-1240>
Email: douglas.eacersall@unisq.edu.au

Dr Chris Dann is an Honorary Senior Lecturer in Curriculum and Pedagogy Digital Technology at the School of Education, University of Southern Queensland, Australia. His research interests include machine learning, student satisfaction, feedback, adult learning, online learning design, educational assessment, enacted curriculum, student retention, and artificial intelligence. ORCID: <https://orcid.org/0000-0001-7477-0305>
Email: chris.dann@unisq.edu.au

Dr Mustafa Ally is an Honorary Associate Professor in Information Systems at the School of Business at the University of Southern Queensland, Australia. His research interests include cryptocurrencies, blockchain technology, online payment systems, trust and online shopping, and technology adoption. ORCID: <https://orcid.org/0000-0001-6370-3860>
Email: mustafa.ally@unisq.edu.au

Dr Subrata Chakraborty is a Senior Lecturer at the University of New England. He received his PhD from Monash University. He is currently also a Visiting Fellow at the University of Technology Sydney and with Griffith University. His current research interests include data analytics, machine learning, image processing, and optimisation. ORCID: <https://orcid.org/0000-0002-0102-5424>
Email: subrata.chakraborty@une.edu.au

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4.2 Links and implications

This chapter provided a view of the state of project management teaching in Australian primary school classrooms. This was the first peer-reviewed study on the topic of project management teaching from the perspectives of primary school teachers and completes the final phase of the overall research objective to explore the past, present, and possible future state of project management teaching in primary education. The findings reveal i) a lack of comprehensive project management teaching in Australian primary schools which is due in part to factors such as limited project management education and training for teachers, and an overabundance of administrative duties placing constraints on teaching time, ii) challenges for teachers inside and outside the classroom when teaching project management, such as the different learning preferences and abilities of students, conflict arising from different personalities, LOTE students, pushy parents, and the conflation of project management and project-based learning, and iii) suggestions for future improvement, which, most significantly, included recommendations for a simple and flexible project management learning framework. While the design and development of such a framework is beyond the scope of this thesis, this chapter, along with the previous two chapters, provides a solid foundation for such an endeavour.

CHAPTER 5: CONCLUSION

5.1 Significance of the contribution

This thesis has made a significant interdisciplinary and multifaceted contribution to the fields of education and project management. Firstly, empirical studies on the topic of teaching project management to primary school children were absent from the peer-reviewed literature. In that regard, Chapter 2 and its associated published article (Delle-Vergini et al., 2023a) provided the inaugural scoping literature review on the topic and a foundation for future research to build upon. It also assisted in answering the first research question: *What does the literature reveal about teaching project management to primary school students?* This new branch of research is important in providing optimal ways for children to learn and apply project management to their projects at home, in school, in the community, in their future careers, and in their personal lives.

Secondly, due to the interdisciplinary nature of the topic, it was necessary to engage experts from the fields of project management and education to understand what components of the project management discipline should be taught to young children, and how project management teaching was being implemented in the primary school classroom. With this objective in mind, Chapter 3 presented the perspectives of project management experts regarding the ability of children in primary school to learn such a complex discipline as project management, when they should first learn about it, who should teach them, and if those teaching them should receive project management training themselves. It also assisted in answering the second research question: *What are the key components of the project management discipline to consider when teaching young children?* Most significantly, Chapter 3 provided a breakdown of the project management discipline into ten hard skills and twenty soft skills, while contrasting each skill's importance versus difficulty. This will assist educators

to design project management content appropriate for primary education. The findings present a window into what *should* be taught according to project management experts. The article associated with Chapter 3 (Delle-Vergini et al., 2023b) was the first article of its kind (i.e., from the perspective of project managers on the topic of children learning project management) to be published in a peer-reviewed journal.

Chapter 4 presented the perspectives of Australian primary school teachers regarding children learning project management and provided some examples of project management elements present in classrooms. It also assisted in answering the third research question: *What does project management teaching look like in Australian primary school classrooms?* The chapter provided a unique view into the challenges faced by educators when teaching project management to young students, in particular the conflation of project management and project-based learning, the lack of project management education, training, mentoring, and professional development for educators, and finally, insufficient time to design and deliver project management content. These findings are significant because they present the first empirical study into what *is* (and is not) being taught in relation to project management in Australian primary schools. This can be compared to the study in Chapter 3 to provide a more holistic view of teaching project management in primary education.

Thirdly, the studies in Chapters 3 and 4 provided several suggestions for improving ways to teach young children about project management. Chapter 3 discussed i) the categorisation, importance, and difficulty level of both hard skills and soft skills in primary education, ii) the mapping of these skills into high importance / low difficulty, high importance / high difficulty, low importance / high difficulty, and low importance / low difficulty, and iii) if, when, and where children should learn about project management, who should teach them, and if those teaching them should be explicitly taught about project management themselves. In this regard, project managers felt that children should learn project management as early as

possible in primary school, and be taught by primary school teachers who have themselves been trained in project management. Chapter 4 provided several suggestions from primary school teachers and the principal investigator for improving ways of teaching project management to children, such as: reducing the conflation between project management and project-based learning, pre-service teacher education and training in project management, and a learning system to assist in the teaching of project management to children. In this regard, the findings in Chapters 3 and 4 assisted in answering the fourth and final research question: *What are some of the ways to improve project management teaching in Australian primary schools?* The article associated with Chapter 4 (Delle-Vergini et al., 2024) was also the first of its kind (i.e., from the perspective of primary school teachers on the topic of children learning project management). Similarly to the articles published by Delle-Vergini et al. (2023a, 2023b), it provides an original contribution to the fields of project management and education.

5.2 Implications

There are several implications from this research for the project management discipline, educators, researchers, and society.

5.2.1 For the project management discipline

The main focus of the project management discipline and its professional community has been on the development, application, and promotion of the discipline for adults. While there are some project management education programs evident in youth-serving organisations and secondary schools, the project management community should sponsor more programs in primary education settings. This requires simplifying the discipline into the core components required to deliver simple projects from beginning to end. In this regard, the discipline and its associated texts should be re-purposed for the explicit teaching of both educators and students

in not only primary education, but secondary education too. In support of such endeavours, however, the project management community will need to contribute to the literature on the topic of children learning project management so that evidence-based discourse can be explored and peer-reviewed. Given the interdisciplinary nature of the topic, both the fields of project management and education will need to expand on the literature presented in this thesis to ensure that children have the best chance of learning and applying the discipline to their projects.

5.2.2 For educators

Educators, particularly in primary education, are key to teaching young children about project management. However, as Chapter 4 demonstrates, there are a lot of challenges for teachers in achieving this aim. Primary school administrators need to include project management teaching into their school ethos and provide adequate time for teachers to design and deliver project management learning content to their students. Pre-service teachers should have a dedicated project management learning unit as part of their undergraduate or post-graduate teaching degrees, or at the very least, a professional development unit once employed as a teacher. Once they enter the teaching profession, they should receive professional development and mentorship, which, again, leads back to a school that adopts an ethos that includes the explicit teaching of project management. As with the project management community, educators are key to the development of a future learning framework and the expansion of peer-reviewed literature. In order to teach project management to young children, the approach should not be to pass the baton from the project management community to the education community, but instead, a collaborative effort between the two fields. This requires the education community to include project management experts in the design, development, and delivery of project management content in primary education.

5.2.3 For researchers

The topic of teaching project management in primary education was absent from the literature prior to this thesis. It is important for the research community to expand upon the concepts and articles presented in this thesis to allow children to benefit from the collective efforts of SMEs in the fields of project management and education. In particular, project management scholars should consider further research and dissemination of findings in this area.

5.2.4 For children

Adults help children learn at home, in school, and in the community. It is about time children were equipped with the knowledge and skills to manage individual and collaborative projects that shape their future. Why is more emphasis placed on Mathematics and English than managing home, school, personal, community, and work projects more successfully? Project management, one of the most significant skills required to be successful in the 21st century, should be taught explicitly and comprehensively to every single child. Children will step into projects and project management activities as soon they enter the workplace. Their success in the 21st century will depend on the hard and soft skills applied through the learning of project management as part of their formal education. The foundations of project management learning should be laid early in primary school and expanded upon in secondary school, with options for advanced learning in tertiary education or professional training programs. Children will shape their preferred futures through the careful selection and management of the projects that matter most to them. The implications for children are simply this: learning the discipline of project management will give them a head start in shaping the future of their world.

5.2.5 For society

Projects permeate society, and all projects benefit from project management. Societies include people of all ages, and a large section of these are primary school children. Therefore, children should be explicitly taught the discipline of project management to increase their chances of being successful in the 21st century and making significant contributions to society. Further, an ethos of project management learning is proposed for schools and society in general.

5.2.6 For the principal investigator

Before embarking on this PhD journey, I was still determining my ontological and epistemological stance and even questioned my ability to conduct doctoral research at the level required to publish in top-quality peer-reviewed journals. Since then, however, I am confident of two things and hopeful about another. Firstly, my worldview is closely aligned with constructionism, an educational philosophy and theory of learning attributed to Seymour Papert. While building upon the theory of constructivism developed by Jean Piaget, it emphasises learning through making and the active role of learners in constructing knowledge. Ontologically, constructionism aligns with a constructivist view that reality is not fixed or objective but instead co-created by individuals through their interactions. However, with constructionism, subjective reality is actively shaped by the individuals who actually construct artefacts, such as models, prototypes, and products. Epistemologically, knowledge is not transmitted passively from the teacher but actively constructed by the student when they create something tangible and meaningful that is grounded in context and personal experience. It is this bridge between constructionist ontology and epistemology, within the lens of pragmatism, that has opened my eyes to the power of project management in education, the workplace, and society in general. Secondly, I am a better researcher as a result of my PhD journey. I can think, investigate, analyse, synthesise, interpret, collaborate, write, edit and present research more

professionally and academically than I ever did before starting the PhD. Finally, with advanced interdisciplinary research expertise in the fields of project management and education, over twenty years of experience in the project management industry, and a strong belief that children can and should learn project management from an early age, I hope that I can advise educators and policymakers on how to empower children with what I believe is the number one skill to make their lives more successful in the 21st century: project management.

5.3 Limitations

This research was subject to several limitations. Firstly, one of the primary limitations of this thesis was the inability to observe project management activity in the classroom or conduct focus groups in primary schools. This was largely due to the COVID-19 pandemic. As the pandemic subsided, teachers and administrators were busy trying to catch up with time lost from frequent pauses in delivering curriculum content. As such, priority was given to this over research requests to access people and resources within schools.

Secondly, due to time constraints, it was not possible to gather project management professionals and Australian primary school teachers into a single focus group. This undoubtedly would have provided additional insights compared to the separate studies outlined in Chapters 3 and 4.

Thirdly, while the number of teachers in Chapter 4 was sufficient to conduct a qualitative study using reflexive thematic analysis, the results are not generalisable to a larger population.

Lastly, as the principal investigator, I struggled with objectivity throughout the research. With over twenty years of experience as a project professional and having identified and explored the unique research gap that fuelled this thesis, I was transformed from a sceptic to an advocate regarding the ability and justification for children to learn about project

management. This transformation, however, made it challenging to analyse, interpret and present participant responses other than through the lens of a biased observer. Moreover, I saw myself as a central component of the knowledge co-production along with other participants, as evident in Figure 1.3 from Chapter 1. While a statement like this might traditionally belong in the *limitations* section of a thesis, the time has come when the central role played by the qualitative researcher should be recognised in the *significance* section and not "...as an apology for the lack of objectivity in a research project" (Olmos-Vega et al., 2023, p. 242). However, to mitigate subjectivity and bias, I frequently consulted with other members of the research team, who helped me balance the advantages and disadvantages of positionality in research (Punch & Oancea, 2014) through discussion, reflexivity, and revision.

5.4 Future research

There are several opportunities for future research, such as:

- empirical research utilising focus groups to collect mutually informed data from project management practitioners and educators.
- further research to inform the design, development, and application of a project management learning framework in primary education.
- examine Australian education policy, particularly regarding the Technologies curriculum, and how project management can be better integrated into primary education teaching and assessment.
- observational studies to identify how project management teaching is being conducted in the primary school classroom, not just relying on teacher accounts.
- quantitative studies that build upon the qualitative insights and findings contained within this thesis.

- expand upon existing research into the philosophical implications of project management but through the lens of childhood education. Children should understand what a project is, why they are important in society, what value projects bring, and what values we hold that influence our involvement in projects.

5.5 Final remarks

This thesis has demonstrated the potential value of young children engaging in project management learning and how it can shape their future. It is hoped that this is just the beginning of a journey to make project management a powerful tool for children to utilise throughout their lives. The project management community, educational institutions, and the research community need to collaborate on the design and development of comprehensive ways of teaching project management to children, ideally through a simple but effective learning framework. This thesis makes a major contribution in this area by i) disseminating the findings in peer-reviewed literature, ii) aggregating the collective knowledge and advice of relevant SMEs (project management experts and educators), and iii) identifying several challenges and suggestions for developing comprehensive ways of teaching project management in primary education.

As to the question asked by my 7-year-old daughter early in the research journey: *how can I learn about it [project management] if nobody teaches me?* I hope that this thesis and subsequent research on the topic will equip educators with the explicit knowledge and skills to be able to answer that question confidently:

“You can learn project management, and I will teach you.”

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APPENDIX I

Producing source document (ACARA, 2022)

One of the major educational sources utilised throughout this thesis was the 117-page document: "Australian Curriculum: Technologies: Foundation Year, Year 1, Year 2, Year 3, Year 4, Year 5, Year 6" (ACARA, 2022) that was produced by filling out the online form below as illustrated in Figure A.1.

Figure A.1

Method for producing source document (ACARA, 2022)

The screenshot shows the Australian Curriculum website interface for downloading curriculum documents. The page is titled "Print / Download Curriculum" and is set to "F-10 Curriculum". The "Download resources" section is active, showing a list of curriculum elements and year levels. The "Technologies" section is selected, including "Design and Technologies" and "Digital Technologies". The "All year levels" section is selected, including "Foundation Year" through "Year 6". The "All curriculum elements" section is selected, including "Cover page", "Table of contents", "How the Learning Area/Subject works", "Year level / band descriptions", "Content descriptions", "Content elaborations", "Achievement standards", and "Glossary". There are buttons for "Download PDF" and "Download entire curriculum".

Source: <https://www.australiancurriculum.edu.au/download?view=f10>

Note. As of May 2024, this online form can still be used to produce the same 117-page document that was cited throughout this thesis. The next version of the Technologies curriculum, version 9.0, was released after the citations were included in the articles associated with this thesis. It contains only minor changes to the Technologies curriculum regarding project management, such as glossary definitions. The article associated with Chapter 3 referred to ACARA (2022) as ACARA (n.d.). They are the same reference.

APPENDIX II

Delphi survey questions for the study in Chapter 3

Round 1

1. In PMI's Guide to the Project Management Body of Knowledge (PMBOK) version 6, there are ten Knowledge Areas (Integration, Scope, Schedule, Cost, Quality, Resource, Communication, Risk, Procurement, Stakeholder). How would you rank each one in order of importance, with the top selection being the most important, and the bottom selection being the least important? Please explain the reasoning behind your top 5 selections.

No. Knowledge Area Reason (for top 5 only)

1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	
7.	_____	
8.	_____	
9.	_____	
10.	_____	

2. Could some Knowledge Areas be combined into a group? If so, which Knowledge Areas, and what would each combined group be named? Please explain the reasoning behind each group that you have suggested.

KA combination

Reason

_____	_____
_____	_____
_____	_____
_____	_____

3. Think of a very small and simple project managed by children aged between 5 and 11 years. In your opinion, which Knowledge Areas are absolutely necessary for small/simple projects managed by children, while still maximising the chances of a successful project?

Knowledge Area

4. Which Knowledge Areas are **not** considered absolutely necessary for small/simple projects managed by children? Please explain why you believe each one is not necessary.

Knowledge Area

Reason

<hr/>	<hr/>

5. Soft skills may be defined as "...a broad set of skills, competencies, behaviors, attitudes, and personal qualities that enable people to effectively navigate their environment, work well with others, perform well, and achieve their goals" (Lipmann et al., 2015, p. 15). Name up to 10 soft skills (in no particular order) that project managers need to successfully manage projects?

1. <hr/>	6. <hr/>
2. <hr/>	7. <hr/>
3. <hr/>	8. <hr/>
4. <hr/>	9. <hr/>
5. <hr/>	10. <hr/>

6. As a project professional, which is more important to your project success: soft skills (interpersonal skills) or hard skills (technical project management skills)? Please explain the reason for your selection.

Selection	Reason
Soft (interpersonal) skills	_____
Hard (technical) skills	_____
Both are of equally important	_____

7. If you were teaching project management to a child aged between 5 and 11, which skills are more important to focus on? Please explain the reason for your selection.

Selection	Reason
Soft (interpersonal) skills	_____
Hard (technical) skills	_____
Both are of equally important	_____

8. Should children aged between 5 and 11 years learn project management? Please explain the reason for your selection.

Selection	Reason
Yes	_____
No	_____
Undecided	_____

9. When should children **first** learn about project management? Please explain the reason for your selection.

Selection	Reason
0 - 4 years old	_____
5 - 11 years old	_____
12 - 17 years old	_____
Any of the above	_____

None of the above _____

Undecided _____

10. If you believe that children aged between 5 and 11 years should learn project management, who is the best person to teach it to them? Please explain the reason for your selection.

Selection	Reason
Teacher	_____
Parent	_____
PM professional	_____

11. If you believe that children aged between 5 and 11 years should learn project management, should schoolteachers and/or parents receive project management training if they are teaching children project management? Please explain the reason for your selection.

Selection	Reason
Yes	_____
No	_____

12. If you believe that children aged between 5 and 11 years should learn project management, what is the best environment for these children to learn project management? Please explain the reason for your selection.

Selection	Reason
School	_____
Home	_____
Community	_____
Workplace	_____
Other	_____

13. If children aged between 5 and 11 learn project management, do you believe this will help them to be more successful in their future employment? Please explain the reason for your selection.

Selection	Reason
Yes	_____
No	_____

14. If children aged between 5 and 11 learn project management, do you believe this will help them to be more successful in their personal lives? Please explain the reason for your selection.

Selection	Reason
Yes	_____
No	_____

Round 2

1. In Round 1, project management experts were asked to rank Knowledge Areas in order of importance. The list on the left-hand side is the result of that ranking exercise. If you disagree with the ranking provided by the panel of project management experts in Round 1, please drag all 10 Knowledge Areas from the left-hand side to the right-hand side in the order of importance you prefer. If you agree with the ranking provided by the panel of project management experts, do not drag any of the Knowledge Areas across.

No.	From Round 1	No.	Your Revised List
1.	Communication Management	1.	_____
2.	Stakeholder Management	2.	_____
3.	Scope Management	3.	_____
4.	Risk Management	4.	_____
5.	Integration Management	5.	_____
6.	Schedule Management	6.	_____
7.	Resource Management	7.	_____
8.	Cost Management	8.	_____

9. Quality Management 9. _____
10. Procurement Management. 10. _____

2. Refer to the ranked list of Knowledge Areas in the previous question. Please explain why you agree or disagree with the ranking of Knowledge Areas provided by the project management experts in Round 1.

3. In Round 1, project management experts were asked if any Knowledge Areas could be combined into one or more groups. The following groups of Knowledge Areas were suggested by the project management experts. The number of times each group of Knowledge Areas was suggested by a project management expert is in the right column.

KA combination	Frequency
Communication, Stakeholder	4
Cost, Procurement	2
Schedule, Resource	2
Schedule, Resource, Scope	1
Schedule, Cost, Scope	1
Scope, Procurement	1
Cost, Risk	1
Quality, Risk	1
Scope, Schedule, Cost, Quality	1
Integration, Procurement	1
Scope, Cost, Schedule, Risk, Quality, Resource	1

If you agree that Knowledge Areas can be combined, which combinations listed above make sense to you (or don't make sense), and why? If you feel that Knowledge Areas should not be combined, simply leave the question blank.

4. Refer to the ranked list of Knowledge Areas in Question 1. Communication Management and Stakeholder Management were ranked 1 and 2 respectively. The research team discovered that these two Knowledge Areas were ranked by the project management experts significantly more times than the third-ranked Knowledge Area: Scope Management. Why do you believe Communication Management and Stakeholder Management ranked so highly?

5. In project management, the "Iron Triangle", sometimes referred to as "Triple Constraints", suggests that the quality of a project is constrained by the 1. budget (cost), 2. deadline (schedule/time), and 3. scope. Refer to the ranked list of Knowledge Areas in Question 1. If the Iron Triangle and balancing the triple constraints are so important, why do you believe Schedule Management and Cost Management ranked low on the list (at numbers 6 and 8 respectively)?

6. In Round 1, project management experts were asked to list up to 10 soft skills needed to successfully manage projects. After removing duplicates, grouping similar terms, and removing a few terms that were not deemed soft skills, the research team was able to generate a list of 70 soft skills (see below).

Communication	Integrity	Forecasting
Leadership	Ability to learn	Humbleness
Teamwork	Presentation	Work ethic
Negotiation	Coaching	Relationship building
Emotional intelligence	Mentoring	Tough conversations
Listening	Compassion	Servant leadership
Empathy	Facilitation	Autonomy
Problem-solving	Cultural sensitivity	Responsible
Motivation	Detail focused	Simplicity
Resilience	Interpersonal	Citizenship
Collaboration	Social awareness	Aesthetic sensibility
Decision making	Analytical	Versatility
Influencing	Transparency	Technological sensitivity

- | | | |
|---------------------|----------------------|------------------|
| Creative thinking | Self-confidence | Advising |
| Conflict management | Artistic sensibility | Issue management |
| Trustworthy | Approachable | Managing people |
| Persuasion | Time management | Inspiring |
| Adaptability | Fairness | Kindness |
| Team building | Calm | |
| Positivity | Honesty | |
| Critical thinking | Decisiveness | |
| Courage | Accountability | |
| Organizing | Political awareness | |
| Open-mindedness | Patience | |
| Flexibility | Responsiveness | |

From the list above, please select 20 soft skills (in no particular order) that you believe are the most important when managing projects. Please fill in all 20 Soft Skill fields below, and only use soft skills from the list above.

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

7. Which Knowledge Area(s) do you believe might be difficult for children aged 5-11 to learn and/or apply to managing small/simple projects? Please enter up to five Knowledge Areas in the left-hand column that you believe might be difficult for children to learn and/or apply to managing small/simple projects. Then provide the reasoning for each choice in the right-hand column. If you don't believe any Knowledge Area might be difficult for children to learn and/or apply to managing small/simple projects, simply leave the question blank.

Difficult KA to learn	Reason
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Round 3

- In Round 2, project management experts were asked to select 20 soft skills from a list of 70. In the table below, the left-hand column lists the top 20 ranked soft skills selected by the panel of experts. The number of times each soft skill was selected by an expert is in the right-hand column. Several soft skills have tied rankings.

Top 20 soft skills from Round 2	Frequency
Communication	14
Leadership	11
Negotiation	11
Emotional intelligence	11
Problem solving	10
Influencing	10
Conflict management	10
Listening	9
Adaptability	9
Facilitation	9
Cultural sensitivity	9
Teamwork	8
Resilience	8
Decision making	8
Critical thinking	8
Empathy	7
Motivation	7
Collaboration	7
Creative thinking	7
Integrity	7

Please drag **all** 20 Soft Skills (below) from the left-hand side to the right-hand side in the order you believe they should be, with the most important soft skill at the top, and the least important soft skill at the bottom. You can still re-arrange the order after you have placed them on the right-hand side. If you feel that the ranked list (below) is in the correct order of priority, do not drag any of the soft skills across. Simply proceed to the next question.

Top 20 soft skills from Round 2	Your preferred ranking
Communication	_____
Leadership	_____
Negotiation	_____
Emotional intelligence	_____
Problem solving	_____
Influencing	_____
Conflict management	_____
Listening	_____
Adaptability	_____
Facilitation	_____
Cultural sensitivity	_____
Teamwork	_____
Resilience	_____
Decision making	_____

Critical thinking	_____
Empathy	_____
Motivation	_____
Collaboration	_____
Creative thinking	_____
Integrity	_____

2. Refer back to the top 20 soft skills listed in Question 1. Which soft skills do you believe are difficult for children aged 5-11 to learn? Please enter up to 10 soft skills in the left-hand column, in no particular order, that you believe are difficult for children aged 5-11 to learn. Then provide your reasoning for each selection in the right-hand column. If you don't believe any of the soft skills listed in Question 1 are difficult for children aged 5-11 to learn, simply leave the question blank and proceed to the next question.

Difficult soft skills	Reason
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

3. Refer back to the top 20 soft skills listed in Question 1. Which soft skills do you believe are impossible for children aged 5-11 to learn? Please enter up to 10 soft skills in the left-hand column, in no particular order, that you believe are impossible for children aged 5-11 to learn. Then provide your reasoning for each selection in the right-hand column. If you don't believe any of the soft skills listed in Question 1 are impossible for children aged 5-11 to learn, simply leave the question blank and proceed to the next question.

Impossible soft skills	Reason
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

4. Many of the questions presented thus far have to do with the Knowledge Areas and Soft Skills in project management. The Knowledge Areas and Soft Skills required by professional project managers may differ from those required by children aged 5-11 managing small/simple projects. Aside from these hard and soft skills in project management, what other things do you feel might assist children to learn project management? It might be tools, techniques, concepts, approaches, or any area within the project management discipline not covered by the ten Knowledge Areas or Soft Skills listed in Question 1. Please share your thoughts in the comment box below. This is also a great opportunity in this final question to present your overall thoughts, feelings, or suggestions on the topic of children learning project management.

References (listed in the online Delphi survey)

Lippman, L. H., Ryberg, R., Carney, R., & Moore, K. A. (2015). *Key “soft skills” that foster youth workforce success: toward a consensus across fields*. Child Trends, Inc. https://www.youthpower.org/sites/default/files/YouthPower/resources/Workforce_Connections_Key_Soft_Skills_and_Appendices.pdf

APPENDIX III

Participant information sheet for the study in Chapter 4



University of Southern Queensland

Participant Information Sheet for USQ Research Project Survey/Interview

Project Details

Title of Project: **A framework to support the learning of project management skills among primary school children in the Australian Technologies Curriculum**

Human Research Ethics Approval Number: H20REA139

Department of Education & Training (VIC) research ID: 2022_004598

Research Team Contact Details

Principal Investigator Details

Mr. Sante Delle-Vergini
Email: sante.delle-vergini@usq.edu.au
Telephone: +61 459 689 978
Mobile: +61 459 689 978

Supervisor Details

Dr. Mustafa Ally
Email: mustafa.ally@usq.edu.au
Telephone: +61 7 3470 4528
Mobile: +61 7 3470 4528

Description

This project is being undertaken as part of the Doctor of Philosophy program. The purpose of this project is to inform teaching approaches for children learning project management skills in primary school. The research team requests your assistance because you have been identified as a qualified primary school teacher at the school where the research will be conducted.

Participation

Your participation will involve a Survey (approx. 15-20 minutes) and an **optional** one-on-one interview via Zoom (approx. 60 minutes).

The survey process will involve an online link, provided to each participant, where they can fill in the survey questions.

The interview process is summarised as follows:

1) Prospective participants will be invited to participate in the research and be given relevant information about the research. 2) If a participant agrees to be involved, they will be interviewed on a date and time that suits the participant. 3) At the interview, the interviewer will give an overview of the research. 4) The participant will be asked a series of open questions. 5) After the interview, the participant will be thanked, and their responses will assist in future research.

Your participation in this research project is entirely voluntary. If you do not wish to take part, you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from

the research project at any stage. The data collected will be stored in a secure location during the research and destroyed five (5) years after the research has concluded.

Your decision whether you take part, not take part, or to take part and then withdraw, will in no way impact your current or future relationship with the University of Southern Queensland.

Expected Benefits

Participants will benefit by taking part in research that is relevant to teachers and students within the primary school sector. The information you provide will greatly assist the research team understand more about how the technologies curriculum can benefit from the development of a project management learning framework in Australian primary schools.

Risks

It is not anticipated that you will be at risk of any negative physical, psychological, legal or economic consequences by participating in this research. There will be some time commitment required of each participant in order to complete the survey (15-20 minutes), and optional interview (up to 60 minutes).

Privacy and Confidentiality

All comments and responses will be treated confidentially unless required by law. Participants will have all identifiable information removed from their interview responses. Participants will be able to change their responses at the end of the interview. The interview will be voice-recorded to aid transcription. The recording and transcription will be available to the participant upon request. The transcription may be used for future research purposes.

Any data collected as a part of this project will be stored securely as per University of Southern Queensland's [Research Data Management policy](#).

Consent to Participate

The research team ask that you confirm your agreement to participate in this research by signing the Participant Consent Form or simply emailing your confirmation to sante.delle-vergini@usq.edu.au.

Questions or Further Information about the Project

Please refer to the Research Team Contact Details at the top of the form if you have any questions or require further information about this research project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project, you may contact the University of Southern Queensland Manager of Research Integrity and Ethics on +61 7 4631 1839 or email researchintegrity@usq.edu.au. The Manager of Research Integrity and Ethics is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Thank you for taking the time to help with this research project. Please keep this sheet for your information.

APPENDIX IV

Participant consent form for the study in Chapter 4



University of Southern Queensland

Participant Consent Form for USQ Research Project Interview

Project Details

Title of Project: **A framework to support the learning of project management competencies among primary school children in the Australian Technologies Curriculum**

Human Research Ethics Approval Number: H20REA139

Department of Education & Training (VIC) research ID: 2022_004598

Research Team Contact Details

Principal Investigator Details

Mr. Sante Delle-Vergini
Email: sante.delle-vergini@usq.edu.au
Telephone: +61 459 689 978
Mobile: +61 459 689 978

Supervisor Details

Dr. Mustafa Ally
Email: mustafa.ally@usq.edu.au
Telephone: +61 7 3470 4528
Mobile: +61 7 3470 4528
Mobile: +61 431 251 457

Statement of Consent

By signing below, you are indicating that you:

- Have read and understood the information document regarding this project. Yes / No
- Have had any questions answered to your satisfaction. Yes / No
- Understand that if you have any additional questions you can contact the research team. Yes / No
- Understand that the interview will be audio recorded. Yes / No
 - Understand that you can participate in the interview without being audio recorded. Yes / No
 - If you **do not want** to be audio recorded during the interview, please initial here: _____.
- Are over 18 years of age. Yes / No
- Understand that any data collected may be used in future research activities Yes / No
- Agree to participate in the project. Yes / No

Participant Name	<input type="text"/>
Participant Signature	<input type="text"/>
Date	<input type="text"/>

Please return this sheet to a Research Team member prior to undertaking the interview.

APPENDIX V

Sample of interview dataset for the study in Chapter 4

Interview date: 12/12/22 4:00pm [Zoom audio]

Interviewee: T-03

Interviewer: So I've seen your survey so that's all cool you've got the ah soft skills that you mentioned there and the difficult ones and you didn't put any that are not difficult which was...

T-03: I don't think I don't think soft skills [pause] I think some kids have just got it [Int: yeah] and other kids don't have it and the kids that find it really really hard [Int: yep] I think there's a lot of different factors involved cos some of it's generational some of its cultural some of it's um I I spose personality as well [Int: mmm] and I think that how do you assess soft skills how do you know you're teaching it well [Int: yep] and I think so for those reasons I don't think soft skills are yeah [Int: mmm] I find that that they all are difficult or if you are teaching them well how do you measure that.

Interviewer: Yeah it's a hard one to measure that's for sure, yep.

T-03: Yep.

Interviewer: Alright so I'll just dive into the questions. The questions kind of ah augment I guess the survey um and there's about how many are there, there's ten, ten questions. I'll go with the first one which is:

Interviewer: [Q1 - 03:30] What is your understanding of project management?

T-03: Um it's funny you say that cos when I read through your questions I'm like oh yeah we do this all the time [Int: yeah teachers do it don't they yeah] yeah the idea of project management I spose is a group of people working together for a common goal [Int: yep] um and I think for us in teaching that's our you know well we're working together to create you know it's usually an inquiry project but um I don't know it's hard to put into words.

Interviewer: Yeah it is. It's one of those general things. Yeah cos I noticed when I was uh...oh I'll ask the second question then I'll follow up with something I was about to say but...

Interviewer: [Q2 - 04:23] Ok so that's for project management, but what is your understanding of project-based learning?

T-03: Project-based learning to me is a combination of your authentic real-life skills and bringing that into a classroom so developing something that will authentically combines real world experiences with the curriculum.

Interviewer: Yep ok. Yeah cos I remember when uh when I first...[redacted] I was 12 years old and I went 1979 it was grade six and it was totally different it was just like Pink Floyd The Wall just teachers or students sitting there at their wooden desks, teachers squeaking on the chalkboard at the front, couple of slaps on the back of the leg with a ruler and that type of, totally changed and then I guess I don't know when I dropped around there say about 10 years ago it was PBL-based there was there was [redacted] [former school principal] and there was all this type of ah autonomy going on and and what I hear from you know some of the teachers is that it's kind of gone back to more um traditional or prescriptive type of teaching I don't know if heard wrong but I don't know it just seems to be it's either you get the the autonomy project-based learning type of mindset or you'll get the 'let's follow Naplan and do all the tests and make sure that the kids are passing their their test' type of environment.

T-03: Um I think that the biggest thing is finding a balance [Int: Yeah] um and I think [inaudible] seem to struggle is if we're doing all of these things [Int: mmm] how are making sure that we're still making um still I spose equipping the kids for a system in high school um [Int: yep] I think in some ways the pendulum swung a little bit too far [Int: mmm] um and in order to get it back to where it needs to be we need to fill in some gaps [Int: mmm] and then come back to centre if that makes sense.

Interviewer: Yeah it probably does cos as they go into high school then they might get a bit of a shock right if if the school's too flexible or open then all of a sudden they're going back to that Pink Floyd room type of thing with all gotta be sitting [T-03: yep] down listening to the teacher so yeah yeah that's a good point.

Interviewer: [Q3 - 06:27] Alright so the third question ah there's many similarities between PBL and project management. For example, they both involve a project, utilise project management skills, and produce a final product or result. Do you see any differences between PBL and project management? And if so, what's your main what's the main differences?

T-03: I think the facilitator and the role of the teacher as a facilitator would be the main difference for me [Int: yeah] um and I think that like if I look at project management in terms of like a HR perspective you don't have the teacher going 'ok well what about you know' it's I spose the level of autonomy [Int: mmm] um [Int: yep] I think that's the main difference.

Interviewer: Yeah that's right um one of the other teachers mentioned that yeah and also the what do you call it um it's more focused on the learning side of things where you know I guess the project you go this sort of outcome like in the business world it's like that right they don't care about learning they just care about doing the product [T-03: yeah].

T-03: I don't I don't care how you get there [Int: yeah] I care about the result whereas we're flipped [Int: yeah exactly] we don't care about the result we care about how you get there. And I think as well is that we're always tied back to the curriculum [Int: mmm] um whereas I don't think project management has those constraints.

Interviewer: Yeah there's a point yeah, you have to, yeah that's right yeah cos you gotta follow certain things in the curriculum you got a certain thing you must teach don't you? [T-03: yep] yeah that's right.

T-03: So what we've done in the past with project management so I don't know do have you heard about our trivia night that we ran a couple of years ago? [Int: nup] Um so we had grade two's and they ran their own trivia project [Int: mmhm] um and what we used to do with that is that we had you know our maths through we taught arrays with um how we were mapping the area and we did um [pause] what else did we do um we wrote persuasive letters and then we went down to Fountain Gate [shopping centre] we handed them out to people looking for donations um we did money through how much is you know how much we're going to cost it everything like that but we still had to have these stand-alone workshops to cover parts of the curriculum that weren't covered in our project in an authentic way.

Interviewer: Right ok and that was just once or one-off or

T-03: That was a one-off um but that was probably one of my favourite projects that I've been involved in [Int: mmm].

Interviewer: [Q4 - 09:04] Ok and the fourth one is do your students participate in project work and if so, what kind of activities are they involved in?

T-03: Um I think this year not so much [Int: right] um I think that [sigh] project [pause] I mean with the trivia example they um worked together and each group worked on a um a round of the trivia [Int: ok] and then we also had a group that was in charge of the raffle, a group that was in charge of the silent auction, a group that was in charge of catering [Int: yep] um another project that was did was about multimodal literacies and each group was in charge of a different way of storytelling and that had to create something that represented a different area of the world and how they told stories so we had a group that researched hieroglyphics and they translated their story into hieroglyphics and we had another group that did [inaudible] body paintings which is a traditional um Indian storytelling way [Int: mmhm]. So I sponse most of the project work that we do looks at a bigger theme connected to education and then breaking it into how do we show this with a specific interest [inaudible] student choice student voice from there so it's I sponse the project is always 'well how do we show our learning?' [Int: show our?] learning, how do we share this learning with the wider community and that's the kinda [Int: right, how we, oh yeah ok, so like through presentations and things like that and] yeah [Int: that type of thing ok] um though I've also had though um I mean projects through production as well [Int: yep] um I mean I sponse we could look at the athletics day the kids have been running at the moment [Int: mmm] um the project is 'well what do we need to do to setup um that particular um sport?' [Int: yep...so do they] and then [Int: ok yeah go on] and then so it's been um 'well what do I need, how will I differentiate' actually do you know what I could do [pause] [inaudible] sports day [inaudible] in the sport area cos I had a template that I worked them through [Int: ok] so it was [inaudible] how you setup the space, based on that um what equipment do you need [Int: mmm] what rules are you going to need um what roles will you need to have um [Int: yep] filled on the day and who will do those roles um and each grade five six student worked on um a different sport so I think Arna [student at the school] was in limbo.

Interviewer: ok, limbo? [T-03: mmm] haha ok that's cool. Yeah yeah roles I guess you'd have to know which roles and and I guess do you find that some students er are exhibiting more sort of leadership or more um I guess you get your shy types, your ones that are more active, your ones that are more um pragmatic.

T-03: Yep um so you'll always find there's a natural leader that wants to take over [Int: ok] um whether or not they're good at that [both laugh] is another question so sometimes it will be delegation and others it will be 'ok I'm doing everything I'm a leader' [Int: yep] um so that and that's that explicit teaching of those soft skills as well what does leadership actually mean [Int: mmhm] it doesn't mean you do everything [Int: no that's right] um and quite often what you'll tend to do is you'll notice well hang on a second this is what the kids are really struggling with let's pull it back and just do a whole entire session on what does this mean [Int: ok] um and I always tend to with project-based learning I always tend to have some sort of template for them to follow through on um and by the end of the project project you'll kind of tick everything off a tick list [Int: mmm] cos all your different groups are gonna work at really really different paces so you can't do one lesson let's do this one lesson let's do that it doesn't tend to work like that.

Interviewer: Ok. There was another question I had about that. Let me have a look [talking to self] students...project work...um what kind of activities...

Interviewer: [Q5 - 13:49] Yeah I guess and what type of artifacts do they produce? Do they do things like timelines or you know, we're gonna start and end here, we're gonna do it in stages, um anything like that?

T-03: Depends on the project [Int: yep] and it depends on the age group [Int: yeah] um.

Interviewer: I guess what I'm asking is it structured in any way, managed or structured in any way?

T-03: Um maybe what I can do actually um [pause] have you got publisher on your um on your computer?

Interviewer: I don't [T-03: no?] I don't know would it open on PowerPoint or something if you send something?

T-03: No it usually won't but I think I've sent it I can quickly save it in um [Int: pdf] pdf.

Interviewer: Alright no worries.

T-03: Oh there we go I have saved it in pdf already. So if you wanted to have a look at that [pause] that's what I have the grade sixers and just said 'look you've got a couple of sessions I want you to work through it at your own pace' and kind of just roamed between the three groups

Interviewer: Have you shared it here have you or in an email or?

T-03: I've emailed it to you.

Interviewer: Ok let me have a look [pause] might be slow here.

T-03: Oh it might be uploading it still.

Interviewer: Yeah [pause] we should hear a ping when it when it arrives [T-03: The wind is crazy] Oh hear it is. Yeah I know it just picked up all...I mean it's summer what can you

what can you do, cold overnight rainy windy haha [T-03: exactly] it's like autumn or something. Oh hear you go 'Athletics day planning' [reading the contents of the template] draw a labelled map of the spaces you'll be using for the events, what equipment will you need, yep so I guess that's like resources in in a project, the roles, job description, job name allocated to student, some potential risks, yep, what rules will you put in place, oh ok yeah, how will you teach the event, yeah it's kind of a roadmap isn't it?

T-03: Yeah [Int: what's gonna happen] um I wonder if I've got the mission impossible stuff on here cos what was quite a good project as well [Int: mmhm] um [pause] um what else have I got?

Interviewer: [Q6 - 16:50] So is it fair to say like the answer to this question: if your students are involved in project work how is the project structured? I guess with like a template like you've just showed me like some type of roadmap.

T-03: I use a lot of templates [Int: yeah] and checklists [Int: right, templates and checklists] um it really depends on the project to be honest and the year level because different groups of children are gonna need really different things [Int: yep] um what's this one this one's from a couple of years ago [pause] oh here you go here's another one it's um project-based learning but it's completely different [pause] so this one was a sewing tapestries um and it was a student choice workshop and they worked with me every Friday [Int: ok] um and it had QR codes embedded into it to help them with the bits that they needed to learn independently which would free me up [Int: mmm] and allow them to work at their own pace and give more of that independence [Int: mmm] and then also setting up those goals which so the last page they actually had to do before they started it would be on the back so it would always be there.

Interviewer: It's not here yet [referring to the email T-03 just sent on the tapestries project] here you go, 'Tinker time' that one?

T-03: Now that was actually designed to cover the whole entire design technologies curriculum at a grade three level as well.

Interviewer: ok [reading the contents of the template] the plan for the finished product [inaudible] use materials, mmm, step three procedure, goals, ok yeah it makes sense a lot of templates and checklists doesn't it um, ah that's cool.

T-03: And then at the start of every session usually what I would have done is sat them down and gone 'right lets open it up...where are we up to...what did you do last session and what's your next step and really explicitly modelling that thinking to them as well.

Interviewer: mmm ok alright.

Interviewer: [Q7 - 20:46] Ah the next one well you've probably just shown me one actually: what kind of project artifacts are created um for them to run their project so you got the templates but I guess specifically related to project management so any sort of like timeline like I said before or resource lists, material lists, I saw material list there before that you needed for that particular project.

T-03: Yeah usually to just we create the templates so that then it would all be in the one document [Int: mmm] um quite often I spose I think teachers are more involved in the timeline side of things [Int: Yep] than the kids but then I'm junior school this is only my first year teaching grade six [Int: Yep] um so a lot of the examples that I've got are younger year level ones [Int: Yep] um.

Interviewer: Yeah so with, so there's some examples that I've seen...this is why I kicked off this whole PhD research in the first place was when looking in the ACARA documentation that they talk about particularly in the technologies subject that they're supposed to be teaching project management but then when I look at some examples there is some examples in high school but not so much in primary school, well actually there's none in primary school, that's why I was trying to find some type of empirical study or something and there's not and it's not a question of good or bad it's a question of if they're stating in the ACARA document that's what's supposed to happen I don't know what that looks like in the classroom, whether it's PBL whether it's a mixture of project management slash PBL or, yeah so that's why I was looking at um trying to investigate what's actually happening in the classroom um yeah so so the next, yeah go on you were going to say?

T-03: I was just going to say I think every teacher does it completely differently as well [laughs].

Interviewer: well that's right they're doing it differently and also like you said with those different age levels like how do you even teach the concept of a project to someone that's like five years old or six years old, do you start off with like concepts of it like, give them some examples of projects like the pyramids or something and talk about that and how many people worked on it and why it's important, how large and long the project was [T-03: Yeah] and even the term project is not, you gotta use different terminology cos you know the Gantt chart where you've got the you know the activities on the left and the bars on the right to show a particular project, it's called a Gantt chart, well you're not call it a Gantt chart to a child because you know it's going to compute the same, or procurement management or something like that you know, terms in traditional project management that you wouldn't use so, so it's another [T-03: Yeah] yeah.

T-03: I spose the biggest thing is I've always we've always started with a whole lot of experiences [Int: mmm] um and we've always had a really good idea of what we want the end product like what is the learning we want to happen [Int: mmm] and what is the end product and then you kind of steer the kids the way you want it to go and the biggest thing is particularly junior school is we got all of this information how can we tell people about it how can we share it what can we do with it and usually if you've done a good job with your immersion their ideas will be what you want them to be [Int: right] and you know they'll be like 'oh we can do this [inaudible] a great idea here's something I've already prepared' [Int: mmm] um.

Interviewer: So what's immersion is that like an education term like [T-03: um] getting...

T-03: Um so lots of different experiences with the same type of thing.

Interviewer: Right ok [pause] mmm ok.

T-03: Now if you drop in I've got um have your kids ever had Supna [one of the teachers] [inaudible] before?

Interviewer: I've heard the name several times miss Sapna yep.

T-03: Yeah cos um I went with her in 2015 [Int: ok] and she's an absolute legend when it comes to documenting projects so she's created a really beautiful book and it documents um a project that we did together in 2016 so it might be worth you having a look at that [Int: yeah] um on my hard drive at home I have a whole lot of documentation from another project as well um I wouldn't be able to give it to you [Int: mmm] I don't think [Int: yeah] but I's be able to show it to you [Int: right ok] cos it's videos and I don't think I have media permissions cos they're kids that don't work ah don't get here anymore.

Interviewer: Right and the, ok and the document you were talking about with miss Sapna is that a project management type of document or is it photos and all that type of stuff you were saying?

T-03: No it's photos [Int: right] but it would show what I pose a project would look like at those junior levels.

Interviewer: Right ok, yep, mmm. Yeah that's interesting. Alright I'll definitely ah, and she's still in the school is she?

T-03: Yeah she is and I've got my own copy as well I think the school actually has a copy [Int: mmm, ok] we would have to find it [Int: ok cool].

Interviewer: [Q8 - 25:53] So what's the next one? Next one is are your students involved in managing their own projects? If so, what kind of activities specifically related to managing projects are they involved in? Doesn't sound they are from what you're saying sounds like the teacher's the facilitator mainly and...

T-03: Um so we have done enigma missions in the past [Int: some, what are they called?] enigma missions [Int: enigma missions, yep ok, what are they?] Um [redacted] [Vice Principal] is the best person to talk about that [Int: ok] her brainchild [laughs] but um essentially tat's about them choosing an area of interest and a passion and they start off writing ten questions about what they want to know about and then the teacher adds to those questions and adds another ten and deepens those questions [Int: mmm ok] so then they use then they sped a lot of time researching those questions and then they need to decide on how they're going to present the information that they found and how they're going to take action and do something with the information.

Interviewer: So this isn't that um "Learning Agreement" thing that goes throughout, this is something different?

T-03: This is something different [Int: ok] that's more senior school and they actually have a contract that they sign with the teacher [Int: ok] um which I may have a let me have a look [long pause].

Interviewer: And is that for a whole year?

T-03: That's for a whole year yep [pause].

Interviewer: And are they still doing that or it's just the previous thing?

T-03: Um they haven't done it this year [Int: ok] I think the other thing is as well is with COVID we're filling I suppose a lot of gaps this year as well because it's the first year that they've had no interrupt um with no interruptions to their schooling [Int: oh ok academically filling in the gaps you mean?] yeah and so making sure that they're prepped and ready for high school it's been a bit different this year [Int: mmm, yeah makes sense] [Pause] I've just sent you that contract.

Interviewer: That contract is part of these enigma missions? [T-03: yep] alright let me have a look [pause] ok, and you were saying that [inaudible] is that like grade five to six pretty much?

T-03: Ah it's always been traditionally five six [Int: ok] um in 2018 we trialled it with grade fours [Int: mmm] and it worked pretty well in grade four as well but that cohort was a very capable cohort [Int: right] and that's only so it's not compulsory to do it either [Int: ok].

Interviewer: Yeah I might reach out to, I think I emailed her about it but I didn't get a response, it might have been busy, she's still VP one of the VPs isn't she?

T-03: She is she was on long service leave for four weeks this term though for the first four weeks it might have been that it may have been why.

Interviewer: So which teacher I'm getting confused there's miss [redacted], there was miss um what's the other Vice Principal always when [redacted] [former Principal] left there was...

T-03: Mrs [redacted] left.

Interviewer: Mrs [redacted] that's right there was that one. Yeah, I had a response from her and then they left or something and then ok so [redacted] still there, Mrs [redacted] [T-03: yep] yeah maybe I'll ask her about that and ah see what she says. So that obviously just this year they're not running it, sounds like that's pretty close a sort of a project mindset right, they decide what they're gonna be doing [T-03: yep] ok.

Interviewer: [Q8 - 31:12] Ah next question. Which one's this? What are your views about primary school children learning how to manage projects from beginning to end? And do you see any challenges with it?

T-03: Um I think it's essential um I think that looking at what's been able to be done in the past um I think it's a really good way to engage students in the curriculum but it can't just be a project for project's sake um it's gotta be really carefully planned to get the most out of it [Int: mmm] and I think that quite often people think that project learning is an easier way to do things whereas it's actually a lot more difficult [Int: mmm, yep] um it takes a lot of foreplanning it takes yeah [Int: ok].

Interviewer: [Q9 - 32:02] And next question, this is number nine, so what more could be done to prepare preservice teachers to teach project management skills to primary school students?

T-03: Um I think there needs to be more training I think as well in order to do [pause] [Int: more training in PM like project management?] [inaudible] yes but I feel like your first couple of years of teaching I'm not sure if that's the right place for it [Int: mmm] pre-service teachers they're treading water in a lot of ways [Int: yep] and I think that in order to do a really good job with project management you've gotta know the curriculum like the back of your hand because then you see these opportunities if they arise [Int: mmm] whereas um and to be able to make those really strong connections and I think that it's very it can be very surface level if it's not done with that experience [Int: yep] so whether or not it could be something that's more done in terms of training more experienced teachers who then mentor graduate teachers [Int: oh] so that they've got it done instead of doing I suppose almost lip service to it at university I feel like it needs to be more ingrained within a school's philosophy and...

Interviewer: So maybe more practical not theoretical so they're inside the school [T-03: yeah] and then someone's the senior sort of person doing it, then they can mentor to the other teachers, that type of thing?

T-03: exactly.

Interviewer: Ok, yeah [pause] but learn it once they're in the school context [T-03: yep] not really in the academic environment, right, yeah makes sense.

T-03: I mean I think you could and I think that they would have um really great ideas [Int: mmm] but you don't know what's going to work until you're actually in that classroom [Int: mmm] and then all of a sudden you get some big personalities and um you know if you don't have your behaviour management bedded down [Int: mmm] then you're not going to be able to be able to manage group work.

Interviewer: Right ok, yep, and there's kind of two sides as well like I was thinking about this there other week, there's the angle of a teacher teaching a child project management but here's also teachers who effectively are project managers, but when you start the year you're planning your year, what you're gonna be doing is effectively a project so would that also help them once they get into a professional sort of career and plan out their whole year? So there's sort of two sides to it.

Interviewer: [Q10 - 34:44] Um so question number ten, the last, should there be a learning framework to assist in the teaching of project management skills to primary school children?

T-03: I'm in two minds [pause] I think sometimes frameworks can be quite restrictive um [Int: yep] myself I find that a lot of these kinds of frameworks don't take into consideration demographics of the school [Int: yep] um I think that a framework I think it can be limiting to a project in some ways but at the same time without that framework where is your consistency and you're already working with people that may not necessarily feel competent in project management [Int: mmm] and you gotta have a starting point.

Interviewer: Yeah it's like a chicken and the egg you know, sometimes it's too prescriptive but you need some type of boundary I guess or else [T-03: yep] I mean it is pretty formal pro...yeah.

T-03: Yeah there's frameworks for everything at the moment [both laugh] and I also worry that if you really value something you don't want it to just be another framework [Int: mmm].

Interviewer: Yeah well that's the thing like when I first started this I thought 'It has to be something, if it was a framework it's gotta be something really prescriptive' and just as a project manager just get the massive books that we learn and whittle it down to this and then say 'teachers here you go' but I don't think that's it, it's almost like because you got different contexts um different environments and things like that and you need something almost the opposite of that like really dispersed and high level that people can just pick and choose what they need for the particular project, I don't know what that looks like but um yeah.

T-03: And that's the hard part and you look at I mean a lot of the things that we're facing here I mean I think it's something like seventy percent of our students come from a language other than English background [Int: mmm] and if you look at the people that are making decisions on education in Australia um is that need necessarily represented in a lot of curriculums [Int: mmm] and then how does that like it all kind of just and you look at I spose another example is you look at some of the texts and some of the assessments that we do with students particularly maths [Int: yeah] and there's a lot of assumptions about language [Int: mmm] and what you've seen before and what you've experienced before and that's not always the case and I think that if we think about that in terms of project management with a framework what assumptions are we making about the people that are using this template or this framework.

Interviewer: So what type of difficulties would there be then with that different diversity there then if you got a framework? From the language point of view or the terminology point of view or...?

T-03: I think the language point of view [Int: yep] I think how you manage it point of view I think a um a values point of view different communities value different things as well and some communities will want different emphasis on things [Int: mmm] and different teachers will value different things a lot of teachers will tell you that 'well where's the literacy where's the' you know all the focus at the moment in the media is all reading writing arithmetic [Int: mmm] so we've gotta sell the idea that project learning can do that [Int: yep] and it can [laughs].

Interviewer: Yeah because it's always kind of there I mean it's there to say indefinitely I guess that sort of um what's it the STEM approach all those sort of critical you know but even you could use that logic what you just said about project management to the curriculum right the certain subjects in the curriculum you know like maybe some cultures they think why are we learning maths why are we learning this why are we learning that right 'we should be doing this' that type of thing. I remember when I was young I hated maths right when I came out of it I'm using a calculator in business, most people use Excel and a calculator, I mean if they go to business, but yet every year after year after year you're learning these maths concepts so anyway it's just an added thought.

T-03: Yeah and there is a lot more focus now on reasoning and fluency in mathematics [Int: right] yep and estimation because a lot of the kids at the moment will use a calculator [Int: mmm] and get something you know the wrong amount of digits [Int: right] because you know they're used the calculator incorrectly and if don't have that mathematical fluency they don't identify the error [Int: mmm].

Interviewer: Actually outside the normal curriculum so maths science all those type of things so you see any shift towards like the beginning of this ah whole survey [referring to the survey given to participants of this study] was about soft skills right so focusing on soft skills like you said the explicit teaching of those type of soft skills, anything like that like there's not a subject on it is there so but yet isn't that really important, problem solving, critical thinking, things like that?

T-03: Yeah there's the Victorian capabilities [Int: yeah yeah I've seen that one] um so if you have a look at the curriculum there's ethical capacity [Int: yep] social and emotional intercultural capability and that's where a lot of the soft skills come in [Int: yeah] but if you look carefully at I think there's been a shift back to in the last kind of five years I've noticed a shift backwards to you know the more um [inaudible] traditional skills but um [Int: like, traditional subjects or traditional skills or] un like that phonics focus [Int: oh ok] um the biggest conversation that I hear about soft skills is how do you prove it and how do you assess it [Int: yeah yeah I read that somewhere as well that how do you assess it, I mean they're there but yeah cos they're so they're such a grey subject right] and unfortunately until it's measurable I don't think I think it's going to be difficult for people the powers that be to make decisions about it because they can't prove that we're teaching it [Int: mmm] and I'm talking about like Department of Education not school level [Int: yeah] because in the end they've gotta prove to stakeholders that we are we have you know we've successfully educating and if we can't measure that [Int: mmm]

Interviewer: So it's in also like the twenty-first century skills that you kind of wrap up the soft in that twenty-first century skills but they talk about that a lot in the curriculum as well right some of these ACARA documents are saying teaching twenty-first century skills and da da da it's necessary, but that's those skills [T-03: It is] a lot of those skills are wrapped up in that.

T-03: And it it's changed slightly when I first started teaching there was actually a whole curriculum on ICT [Int: right] and they've scrapped that now and that ICT curriculum was word processing and accessing like by grade two you had to know how to save a file [Int: right] and it was very explicit like that and they've scrapped that now and it's entwined within everything and I think that's where they say that twenty-first century teaching because we're supposed to be doing that you it says like for example the maths curriculum now says with and without the use of technology [Int: mmm] um and the literacy curriculum talks a lot about multi-media and it's now reading and viewing so you teach reading through watching a movie and talking about that in a similar way to the way we would also study books [Int: mmm] so I think it's integrated do I see a the capabilities did it in some ways but in a lot of ways they just rebrand it.

Interviewer: Yeah and the ICT with that going away is it wrapped up in that technology subject or is it [T-03: um] part of that or not part of that or, cos technology is just the design and thinking and all that type of stuff right?

T-03: Yeah but you also have digital technologies as a subject [Int: yeah yeah] um but that also is different as well that talks about um it's there but it's not it's not as explicit as it used to be but the assumption that we're doing it.

Interviewer: Is the subject there though in primary school cos it's in the curriculum like the ACARA's document says digital technologies and design and technologies [T-03: yep] yep and it says starting from foundation right up and they mention all the different little things they learn at each level, or they're supposed to learn, but I never hear about the technology subjects from even my kids so I don't know what's happening there, and project management um when I say I've read that primary schools are supposed to teach kids project management that's only in the technology subjects, I don't see the word project management anywhere else in the in the ACARA documents.

T-03: No and those two technology subjects are bi-annual so you only teach them [inaudible] sorry you're supposed to teach them all the time [Int: yep] in our very very crowded curriculum [Int: yeah] but you only assess them every two years [Int: ah ok] and I remember someone telling me there's something like 27 years worth of curriculum that you fit into 13 years of schooling [Int: mmm, ok] so [Int: right] yeah. [Int: how's that, I'm not a mathematician but that doesn't quite fit, but yeah] no it doesn't um so I know that um we didn't teach digi tech this year because mrs [redacted] did quite a bit of it last year [Int: right] um the grade six curriculum is more about binary and things like that I'm pretty sure in um in grade six I know that [Int: binary as in mathematics, the zero and the one's, that type of computer binary?] yep [Int: ok] yep [Int: but not] but just cos I was on mat leave [maternity leave?] for the last year but I relieve taught in um five six a little bit and I had to teach it and I've never done it before [laughs].

Interviewer: yeah it can get difficult binary stuff, um, mmm that's interesting. I guess that's why project management in those technology subjects cos they're doing a lot of um solutions. They talk about solutions all the time, creating solutions so [T-03: mmm] and they're kind of like projects, there's always a product that comes at the end of it, there's planning involved, that's why they say it's critical and if you look at the ACARA document they've got that diagram where they, I think they've got in the centre 'creating solutions' and then they've got something around the, and then they've got project management, and then they've got other things around it so [T-03: yeah] but um.

T-03: Um miss [redacted] who's our grade two teacher as well [Int: yeah] she did community kitchen for a lot of years [Int: mmm] her and mrs [redacted] [inaudible] who's is in grade three [Int: ok] and they'd both be really good to talk to cos again community kitchen is a really big group project and they had to all you know organise the food they go shopping they buy the food work out how much to cost to make a profit [Int: mmm].

Interviewer: Yeah I could ring them up I suppose, I mean I rang miss [redacted] I'll probably ring her up again cos I've already had a chat about this particular research, it's just that because you know ethically when I sent this document in some of the teachers know about this research and then opt in to participate [T-03: yep] if I ring up they may say I'm harassing them or something I don't know but I wish they went in I wish miss [redacted] was there and uh, who's the other teacher I contacted, miss [redacted] so [redacted] I contacted she said she'd do it but I haven't heard from her since, I don't know if she's sick or away or [T-03: yep] and I don't wanna keep bugging these people cos I know they've got reports at the end of the year and.

T-03: Honestly I'd try again term one term one's a lot calmer [laughs].

Interviewer: Yeah it's funny you say that because when I started this ah a few months ago I thought 'yeah you know I'll get this wrapped up and I'll have the article written and' and actually my supervisor who's the only, I've got four supervisors for this PhD, one is in education and he said 'ah you'll be lucky to get anything done towards the end of the year because of reports' and I said 'really', he goes 'yeah the best time is probably the end of', I said February, he goes 'nah nah end of January when the teacher's start, they're all in a happy mood cos of Christmas, they haven't really got busy yet, bug them then and just see if you can get some people to participate' so maybe he's right.

T-03: Yep a hundred percent, a hundred percent.

Interviewer: Yeah I might do that.

T-03: Yep term four honestly is probably the hardest time to try and catch people [laughs].

[Interviewer thanks the participant and expresses appreciation. A general and unrelated discussion follows]

Note. This interview transcript has not been proofread for spelling and grammatical errors. It reads as it was transcribed from the original audio recording.

APPENDIX VI

Survey dataset for the study in Chapter 4

Question 1		
Soft skills may be defined as "...a broad set of skills, competencies, behaviors, attitudes, and personal qualities that enable people to effectively navigate their environment, work well with others, perform well, and achieve their goals" (Lipmann et al., 2015). As a teacher, please list up to 10 soft skills that you believe are important for successfully managing a project from beginning to end.		
ID	Selection	Reason for selection
T-01	Communication Problem solving Adaptability critical thinking Teamwork Attention to detail Listening Curiosity Integrity Negotiation	N/A
T-02	Communication problem solving teamwork positivity growth mindset diligence creativity compassion	N/A
T-03	Collaboration Communication Resilience Persistence Patience Critical thinking Reading social cues time management goal setting working independently	N/A
T-04	Collaboration Communication Teamwork Listening skills Effective communication Participation Creativity Critical thinking Growth mindset Productivity	N/A
T-05	Listening Empathy Mentoring Setting up expectations Kindness Caring Seek first to understand before being understood Good leadership	N/A

	Communication Positive attitude	
T-06	teamwork communication time management negotiation decision making Leadership Listening Empathy Problem solving Work ethic	N/A
T-07	Time management Organisation Flexibility Effective communication Positive mental attitude Resilience	N/A
T-08	A level of confidence that allows students to take risks Communication Awareness of non-verbal communication Planning Time awareness Understanding of key concepts Language Recognising other perspectives Compromise Visual spatial reasoning	N/A
T-09	Good communication skills Organisational skills Delivering on what you say you will Approachability Respectfulness Teamwork Time management Leadership Creativity Flexibility	N/A
T-10	Communication Leadership Problem solving Teamwork Critical Thinking Decision Making Creativity Active listening Critical thinking Time Management	N/A
T-11	Communication Emotional Intelligence Teamwork Organisation Problem Solving	N/A

	Creativity Giving and receiving feedback	
T-12	Communication Planning Critical thinking and analysis Flexibility People management Leadership Negotiation Prioritisation Collaboration	N/A
T-13	A nurturing attitude Adaptable - change is essential and necessary Continuous learner Goal oriented Team - group skills Organisation Reflective	N/A

Question 2

From your responses in Question 1, which soft skills, if any, may be difficult for primary school children to learn? Note: Please list each soft skill in the boxes on the left-hand side and your reasoning for listing that soft skill on the right-hand side.

ID	Selection	Reason for selection
T-01	Empathy	Age related skill.
	Collaboration	Ego is also age related.
	Negotiation	Need to be able to understand others points of view.
T-02	Growth mindset	It can be challenging to be open to mistakes.
	Problem solving	Sometimes young children need more exposure to multiple problems before they can start seeing solutions.
	Teamwork	Young students are learning how to navigate working together.
	Creativity	Sometimes young students want to be told the solution rather than think creatively.
	Diligence	Some young students tire easily and need time to build up their diligence.
T-03	Reading social cues	Effected by neurological differences in people such as ASD, develops with maturity.
	Patience	Technology means students are constantly stimulated and often want things completed easily and quickly.
	Persistence	Technology means students are constantly stimulated and often want things completed easily and quickly.
	Critical thinking	Goes against the grain of lots of other things taught in school (wanting students to follow procedures and routines etc).
T-04	Critical thinking	Needs practice.
	Teamwork	Need to have effective problem solving skills.
	Growth mindset	Students find it difficult to be resilient at times.

	Productivity	Students find time management hard at times.
T-05	Listening	Children are primarily into themselves, so listening is a developed skill which develops a little later in ones life.
	Empathy	Once again, a skill for an older person.
	Mentoring	Children at a young age, particularly in a Montessori classroom are taught to mentor, so this is a soft skill that can be achieved.
	Setting up expectations	Communicating clearly from one child to another can set up expectations.
	Kindness	This skill of kindness is within everyone, however, it needs to be role modelled and talked about with children. Books are a great starting point here.
	Caring	Caring is a soft skill that also needs to be learnt by others exhibiting and behaviour.
	Seek first to understand and then to be understood	This soft skill is too difficult for Primary aged children.
	Good Leadership	We demonstrate this in our Montessori classrooms, however, its hard for children to really understand at a young age.
	Communication	This skill comes with lots of practise.
	Positive attitude	I think that we are born with this, it's in ones DNA.
T-06	Negotiation	Can be self-centred with ideas.
	Empathy	Tend to focus on their own wellbeing.
	Time management	Do not value this without adult reminders.
	Problem solving	Tend to rely on one solution.
	Leadership	Rely on adults to lead.
T-07	Resilience	It isn't taught as a basic skills or competency outside of the school environment as much as it used to be. As such, students have become less tolerant and able to sustain practice when faced with challenges.
	Time management	Similarly to my first response, time management is a skill that needs to be applied and practiced in every facet of one's life in order to fully attain and be able to use the skill in a versatile manner.
T-08	Confidence	Environmental and societal factors such as self critical behaviour of peers.
	Communication	Healthy and helpful communication is a skill that must be taught and modelled and it also helps to have similar language skills. This can be challenging for some children depending on their backgrounds and communication styles.
T-09	Leadership	Not all children have this natural inclination to leadership.
	Integrity	Quite a sophisticated topic for children, especially younger children to fully comprehend.
	Organisation	This would vary depending on the child. Some children are already extremely organised while others struggle to maintain attention and focus and can be easily distracted. This is especially the case for

	Respectfulness	children diagnosed with ADHD. This is of course not to say that you cannot teach these skills but some may need the teaching more than others.
	Creativity	Again, this is dependent on the child. Most children do respond well to explicit instruction around respectfulness especially if this is already occurring at home.
	Time management	Again, this is child dependant and something which generally comes naturally to certain children. However creative thinking can be modelled and taught.
	Time management	Will again depend on the child. Similar to organisation skills.
T-10	Time Management	This age group of pupils come up with many ideas in terms of any problem solution, and find hard to manage time.
T-11	Communication	I have worked in the juniors for many years and this can be difficult to teach as we all communicate in a variety of ways. Communication can also take shape in many forms (verbal, non-verbal, written etc.)
	Problem Solving	Similar to communication, this can be taught but is difficult. Some kids like to talk out their problem, others need adult intervention, some are happy dealing with it in simplified terms.
T-12	Leadership	I don't think leadership can be taught.
	People management	Lack of opportunity - although can be observed in some student's particularly in playground environments.
T-13	Work well with others	conflicting personalities, dominant personalities, inclusion issues.
	Organisation	home life can have an impact on this - homework, bedroom organisation etc.
	Reflective	if they aren't taught how to reflect they won't bother.

Question 3

From your responses in Question 1, which soft skills, if any, would NOT be difficult for primary school children to learn? Note: Please list each soft skill in the boxes on the left-hand side and your reasoning for listing that soft skill on the right-hand side.

ID	Selection	Reason for selection
T-01	Attention to detail	Part of their everyday learning.
	Communication	Part of their everyday learning.
T-02	Positivity	This might be easier to achieve depending on the background of the child because they tend to look on the bright side.
	Communication	This can still be a challenge for young children but potentially easier to learn than some of the others.
T-03	[no reply]	[no reply]
T-04	Communication	Students are familiar with most peers and are comfortable speaking to them.
	Creativity	Students enjoy being artistic and creating new products.
T-05	Listening	This is difficult for younger children.
	Empathy	This is a learnt skill and can be hard for little ones.
	Mentoring	This can be with careful skill and teaching to not too difficult for Primary aged children.
	Setting up expectations	Clear and concise communication will help the children to understand this and then it's not too difficult for them.

	Kindness	I believe that children have this innate ability to exhibit kindness.
	Caring	Once again, children have this inside them.
	Seek first to understand and then to be understood	This is difficult for primary aged children to learn.
	Good Leadership	I believe that in upper Primary, this is very achievable.
	Communication	By constant clear examples and role modelling this, children in Primary schools can skill themselves in the art of communication.
	Positive attitude	Working with Primary aged children on being the best that they can be, can really assist with a positive outcome for children here.
T-06	listening	taught this skill very early in primary school.
	teamwork	needed for sporting and class activities more frequently.
	communication	have to use this to have needs met.
	decision making	need to answer set.
T-07	Communication	It's woven into all aspects of life and certainly features heavily across the curriculum from presentations to group work, to paired studies etc.
T-08	Non-verbal communication	It comes naturally to observant and receptive children
T-09	Communication skills	Some children may need more explicit instruction and modelling than others but generally this is something often discussed and taught even in incidental learning.
	Teamwork / collaboration	Many avenues to teach this including group projects, games, sports and PE.
T-10	Teamwork	Primary school children love sharing ideas with others and enjoy teamwork.
T-11	[no reply]	[no reply]
T-12	Flexibility / adaptability	Students are just developing their sense of sharing, conflict resolution etc learned through play and experience.
	Communication	Whilst not easy as such, this is an area they are learning everyday. Positive behaviours for learning includes a focus on how to communicate with teachers and peers and sometimes parents.
T-13	Goal oriented	They should be used to having and setting goals within the classroom and see their progress.
	continuous learner	Every day we learn something in or out of the classroom.

Question 4

Should primary school children learn how to manage projects? Note: After selecting your choice on the left-hand side, please explain your reasoning for that choice in the box on the right-hand side.

ID	Selection	Reason for selection
T-01	Yes	However it needs to be scaffolded appropriately in order for students to be successful and enjoy the process.
T-02	Yes	Of course, primary aged children should be exposed to as many opportunities as possible to grow their skills and enhance their learning.
T-03	Yes	These skills are more important in the future than many other skills. It's a great way to integrate and engage students with more traditional academic learning and to develop fluency with this academic learning by translating the skills to other settings, therefore consolidating the learning.

T-04	Yes	They can learn skills that will be effective for future endeavours.
T-05	Yes	Children of all ages are highly capable. There is no need to molly coddle children. Two year olds can empty dishwashers, cut & prepare food, get themselves dressed; make their beds. We as adults limit children's abilities to explore their outside and inside environments. So hence, in the right Primary school environment there should be no holding back on children and their capabilities on managing projects.
T-06	Yes	It is a life skill and needs to be taught in increments.
T-07	Yes	Yes, managing projects and other people is an essential skill in later life - in the work space, higher education.
T-08	Yes	It's a lifelong skill that assists in a range daily tasks. It would increase executive functioning and presumably confidence.
T-09	Undecided	[no reply]
T-10	Yes	Introducing the basic idea of Project management in primary school will enhance the opportunity to use their Problem Based Learning.
T-11	Undecided	I think there is definitely a need to teach children how to manage a project from start to finish and understanding skills listed about in question 1. Children need to be explicitly taught emotional intelligence to understand themselves as a person and a learner but also to understand others. If you do not have solid relationship building skills to begin with, then project based learning in a team won't be successful. You need to build rapport and trust within a classroom setting as well.
T-12	Yes	This happens via collaborative group work in classroom.
T-13	Yes	It's a life skill that many will need in their jobs as well as home environments.

Question 5

When should children FIRST learn how to manage projects? Note: After selecting your choice on the left-hand side, please explain your reasoning for that choice in the box on the right-hand side.

ID	Selection	Reason for selection
T-01	5-11 years old (primary school)	Students often begin to manage small group projects in primary school.
T-02	5-11 years old (primary school)	Pre-school children should be exposed to play based ideas and concepts but not necessarily put into the task of managing projects, while primary aged students should have enough foundational learning to begin to manage projects.
T-03	0-4 years old (pre-school)	Can always be done in a simple way, adding complexity and explicit skills as we go. We also often do 'projects' with young children in a guided way without thinking about it through play.
T-04	5-11 years old (primary school)	[no reply]
T-05	0-4 years old (pre-school)	Children from the age of 18months and onwards are very capable for manage small projects.
T-06	5-11 years old (primary school)	From the day they enter school they are being exposed to ways of managing projects via soft skills.
T-07	5-11 years old (primary school)	There is scope for this to begin earlier too though, with effective role models and tools to support positive management.
T-08	5-11 years old (primary school)	[no reply]
T-09	5-11 years old (primary school)	I think younger children should at least be exposed to projects they can manage at an age appropriate level. Often some students rise to the occasion more than others which is where natural leadership skills are often observed and other students who take more passive roles can be supported to engage more with the project and hence have opportunity to learn the skills they may be lacking in.
T-10	5-11 years old (primary school)	They might be interested in learning a new application that relates to their PBL.

T-11	5-11 years old (primary school)	Perfect age when starting school. 0-4 should be more play based learning experiences and then a move to hands on and project based learning.
T-12	5-11 years old (primary school)	Early exposure to things such as leadership, time management, collaboration can start in lower primary perhaps without labelling it project management.
T-13	0-4 years old (pre-school)	The earlier the better.

Question 6

If you selected "5-11 years old" in the previous question, which year band should primary school children FIRST learn how to manage a project? Note: After selecting your choice on the left-hand side, please explain your reasoning for that choice in the box on the right-hand side.

ID	Selection	Reason for selection
T-01	3-4	This age allows their communication skills to have evolved enough to be able to manage.
T-02	F-2	Younger primary students can begin to manage small projects and build the project task as they grow older.
T-03	F-2	[no reply]
T-04	3-4	[no reply]
T-05	F-2	The earlier, the better.
T-06	F-2	As previously stated it should be incremental and built upon.
T-07	F-2	Management of simplistic projects can begin early, e.g. Managing the building of a Lego model, get resources, work out what to make, make it.
T-08	3-4	[no reply]
T-09	F-2	Kids can manage small age appropriate projects at this age.
T-10	5-6	I think, this age group is more interested in applying this sort of skills.
T-11	3-4	I think you need to build the foundations for the project based learning in F-2 and teach the soft skills and give them smaller experiences. By Year 3-4, students have those skills and can begin to understand how to utilise those skills.
T-12	3-4	F-2 focus on socialisation and learning to read, write and count etc.
T-13	F-2	I didn't select 5-11, but the earlier the better.

Question 7

Who is the best person to teach primary school children about managing projects? Note: After selecting your choice on the left-hand side, please explain your reasoning for that choice in the box on the right-hand side.

ID	Selection	Reason for selection
T-01	Teacher	I would have selected teacher and parents as both have the skill set to cope with the issues that come from children working together and the ability to scaffold.
T-02	Teacher	All of the above but the teacher can get a project management expert in and include parent involvement.
T-03	Teacher	Integrate it into other areas of the curriculum. Though I do believe experts should be involved in the process. I have seen many experts come into the classroom and as their do not specialise in teaching, have had difficulties with the planning, scaffolding, behaviour management aspects. The more parent involvement the better!
T-04	Teacher	Someone they are familiar with in a school setting
T-05	Parent	I think that both a parent and early child carer should be starting with small scale project work.
T-06	Teacher	Parents and teachers play a vital role in coaching children however not all parents (due to many factors) are able to support the teaching aspect.
T-07	Teacher	Both teachers and parents can enter into this.
T-08	Teacher	The teacher would be best because they are qualified. They have the ability/background knowledge and awareness of developmental stages, barriers and needs of the students. They are able to provide differentiated tasks that are related to the students needs in an environment conducive to learning (for most). Unfortunately, with an

		extremely packed curriculum/ competing time constraints it is hard to make time to explicitly teach these skills even though teachers know it's important. Some programs do still teach it. Another issue to overcome is the materials, time, background knowledges and support needed for those students who may have disorders effecting their executive functioning. Ideally, parents would teach this too.
T-09	Teacher	I would imagine a teacher would be best but they may benefit from PD with project managers.
T-10	Project management expert	Sometimes School Children find more interested and fun in learning from outside sources/experts as a change.
T-11	Teacher	Students have the relationship with their teacher and would perform better. Could definitely use a PM to contribute though.
T-12	Teacher	Trusted and can be integrated into all aspects of learning across curriculum.
T-13	Teacher	I selected teacher as they have the student during crucial hours of the day, however I also believe parents should be involved in this process.

Question 8

Which group is best to develop a learning framework for teaching primary school children how to manage projects? Note: After selecting your choice on the left-hand side, please explain your reasoning for that choice in the box on the right-hand side.

ID	Selection	Reason for selection
T-01	Both in collaboration	[no reply]
T-02	Both in collaboration	[no reply]
T-03	Both in collaboration	See above, to get the best outcomes both should collaborate
T-04	Both in collaboration	Better understanding of specific topics
T-05	Both in collaboration	All people involved in a child's life are more than capable of developing a learning framework for teaching primary school children in managing projects.
T-06	Both in collaboration	Experts in the field would be best in developing a sequential framework with teacher feedback
T-07	Teachers	Teachers have the ability and means to model by example management of a project, skills to guide through the process and understanding of the developmental steps that students will go through/are working from.
T-08	Both in collaboration	[no reply]
T-09	Both in collaboration	[no reply]
T-10	Both in collaboration	Teamwork works better in most cases.
T-11	Both in collaboration	Collaboration works best here so the PM can understand the students better and teacher can learn about project management skills.
T-12	Both in collaboration	[no reply]
T-13	Both in collaboration	Teachers need to be shown the best ways to teach students how to do this.

Question 9

Should the person teaching children how to manage projects receive project management training themselves? Note: After selecting your choice on the left-hand side, please explain your reasoning for that choice in the box on the right-hand side.

ID	Selection	Reason for selection
T-01	No	I think teachers already have this skillset as we constantly manage many projects at once.
T-02	Yes	The more teachers are trained the better they can share that expertise.
T-03	Yes	Teacher PD is essential to good quality programs.
T-04	Yes	[no reply]
T-05	No	I can't see how this would be required.
T-06	Yes	Background knowledge will assist with delivering a solid teaching framework.
T-07	Yes	Yes if we are talking about the management of greater more complex issues and problems. However, the training would need to be applicable to the needs and purpose of the individuals.

T-08	Yes	[no reply]
T-09	Yes	This should be with the view of teaching these skills to children.
T-10	Yes	That would make the trainer more efficient in teaching.
T-11	No	Probably more undecided on this one. My husband is a PM and when we chat shop there are a lot of skill sets that I have that he uses in work. It would be person/situation dependent.
T-12	No	[no reply]
T-13	Yes	You want to be able to teach best practice.

Question 10

What is the best environment for children learning how to manage projects? Note: After selecting your choice on the left-hand side, please explain your reasoning for that choice in the box on the right-hand side.

ID	Selection	Reason for selection
T-01	School	This needs to be a multiple selection question as learning through school while in conjunction with community projects works well.
T-02	Other (specify)	All places are good. School is good but also onsite in the community or in a workplace.
T-03	Other (specify)	A range of different experiences as well as integrating different environments to provide access to a range of opportunities and experts. the best projects I have seen move out of the classroom.
T-04	School	[no reply]
T-05	Other (specify)	All of the above: School; Home; Community and workplace.
T-06	School	This has potential for all areas / environments to be involved and successful.
T-07	School	School and community where children have the peers around the model from and work with.
T-08	Community	All of the above.
T-09	Other (specify)	School would be best place to receive explicit instruction. However school could do some collaborative projects with the community.
T-10	Workplace	Makes it more practical and realistic.
T-11	School	School to begin with, however I could see this working in the community or work place. Could be a school-wide progression.
T-12	Community	[no reply]
T-13	School	Core hours of the day, safe learning environment.

Question 11

If primary school children learn how to manage projects, do you believe this will help them to be more successful in their future careers? Note: After selecting your choice on the left-hand side, please explain your reasoning for that choice in the box on the right-hand side.

ID	Selection	Reason for selection
T-01	Yes	[no reply]
T-02	Yes	They learn essential skills they will need later in life.
T-03	Yes	Students need to know how to learn and how to manage themselves. this will not only help as an employee, but adulting in general with managing a household, working towards goals and planning for events and special occasions. Project management also assists in working with people with different values and experiences, something essential to be successful in collaborative workplaces.
T-04	Yes	[no reply]
T-05	Yes	By managing projects they are encountering working with others; communication skills, teamwork, patience and excitement when a project comes to a conclusion where one can feel very happy and satisfied with a job well completed.
T-06	Yes	Yes as soft skills will continue to develop over the course of schooling
T-07	Yes	The amount of skills that one obtains and exercises through project management is immeasurable. These skills are transferable to many workplaces. The development of independent thinkers and learners should be our ultimate goal, project management is an avenue towards this.

T-08	Yes	[no reply]
T-09	Yes	May depend on career. However any organisational based skills would be highly beneficial for thus generation of children given increase in short attention spans with children.
T-10	Yes	This will teach them the basic knowledge of managing projects before entering into reality.
T-11	Yes	Enormous increase in skill set, especially communication, teamwork and emotional intelligence.
T-12	Yes	[no reply]
T-13	Yes	A lot of jobs have projects so students need to be shown from an early age how to manage these.

Question 12

If primary school children learn how to manage projects, do you believe this will help them to be more successful in their personal lives? Note: After selecting your choice on the left-hand side, please explain your reasoning for that choice in the box on the right-hand side.

ID	Selection	Reason for selection
T-01	Yes	[no reply]
T-02	Yes	These same skills are helpful throughout life in many ways.
T-03	Yes	See above
T-04	Yes	[no reply]
T-05	Yes	This will improve the whole being and make the learning path and working path more rounded.
T-06	Yes	All soft skills are advantageous and if developed increase personal growth.
T-07	Yes	Again, the skills obtained are transferable.
T-08	Yes	[no reply]
T-09	Yes	Seeing something through to completion. Focusing on having a goal and completing it. These are all great aims for this generation who may lack some of these skills due to rens mentioned above.
T-10	Yes	That could be the practice platform of 'The soft skills' anyone needs for managing projects and help them succeeding in future endeavours.
T-11	Yes	I think for some children, this would help them manage the work load when entering high school as well and then give them an understanding of seeing out a project from start to finish.
T-12	Yes	[no reply]
T-13	Yes	I'm 50/50 on this, but there are many projects in life both at work and at home and being able to manage these will make life easier.

Question 13

Technical or hard skills may be defined as the necessary abilities to perform a particular task or activity (Cimatti, 2016) and requires a high degree of domain-specific knowledge (Torres et al., 2020) and technical expertise (Marin-Zapata et al., 2021). For primary school children learning how to manage projects, which category of skills is more important to focus on? Note: After selecting your choice on the left-hand side, please explain your reasoning for that choice in the box on the right-hand side.

ID	Selection	Reason for selection
T-01	Soft skills	[no reply]
T-02	Soft skills	I believe soft skills need to be established first as they are the foundation for many things and then hard skills can be taught later once the student decides their specified learning path.
T-03	Both are equally important	[no reply]
T-04	Both are equally important	[no reply]
T-05	Both are equally important	To have a successful project will entail all facets of skills - both technical and soft in order to deliver an all rounded project that can be well communicated to the representative body & fulfill the technical criteria which was laid out as the foundation for the project work.

T-06	Soft skills	It's a framework building up and technical skills should come into play in Secondary school.
T-07	Both are equally important	These skills go hand in hand with each other in my view.
T-08	Soft skills	[no reply]
T-09	Soft skills	Will depend on age but generally, I think the soft skills will be more transferable so more useful to children, especially younger children.
T-10	Both are equally important	Both skills are correlated, and work better together.
T-11	Both are equally important	Need to have both skill sets in order to succeed. You would need some form of hard skills to be able to complete a specific type of project (e.g. IT, written, visual at etc.).
T-12	Soft skills	[no reply]
T-13	Both are equally important	They go hand-in-hand. Knowledge is crucial, but you also need to be able to put it into practice with the technical skills.

Question 14		
How many years teaching experience do you have?		
ID	Selection	Reason for selection
T-01	12	N/A
T-02	2	N/A
T-03	11	N/A
T-04	3	N/A
T-05	30	N/A
T-06	25	N/A
T-07	13	N/A
T-08	3	N/A
T-09	8	N/A
T-10	6	N/A
T-11	9	N/A
T-12	1	N/A
T-13	10	N/A

APPENDIX VII

Department of Education permission to conduct research



Department of
Education & Training

2 Treasury Place
East Melbourne Victoria 3002
Telephone: 03 9637 2000
DX210083

Application number: 2022_004598

Mr Sante Delle-Vergini



Dear Mr Delle-Vergini

Thank you for your application of 25 May 2022 requesting permission to conduct research in Victorian education settings, for the research project *A framework to support the learning of project management among primary school children in the Australian Technologies curriculum*.

I am pleased to advise that your research proposal is approved in principle, subject to the following:

1. The research is to be conducted in accordance with the final documentation you provided to the Department of Education and Training.
2. Research is to be conducted in accordance with Victorian government health advice, including public health directions related to COVID-19, and any adjustments to the research methodology requested by the participating education setting in this regard.
3. Separate approval for the research is to be sought from school principals/and or site managers, who are the final decision-makers as to whether the research is to be conducted in their education setting. It must be made clear to each principal/site manager that you approach that participation in the research is optional and is not a Department of Education and Training requirement. Recruitment of research participants at education sites can only commence after approval has been sought from principals/and or site managers.
4. Principals and site managers should be provided with this approval letter and, if applicable, the letter of approval from a relevant and formally constituted Human Research Ethics Committee.
5. Principals and site managers are to be provided with clear guidance regarding the project, including all relevant information regarding the potential time burden to sites and individuals, proposed research methodologies, and risk mitigation strategies which may relate to the project.
6. All individuals participating in the research project should be provided an explanatory statement about the research and active, informed consent needs to be obtained from all eligible participants.

Your details will be dealt with in accordance with the *Public Records Act 1973* and the *Privacy and Data Protection Act 2014*. Should you have any queries or wish to gain access to your personal information held by this department please contact our Privacy Officer at the above address.



APPENDIX VIII

University of Southern Queensland ethics approval

Dear Sante

I am pleased to confirm your Human Research Ethics (HRE) application has now been reviewed by the University's Expedited Review process. As your research proposal has been deemed to meet the requirements of the National Statement on Ethical Conduct in Human Research (2007), ethical approval is granted as follows:

USQ HREC ID: H20REA139

Project title: A framework to support the learning of project management competencies among primary school children in the Australian Technologies Curriculum

Approval date: 29/07/2020

Expiry date: 29/07/2023

USQ HREC status: Approved

The standard conditions of this approval are:

- a) responsibly conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal;
- b) advise the University ([email:ResearchIntegrity@usq.edu.au](mailto:ResearchIntegrity@usq.edu.au)) immediately of any complaint pertaining to the conduct of the research or any other issues in relation to the project which may warrant review of the ethical approval of the project;
- c) promptly report any adverse events or unexpected outcomes to the University ([email: ResearchIntegrity@usq.edu.au](mailto:ResearchIntegrity@usq.edu.au)) and take prompt action to deal with any unexpected risks;
- d) make submission for any amendments to the project and obtain approval prior to implementing such changes;
- e) provide a progress 'milestone report' when requested and at least for every year of approval.
- f) provide a final 'milestone report' when the project is complete;
- g) promptly advise the University if the project has been discontinued, using a final 'milestone report'.

The additional conditionals of approval for this project are:

- (a) Research must adhere to COVID-19 restrictions.

Please note that failure to comply with the conditions of this approval or requirements of the Australian Code for the Responsible Conduct of Research, 2018, and the National Statement on Ethical Conduct in Human Research, 2007 may result in withdrawal of approval for the project. Congratulations on your ethical approval! Wishing you all the best for success!

If you have any questions or concerns, please don't hesitate to make contact with an Ethics Officer.

Kind regards

Human Research Ethics

University of Southern Queensland
Toowoomba – Queensland – 4350 – Australia
Phone: (07) 4631 2690
Email: human.ethics@usq.edu.au